



# PACIFIC HEALTHY DIETARY GUIDELINES FOR PEOPLE WITH DIABETES:

*A handbook for health professionals and educators*

by the Public Health Division of the Pacific Community



Pacific  
Community  
Communauté  
du Pacifique

# **Pacific healthy dietary guidelines for people with diabetes:**

**A handbook for health professionals and educators**

by

The Public Health Division of the Pacific Community

Noumea, New Caledonia, 2020



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## GLOSSARY

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<b>BMI</b>	Body Mass Index: measurement of an individual's body fat based on their height and weight
<b>Calorie</b>	unit of food energy
<b>Carbohydrate</b>	any of a large group of organic compounds occurring in foods and living tissues, including sugars, starch and cellulose
<b>Diabetes</b>	the inability to regulate the level of sugar in the blood
<b>Dietitian</b>	a registered health professional who meets standards required by the New Zealand Dietitians Board and has both an undergraduate science degree in human nutrition and a post-graduate qualification in dietetics
<b>Fructose</b>	fruit sugar (glucose)
<b>Glucose</b>	simple sugar
<b>HbA1c</b>	Haemoglobin A1c measures average level of blood sugar over the past 2 to 3 months (8 to 12 weeks). It gives an indication of blood glucose control. It is also used as a screening test to identify diabetes
<b>Heart disease</b>	any disorder of the heart or its blood supply, including heart attack, atherosclerosis, and coronary artery disease.
<b>Hypertension</b>	high blood pressure
<b>Insulin</b>	the hormone released by the pancreas to regulate the level of sugar in the blood
<b>Isocaloric</b>	same amount of calories
<b>Lactose</b>	milk sugar (glucose and galactose)
<b>Lactose intolerance</b>	the inability to digest lactose
<b>Mineral</b>	an inorganic (non-carbon-containing) element, ion, or compound
<b>Nutritionist</b>	a person who gives advice on matters related to food and nutrition. There is no specific qualification or statutory legislation that regulates that profession and therefore the title can be used freely by anyone. This could range from someone with a PHD in a specialty area of nutrition to someone with no formal training.
<b>Portion size</b>	the amount of food you eat. Using hand can be an easy way to check the size of portions and amount of food on your plate
<b>Saccharide</b>	Any of a series of sweet-tasting, crystalline carbohydrates, especially a simple sugar (a monosaccharide) or a chain of two or more simple sugars (a disaccharide, oligosaccharide, or polysaccharide). Glucose, lactose, and cellulose are saccharides.
<b>Serving size</b>	the amount of food or drink that is generally served, used as a reference on the nutrition label of processed food and determined by the food manufacturer
<b>Stroke</b>	loss of blood supply to part of the brain, due to a blocked or burst artery in the brain
<b>Sucrose</b>	made up of glucose and fructose
<b>Vitamin</b>	any of a group of organic compounds that are essential for normal growth and nutrition.

# OVERVIEW

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## Purpose and statement of intent

The main purpose of this handbook is to provide background information and evidence-based nutrition and dietary guidelines for Pacific people with diabetes.

The handbook is intended for health professionals and educators who provide health advice on nutrition and dietetic interventions for people with diabetes in the Pacific region. Whilst it has a focus on diabetes, the healthy eating principles and recommendations are similar to those for people who need to lose weight and reduce the risk of cardiovascular diseases (CVD).

The handbook provides key nutrition and dietary recommendations, along with a brief explanation of the available evidence that has resulted in changes in approaches to the management of diabetes. Evidence-based dietary recommendations for people with diabetes have been issued in most countries. The most widely quoted are those of the American Diabetes Association and the nutrition studies of diabetes by the European Association for the Study of Diabetes. The evidence derives from trials that show that dietary modifications improve clinical outcomes in people with diabetes.

The nutrition and dietary guidelines are designed to be culturally appropriate to all Pacific communities. They also enable advice to be tailored to individuals and their families in the context of their physiological, cultural, social-economic and political environment and personal preference.

It is important that all healthcare professionals working with people with diabetes have a thorough understanding of these diabetes nutrition and dietary guidelines. There is a separate but related guideline for pregnant women with diabetes (gestational) and young children in Part 3.

## Structure of the handbook

There are three parts:

Part 1 – Background;

Part 2 – The guidelines and the technical explanatory notes for each guideline; and

Part 3 – Special topics with information and resources to support the guidelines.

This handbook builds on other guidelines and training programmes published by the Pacific Community (SPC). They include *Pacific guidelines for healthy living*<sup>[1]</sup> and *Diabetes is everybody's business*,<sup>[2]</sup> alongside other handbooks developed to support and promote healthy lifestyles for Pacific Island communities.

# PART 1

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## Background

- Diabetes mellitus (DM) is defined as a long-term metabolic disorder of multiple aetiology characterised by chronic high blood sugar (hyperglycaemia).<sup>[3, 4]</sup> The maintenance of normal blood glucose depends on two processes.<sup>[4]</sup> When the liver receives signals that the blood glucose level is too low, food can rapidly replenish it. In the absence of food, glucagon signals the liver to break down glycogen stores. Eating balanced meals helps the body to maintain a balance between the extremes, allowing for glucose to enter the blood gradually. When the blood glucose level is too high, insulin signals the cells to take up glucose for energy.<sup>[4]</sup>
- In diabetes mellitus, defects in insulin secretion, insulin action or both, cause the body not to use carbohydrate (sugar and starch) properly. There are three main types of DM: Type 1 (T1DM) previously known as insulin-dependent diabetes (IDDM); Type 2 (T2DM), previously known as non-insulin-dependent diabetes (NIDDM);<sup>[4]</sup> and gestational diabetes mellitus (GDM), diabetes developing during pregnancy. Food and nutrition therapy is integral to all types of diabetes care and management.<sup>[3-7]</sup>

Evidence shows that diabetes mellitus is a major cause of morbidity and mortality worldwide, with an increasing prevalence. It was estimated that 422 million adults worldwide had diabetes in 2014, a prevalence of 8.5%.<sup>[5, 6, 8, 9]</sup> It is well recognised that diabetes is a major public health problem globally.<sup>[4, 8, 9]</sup> Diabetes mellitus significantly contributes to the development of cardiovascular disease, blindness, kidney failure and lower limb-amputations and is recognised globally as a major public health problem.<sup>[8, 9]</sup> Of particular concern is the high prevalence of debilitating diabetes complications in Pacific Island countries and territories (PICTs).<sup>[10, 11]</sup> Seven PICTs are in the top ten countries with the highest diabetes rates in the world.<sup>[9]</sup>

These small island nations are inadequately equipped to face human and economic development challenges arising from the consequences of diabetes. To address these challenges, a more effective strategic approach is needed. One of the approaches identified by the Pacific Community (SPC) is to develop nutrition and dietary guidelines for people with diabetes in the Pacific region and for Pacific peoples living overseas.

This nutrition and dietary guideline focuses on T2DM, given that this is the most common form of diabetes in the Pacific population. The high prevalence is associated with an aging population, reduced levels of physical activity, and the rapid change from a traditional lifestyle (non-western) to increasing consumption of high energy foods, high in fats and sugars.<sup>[2, 3, 7, 8]</sup> T2DM frequently results from insulin resistance caused by obesity, predominately abdominal adiposity. There can be a high level of circulating insulin, but the body is resistant to its action because of the excess weight. For this reason, weight loss is a key component of diabetes management. Nutrition and dietary management is an essential but very challenging aspect of successful diabetes management.

## Nutrition and dietary therapy for diabetes

The nutrition and dietary guidelines have been developed to strengthen and standardise diabetes food and nutrition care in the Pacific region. People with T2DM should have access to nutrition advice from a trained health professional in either one-on-one or group consultations. Personalised advice on food and nutrition should be tailored and meaningful to the person with diabetes and their family.<sup>[7]</sup> Achieving nutrition-related goals required a coordinated team effort.



Food and dietary modification is the cornerstone of diabetes management. The treatment of T2DM focuses on achieving good glycaemic control through lifestyle modifications, with healthy eating and physical activity.<sup>[4, 12]</sup> T2DM is a progressive disease and, in some cases – particularly the later stages of diabetes – lifestyle modifications alone are likely to be insufficient to achieve good glycaemic control. Therefore treatment with oral hypoglycaemic agents (OHAs), a blood glucose-lowering medication, is recommended and insulin may be required later.<sup>[12, 13]</sup> Even when oral hypoglycaemic treatment and/or insulin treatment is required, nutrition and dietary practices must be maintained to achieve diabetes management goals.

## Goals and objectives

The overall goal of nutrition and dietary therapy is to assist people with diabetes in changing their physical activity habits and their food practices and choices to achieve a normal blood sugar level. Diabetes-specific dietary advice can improve clinical and metabolic outcomes associated with diabetes and cardiovascular risk, such as glycaemic control, dyslipidaemia, hypertension and obesity, as well as improve overall nutrition status.<sup>[2, 5, 6, 11, 14-16]</sup>

### The specific objectives for T2DM dietary management

1. **To achieve/maintain appropriate weight:** Weight loss improves the body's sensitivity to insulin and is the key overarching lifestyle goal. People who are overweight or obese (predominantly abdominal obesity with intra-abdominal fat) should be encouraged to lose weight. It is important to have a reasonable weight loss that is achievable and maintainable. Prevention of weight regain is an important aim, once weight loss has been achieved.
2. **To improve overall health through optimal nutrition:** There are appropriate amounts of a variety of foods from the three Pacific food groups to achieve adequate nourishment for overall health and wellbeing. The carbohydrate content of meals and snacks must be appropriate to achieve good glycaemic control.
3. **To achieve and maintain good glycaemic control:** A near-normal blood glucose level can be maintained by balancing food intake and physical activity with insulin (either endogenous or exogenous) or oral glucose-lowering medication.
4. **To reduce the chances of developing diabetes complications:** Attaining individual goals for glycaemic control/goals for diabetes, blood pressure and lipids levels can delay or prevent diabetes complications, and treat both acute and long-term complications.

## Principles

The principles of nutrition and dietary therapy for people with T2DM are the same as those for healthy eating recommended for the entire Pacific population. Healthy eating for diabetes is not a special diet, as nutrient requirements do not change when diagnosed with diabetes.<sup>[3, 5, 6, 11, 17]</sup> Personalised advice on food and nutrition should be tailored and meaningful to the person with diabetes and his/her family.

The nutrition and dietary advice for T2DM should be provided in a form that is appropriate to the person's physical needs, medical conditions, culture, beliefs and preferences.<sup>[5, 11, 15]</sup> It should also take into account their willingness to change and to make a positive effort to improve their quality of life.

The most challenging part of the nutrition and dietary therapy is determining what to eat and following a meal plan. There is no one-size-fits-all eating pattern for people with diabetes.<sup>[5-7, 11, 14, 17]</sup> It is important to emphasise that diabetes dietary management is largely about carbohydrate metabolism. Nutrition and dietary recommendations for healthy eating may have changed over time but the basic principles remain the same.

People with diabetes need to eat:

- an adequate amount of carbohydrate (especially local, wholesome and low glycaemic index carbohydrate food);
- consistent amounts of carbohydrate and even distribution, based on three meals a day;
- a variety of colourful fruits and vegetables;
- food that is high in dietary fibre;
- less sugary food and drinks;
- low-fat food, especially saturated fat;
- less salty food.

The following sections describe the key principles of diabetes nutrition and dietary management for Pacific people with T2DM as they relate to carbohydrates, dietary fibre, sugar, energy intake, dietary fat and salt.

## Carbohydrates

Carbohydrates are the most important source of energy and everyone need carbohydrates, including people with diabetes. Carbohydrates are broken down in the body into glucose, its simplest form, and used as an energy source for metabolic processes. Therefore, it is important for people with diabetes to consume enough carbohydrates each day. When there is not enough carbohydrate from dietary intake, the body uses its stored carbohydrate, which is in the form of glycogen, to meet energy requirements [3, 4, 11, 12]. People with T2DM need to eat the same amount of carbohydrate at each meal and snack to avoid the risk of having hypoglycemia (low blood sugar), especially those on medications. For people who are on OHA and/or insulin, the amount and type of carbohydrate intake need to be aligned with timing and dosage of medications in order to achieve good glycaemic control and avoid diabetes complications.

### Types and quality of carbohydrate

Evidence suggests that both the quantity and type of carbohydrate in a food influence the blood glucose level, and the total amount of carbohydrate eaten is the primary predictor of glycaemic response.<sup>[11]</sup> There is no ideal percentage of energy from carbohydrates for all people with diabetes so it needs to be individualised. The range of carbohydrate intake recommended for people with diabetes is 45–60% of total energy intake.<sup>[3-5, 11, 12, 14, 18]</sup> A very low carbohydrate or ketogenic diet (less than 50 g carbohydrate per day) may be appropriate only for a short-term intervention (up to three or four months). There is little research citing long-term benefits or harms.<sup>[11]</sup> Careful planning is required to ensure adequate nutrient intake for other essential vitamins and minerals.<sup>[19]</sup>

- The types and quality of carbohydrate also influence the blood glucose level.<sup>[3-5, 11, 16]</sup> Natural sugar has the same effect on blood glucose as starch and added sugar. The preferred types and sources of carbohydrate are starchy staples, including root crops and vegetables, wholegrains, legumes, fruits and dairy food. These foods have better glycaemic effect.<sup>[4, 5, 11]</sup> Frequent intake of processed foods is associated with high blood sugar level and poor glycaemic control and they increase the risk of diabetes complications.<sup>[4, 5, 14]</sup> It is not about avoiding carbohydrate foods but rather eating the right amount and the right type throughout the day.
- The literature concerning glycaemic index (GI) and glycaemic load (GL) is complex and often yields mixed results.<sup>[11]</sup> However, for the Pacific region, it is important to understand the concept of the types and quality of carbohydrate in terms of GI and GL.

## Glycaemic index

The glycaemic index (GI) is a system of classifying carbohydrate foods based on their ability to raise the blood sugar level after consumption.<sup>[3, 14, 20]</sup> Different carbohydrates are digested and absorbed at different rates. Food raises blood glucose levels quickly, moderately or slowly.<sup>[3, 4]</sup> A GI scale/range from 0–100 is suggested, using glucose as the reference with a GI of 100.

A GI of over 70 is high, between 50 and 69 is medium, and below 50 is low. Foods with high GI values raise the blood sugar level quickly. Foods with low GI are digested slowly, resulting in a more gradual rise in blood sugar level, therefore improving glycaemic control, especially in people with T2DM.<sup>[3, 4]</sup>

Many starchy foods affect blood glucose as quickly as glucose, whereas sucrose (cane sugar) has an intermediate effect.<sup>[4, 16]</sup> Factors affecting the GI of food include particle size, type of starch, fibre content, cooking method and processing.<sup>[21]</sup> However, GI was not designed to be used as a stand-alone system, as there are limitations to using GI values. It is often difficult to discern the independent effect of GI on glycaemic control.

The glycaemic response to particular food varies among individuals and can also be affected by the overall mixture of foods consumed.<sup>[11]</sup> Foods high in fat and sugar can have low GI because fat slows the breakdown of blood sugar, but high-fat foods are high in energy and contain unhealthy types of fat (saturated) which are not recommended for people with T2DM or for people who are overweight and at risk of cardiovascular diseases.

The GI values of foods must be interpreted in relation to energy content, the total amount of carbohydrate and the amount and types of fats and proteins to ensure effectiveness of good glycaemic control.<sup>[21]</sup> Other factors identified that may affect how a food alters blood sugar include the ripeness of the food. For example, some over-ripe bananas have a GI over 51 because starches are converted to available sugars as the bananas ripen, while the GI in under-ripe bananas with yellow and green sections is about 42.

## Glycaemic load

The concept of glycaemic load (GL) quantifies the overall glycaemic effect of a portion of food. It is a measure that takes into account both the amount of carbohydrate and GI in a single portion of a food.

## Dietary fibre

Fibre is the partially digestible part of plant foods. It includes the edible components of plant material that are resistant to digestion by human enzymes (non-starch polysaccharides and lignin). Dietary fibre intake, especially soluble fibre from wholesome food sources, has been shown to slow gastric emptying and delay the absorption of glucose in the small intestine, thereby improving postprandial glycaemic control.<sup>[2-4]</sup> Fibre also has the beneficial effects of keeping the gut healthy, keeping bowel habits regular, preventing constipation, and lowering cholesterol levels and other cardiovascular diseases risk factors such as high blood pressure and obesity.<sup>[2, 3, 11, 12, 22]</sup>

A healthy diet should include a generous quantity of high-fibre, unprocessed food (staple crops and starchy vegetables, whole grains, legumes, fruits and vegetables). The recommendations are the same as for the general population: 25g/day for adult women and 38g/day for adult men [3, 6, 11, 12]. Five or more servings/portions of fruits and vegetables per day will help provide the minimum requirements of dietary fibre intake.

## Sugar

Sugar is a type of carbohydrate and is presented in the form of **monosaccharides**, **disaccharides** and **sugar alcohols**. The three **monosaccharides** (one sugar unit) are glucose, fructose and galactose. These are the building blocks of **disaccharides** (two sugar units) sucrose, lactose and galactose, and **sugar alcohols** (polyols) such as sorbitol.

**Sucrose** is a disaccharide made up of glucose and fructose. Commonly known as table sugar, it is found naturally in sugar cane and sugar beet. Foods high in sucrose are generally high in calories so they should be eaten sparingly in the context of an overall healthful eating pattern.<sup>[4]</sup>

Diets high in sucrose may be associated with increased insulin resistance, contributing to the energy content of the diet and thus leading to being overweight and obese. The majority of people with T2DM are overweight, and restriction of free sugars along with energy-dense foods, will facilitate weight loss, a principal goal in the treatment of people with diabetes.

**Fructose** is a monosaccharide and the sweetest of all the carbohydrates. The term 'free fructose' refers to fructose that is naturally occurring in foods such as fruit. The recommendation for people with diabetes is to restrict its intake for weight reduction, improved glycaemic control and dyslipidaemia (high triglycerides and low HDL (High Density Lipoprotein)).<sup>[3, 4]</sup>

## Energy intake and body weight

- All guidelines recommend a hypocaloric diet (eating fewer calories than one burns) for overweight or obese people with T2DM in order to aim for normal body weight.<sup>[23]</sup> This means that moderately obese people have to lose at least 10 kg within six months.<sup>[11, 23]</sup> Overweight and obese patients with T2DM should reduce their daily caloric intake by 500–600 calories (follow an 800–1200 cals diet).
- The key recommendation for those who are overweight or obese is that energy intake should be reduced and energy expenditure (physical activity) should be increased in order to lose weight. Even a 5% weight loss will improve insulin sensitivity, glycaemic control, blood lipids, blood pressure and other cardiovascular risk factors. Weight loss may reduce or eliminate the need for oral hypoglycaemic agents (OHA), and reduction of insulin dose and improved glycaemic control.<sup>[2, 11, 12]</sup>
- The meal plans often used in intensive lifestyle management for weight loss may differ in type of foods to restrict (e.g. high-fat versus high-carbohydrate foods), but the emphasis should be on nutrient-dense foods, such as vegetables, fruits, legumes, low-fat dairy, lean meats, nuts, fish, seeds, and wholegrain, as well as on achieving the desired energy deficit.<sup>[2, 11]</sup>

## Dietary fat

The types of fat rather than the amount of fat has resulted in beneficial effects on cardiovascular disease risk factors, such as improved lipid profiles, blood pressure and weight control. Total intake of saturated fat should be restricted because of its relationship with total and low-density lipoprotein (LDL) cholesterol and a risk of cardiovascular disease.

<sup>[11]</sup> People with diabetes should follow the guidelines for the general population for the recommended intakes of saturated fat, dietary cholesterol and trans fat.

The ideal amount of dietary fat for individuals with diabetes is controversial. The National Academy of Medicine has defined an acceptable macronutrients distribution for total fat for all adults to be 20–30% of total energy intake.<sup>[11, 12]</sup> Restriction of fat intake will help to reduce total energy intake, especially for people with T2DM who are overweight or obese.

## Salt (sodium)

As for the general population, people with diabetes are advised to limit their sodium consumption to <2000 mg/day. Approximately 75% of sodium intake comes from processed foods. Food high in salt (sodium) should be limited as sodium is linked to high blood pressure, which people with diabetes need to avoid, as it may lead to a stroke, heart attack or kidney disease.

## Nutrition care process

In order to achieve nutrition and dietary goals and objectives, a diabetes care team should follow a nutrition care process. We recommend the use of the Nutrition Care Process (NCP) and model developed by the Academy of Nutrition and Dietetics<sup>[24]</sup>, an international standard. The following sections describe the NCP and model in relation to nutrition and dietary therapy for people with T2DM.

The Nutrition Care Process is a systematic approach to providing high quality nutrition care. It provides a consistent structure and framework for dietetic and nutrition professionals to use when delivering nutrition and dietary therapy for patients, clients and community groups. The framework allows the diabetes care team to individualise care, taking into account the patient's needs, culture and beliefs using the best evidence available to make decisions.<sup>[25]</sup>

The NCP consists of four distinct, interrelated steps. Each step informs the subsequent step.

- **Nutrition assessment:** Information collected on food intake (24-hour diet recall, food diary, food record); anthropometric measurements (weight, body mass index); biochemical data; clinical findings such as medication; medical tests and procedures; physical activity level (types of exercise and duration).
- **Nutrition diagnosis:** Data collected during the nutrition assessment indicate the appropriate nutrition diagnosis. Naming the specific nutritional problem (e.g. excess carbohydrate intake, excess energy/fats intake, inconsistent carbohydrate distribution, irregular meals).
- **Nutrition intervention:** An intervention that addresses the root cause (or aetiology) of the nutrition problem and is aimed at alleviating the signs and symptoms of the diagnosis (e.g. cut down on the amount of carbohydrate per meal, add a snack meal to avoid hunger or risk of diabetes complications).
- **Nutrition monitoring and evaluation:** This will determine if the patient/client has achieved, or is making progress towards, the planned goals.

## Nutrition assessment

Nutrition assessment is the first step to help identify the food, nutrition and dietary issues and needs of the patient. Tools for assessment include a 24-hour diet recall (ask what she/he has consumed in the past 24 hours), a food frequency questionnaire (how often food is consumed) or a food record (three days' food diary or one week's food record).

Nutrition assessment will capture the types of food and drinks (food groups) plus food practices, the amount of food and drink (portion size) and the times of meal and/or snacks (meal distribution). The three key questions to be asked are set out below.

- i. **What** do you eat and drink?
- ii. **How** much do you eat and drink?
- iii. **What** time do you eat and drink?

Nutrition assessment will assist you to analyse the nutrition information collected and:

- identify food and nutrition gaps in relation to the general nutritional principles that relate to the diabetic problem;
- indicate overall nutritional adequacy of the food choices, practices, amounts and meal patterns;
- identify the food and dietary practices /patterns that affect the health problem;
- identify the patient's nutritional knowledge and level of understanding in managing diabetes treatment;
- identify the types of diabetic treatment, e.g. types of OHA, types and dose of insulin (insulin regime); and
- Identify meal times and carbohydrate distribution in relation to treatment for T2DM.

Nutrition assessment will provide information on the patient's nutrition diagnosis and therefore nutrition and dietary therapy, which will include nutrition education and a management plan.

## Nutrition diagnosis

The purpose of a nutrition diagnosis is to identify and describe a specific nutritional problem that can be resolved or improved through nutrition and dietary therapy (treatment/nutrition intervention). An example of nutrition diagnosis is *inconsistent carbohydrate intake*. This is different from a medical diagnosis of *Type 2 diabetes mellitus*.

## Nutrition intervention

A nutrition intervention is a planned action design to change a nutrition-related behaviour, risk factor, environmental condition, or aspect of health status. The nutrition intervention is typically directed towards resolving the nutrition diagnosis through nutrition and dietary education and a management plan to achieve the nutrition and dietary goals.

The nutrition and dietary education needs to be realistic and practical. It requires an individualised approach, appropriate for the patient's lifestyle. It is important to have a holistic approach, taking into consideration the cultural, ethnic, family, social and financial situation. It must be flexible and tailored to the patient's level of understanding and willingness to engage in diabetes glycaemic control.

Nutrition education topics may include an overview of diabetes and diabetes management. Other nutrition topics are:

- an explanation of T2DM and insulin resistance (if appropriate);
- an explanation of basic food groups (including sources of macronutrients – carbohydrates, proteins and fats) and the role of each of these in diabetes management;
- an explanation of food preparation and cooking methods in relation to diabetes management;
- understanding food labels and shopping for healthier choices;
- an explanation of the relationship between carbohydrates and blood glucose level (BGL);
- prevention and treatment of hypoglycaemia (if appropriate); and
- requirement and effect of snacks/supper on BGL (if appropriate).

Making good choices about what and how much to eat and drink and being physically active are important for good health.

## Nutrition monitoring and evaluation

Nutrition monitoring and evaluation identifies the progress made and whether goals and expected outcomes are being met. It identifies outcomes relevant to the nutrition diagnosis, intervention plans and management goals.

Nutrition monitoring and evaluation components include three distinct and interrelated processes:

- i. monitor the progress made – check the patient’s understanding and compliance with the diabetes management plan, determine whether the intervention is being implemented as discussed;
- ii. measure the outcomes – a statement of the patient’s progress towards nutritional goals – improved meal times and appropriate portion control of carbohydrate intake, appropriate timing of blood glucose monitoring; and
- iii. evaluate the outcomes – evaluate the improvement in glycaemic control – HbA1c result, pre- and postprandial BG levels, and weight loss.

## PART 2: THE TEN GUIDELINES AND EXPLANATORY NOTES

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The purpose of this section is to provide technical information and evidence-based examples that underpin the guidelines. It is important to note that the information should be adapted and tailored to the target groups with whom the diabetes team is working. In addition, the inclusion of the NCP is essential to provide standardised nutrition and dietary care. The following guidelines are not set in order of priority as it is anticipated that the nutrition assessment component will inform and prioritise actions appropriately.

### Nutrition and dietary guidelines

#### The ten healthy eating guidelines for people living with T2DM

1. Eat a variety of foods from the three food groups in the appropriate amounts every day. Choose fresh local products/produce when possible.
2. Eat carbohydrate food at each meal for consistent carbohydrate distribution.
3. Eat three regular meals every day at a consistent time.
4. Eat plenty of vegetables every day. Half the plate should contain vegetables.
5. Eat three or four portions of fruit every day. Avoid eating two or more fruits at one time.
6. Drink plenty of safe, clean water every day. Avoid drinking fruit juice and sugar sweetened drinks.
7. Choose and prepare foods with less fat, particularly saturated fat.
8. Choose and prepare foods with less salt.
9. Reduce or avoid consumption of alcohol.
10. Reduce energy intake and increase daily physical activity for weight loss.

People with diabetes do not need to buy special food or cook separate meals. The whole family can eat the same healthy food. What is good for diabetes is also good for everybody.

# 1. Eat a variety of foods from the three food groups in the appropriate amounts every day. Choose fresh local products/produce when possible.

General healthy eating principles are to recommend a variety of foods from the Pacific three-food groups every day. These are: **energy food**, **body building food** and **protective food**. There is no single food or food group that provides all the nutrients the body needs. Different foods provide different types and amounts of nutrients. Therefore, healthy eating for diabetics involves eating a range of foods from the three food groups with specific emphasis on variety and portion size.

By eating a variety of foods each day, people with T2DM are bound to get the essential nutrients they need to stay healthy and lower their risk of developing diabetes complications. Blood glucose levels are affected by the amount and type of carbohydrate food and drink consumed.

## A diabetes healthy plate model

The healthy plate model helps us to understand portion sizes and to offer alternatives and meal replacements for people with diabetes. It includes a variety of foods from the Pacific three food groups in the right proportions. These foods provide a wide range of essential nutrients for energy, body building and repair, and protecting and promoting good health. The model focuses on sources of carbohydrates, proteins, vitamins and minerals.

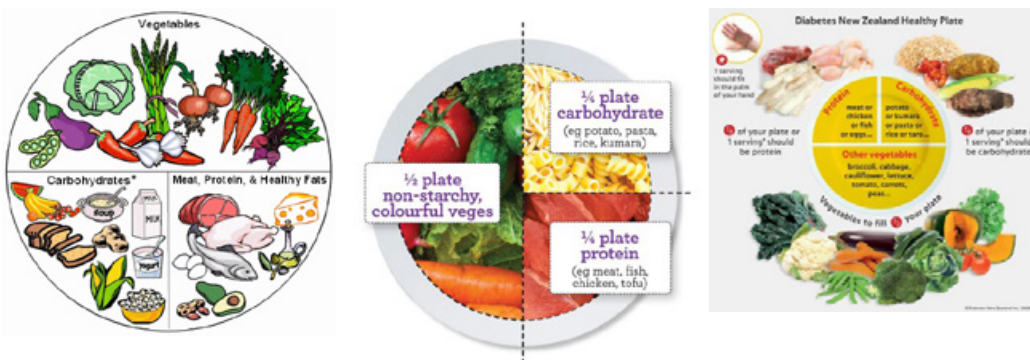
The recommended portion sizes are the same for people with diabetes and those who are not diabetic. The daily energy requirement is based on individual current weight, so if a person is overweight or obese, their goal will be to cut down on energy foods in order to lose weight.

A diabetes healthy plate should include local foods from the three food groups:

- protective foods (vegetables, providing vitamins and minerals: ) – half a plate;
- energy foods (root crops and starchy vegetables, providing carbohydrates) – a quarter of a plate; and
- body-building foods (lean meat, chicken or legumes, providing protein) – a quarter of a plate.

This is based on a regular size dinner plate.

Note: The recommended diabetes plate is different from the PGHL plate model.<sup>[1]</sup>



**Protective food:** Vegetables should make up half of the plate.

Vegetables and fruit provide vitamins, minerals and dietary fibre, as well as many other phytonutrients (beneficial chemicals found in plants). Eating a variety of fruit and vegetables is recommended to ensure that the body gets



the full range of required vitamins and minerals. Fruit and vegetables are considered protective foods that can help strengthen immunity to disease.

Vegetables are low in carbohydrate and calories and high in vitamins, mineral and fibre. The emphasis is on eating more non-starchy vegetables (greens). Start by filling half the plate with non-starchy vegetables, known as free food for people with diabetes. Non-starchy vegetables are distinct from starchy vegetables (corns, pumpkin, potatoes, kumara), which also provide carbohydrate and are denser in energy [3, 12, 26]. Starchy vegetables should be limited (e.g. a quarter plate or fist-sized serve) but non-starchy vegetables should be encouraged and consumed in generous amounts.

Fruits contain natural sugar known as fructose (or fruit sugar). Fructose is a simple monosaccharide found in many plants, where it is often bonded with glucose to form the disaccharide sucrose. Fructose is absorbed directly into the blood during digestion. Fruit is not considered a free food for people with diabetes. It is good to spread fruit throughout the day, rather than eating a lot at once.

The diabetes plate model has a fruit on the side, as your meal plan and calorie needs allow.

Notes: Serving size examples (Figure 1- see p.13)

**Energy food:** Carbohydrate staple root crops and starchy vegetables should make up a quarter of the plate.

Carbohydrates are the major source of energy. They include starches, sugars and fibre. Carbohydrates break down into glucose in the body. Wholesome foods, including starchy foods, are better sources of carbohydrates (complex), than processed foods (simple carbohydrates), which can be high in sugar. When digested, these wholesome foods release glucose slowly into the blood stream, preventing rapid peaks in glucose levels. Carbohydrate foods are also good sources of dietary fibre, vitamins and minerals. Choose high fibre food like whole-grain bread or high-fibre breakfast cereals instead of white bread and low-fibre varieties.

Starchy carbohydrate foods include: Taro, cassava, yam, breadfruit, kumara (sweet potatoes), green banana and plantain. These foods are also high in fibre. Other carbohydrate foods are bread, cabin crackers, roti, pasta, noodles, breakfast cereals, porridge, rice, flour and flour products.

Include carbohydrate at each meal. A carbohydrate portion regime is essential to facilitate consistency of day-to-day carbohydrate intake.








**Body-building foods:** These are protein-rich foods from both plant and animal sources. These foods provide a range of nutrients to the diet but the key nutrient is protein.

Body building foods are required in small amounts each day for good health. They should make up one quarter of the plate. One portion at two meals a day is adequate for most people with diabetes. Excess intake of protein should be avoided as it may contribute to the pathogenesis of diabetic nephropathy as well as weight gain.

Body-building foods include protein-rich foods such as meat (lean cuts), chicken, duck, fish, shellfish, reduced-fat milk and milk products, cheese, dried beans and legumes, lentils, nuts and seeds. Usually body-building foods that are low in fat and salt should be chosen.

- Red meat is an excellent source of nutrients like iron (in an easily absorbed form) and zinc.
- Oily fish, such as salmon, tuna, mackerel and sardines, and some seafood, such as oysters, are good sources of omega-3 fatty acids. Omega-3 is linked to a lower risk of heart disease and stroke.  
**Serving:** 1–2 servings per week. Examples of a serve are: two small fish, one large fish fillet, half a cup of tuna, one cup of oysters, half a cup of salmon, half a cup of canned sardines.

Figure 1. Food groups and portion size

Food groups and types of foods to choose	Amount to be eaten	Main nutrients they provide
<p><b>Energy foods</b> – starchy staples</p> <p><i>Energy food to choose:</i></p> <ul style="list-style-type: none"> <li>- Locally grown root crops</li> <li>- Breadfruit, cooked green bananas</li> <li>- Whole grain breads</li> <li>- Brown rice</li> </ul> <p><i>Energy foods to limit:</i></p> <ul style="list-style-type: none"> <li>- Refined grains and cereals such as white rice, pasta, noodles, vermicelli and bread</li> <li>- Foods prepared with fats and sugar, e.g. biscuits and cakes</li> </ul> <p><i>Energy foods to avoid:</i></p> <ul style="list-style-type: none"> <li>- Processed and deep-fried foods</li> <li>- Sugar and free sugars<sup>10</sup></li> <li>- Sugar-sweetened beverages</li> </ul>	<p><b>Should make up half (50%) of all the food you eat each day</b></p> <p>Eat at least six portions each day</p> <p>Example of portion: 1 portion = fist</p> 	<p>Carbohydrates Vitamins Dietary fibre</p>
<p><b>Protective foods</b> – all vegetables and fruits</p> <p><i>Protective foods to choose:</i></p> <ul style="list-style-type: none"> <li>- All fresh fruits and vegetables, locally grown</li> <li>- All frozen vegetables and fruits with no added sugar or salt</li> </ul> <p><i>Protective food to limit:</i></p> <ul style="list-style-type: none"> <li>- Canned fruit in juice is a good alternative if fresh fruit is limited.</li> <li>- Dried fruits with no added sugar or preservatives</li> <li>- Canned vegetables containing little salt</li> </ul> <p><i>Protective foods to avoid:</i></p> <ul style="list-style-type: none"> <li>- Canned vegetables</li> <li>- Dried fruits with added sugar or preservatives</li> <li>- Cordials and fruit drinks</li> <li>- Fruit juice and fruit juice concentrate<sup>2</sup></li> </ul>	<p><b>Should make up one third (35%) of all the foods you eat each day</b></p> <p>Eat five or more portions each day</p> <p>Example of portions: <b>Vegetables</b> 1 portion = 2 cupped hands</p>  <p><b>Fruit</b> 1 portion = 1 cupped hand</p>  	<p>Vitamins Minerals Dietary fibre Phytochemicals Antioxidants</p>
<p><b>Body-building foods</b> – protein rich foods</p> <p><i>Body-building foods to choose:</i></p> <ul style="list-style-type: none"> <li>- Local, lean cuts of meat, chicken</li> <li>- Fish</li> <li>- Eggs</li> <li>- Dried beans and legumes</li> <li>- Nuts</li> <li>- Reduced fat milk and milk products</li> </ul> <p><i>Body-building foods to limit:</i></p> <ul style="list-style-type: none"> <li>- Meat with visible fat</li> <li>- Canned meat or fish with high salt content</li> </ul> <p><i>Body-building foods to avoid:</i></p> <ul style="list-style-type: none"> <li>- Processed meat – spam, canned corned meat</li> <li>- Corned beef/brisket in container, burgers, sausages, condensed milk, mutton flaps</li> </ul>	<p><b>Should make up one sixth (15%) of all the food you eat each day</b></p> <p>Eat at least one to two portions each day</p> <p>Example of portions: <b>Meat</b> 1 portion = palm of your hand</p>  <p><b>Nuts</b> 1 portion = 1 cupped hand</p>  <p><b>Beans/legumes</b> 1 portion = 1 cupped hand</p> 	<p>Proteins and essential amino acids Vitamins Minerals Fatty acids Fibre (from dried beans and nuts)</p>

1 World Health Organization. 2015. *Guideline: sugars intake for adults and children*. WHO, Geneva, Switzerland.

- Eggs provide useful nutrients and can be part of a healthy diet for adults in general.  
**Serving:** Unlimited to most people with diabetes except those with heart disease, when it is limited to six eggs per week.
- Poultry (chicken) is a good source of protein and some minerals, including iron and zinc. Poultry has a variable fat content, depending on the type of bird, but it can usually be found in and around the skin so it is easy to remove.  
**Serving:** limit to 1–1.5 servings per week. A serve can be: two slices of trimmed meat/chicken (100–120 g), one small lean steak (100 g), one small chicken breast (120 g), two small drumsticks, one leg (skinned).
- Legumes, nuts and seeds are sources of protein and they are also rich in nutrients and high in fibre. Some types of nuts are useful sources of specific nutrients (e.g. almonds provide calcium and brazil nuts provide selenium). Nuts are high in unsaturated fats, but eating small amounts (around 30 g) each day should not cause weight gain, especially if eaten instead of other, less healthy foods.  
**Serving:** 1 cup cooked dried beans, chickpea, lentils, 1 glass of soy milk (250 ml)
- Reduced-fat milk and milk products: Milk contains carbohydrate as lactose, a sugar composed of galactose and glucose, which also count toward total carbohydrate intake for each meal. Milk and yoghurt are also good sources of protein and calcium.  
Note that drinking large quantities of milk will increase blood glucose above recommended levels. Healthy choices include low-fat or reduced-fat milk or soy products; and low-fat, low-sugar yoghurt, e.g. diet, lite or unsweetened varieties.  
Flavoured milk is not recommended, as it may be high in fat and sugar.

Notes: Serving size examples (Figure 1- see p.13)

## 2. Eat carbohydrate food at each meal for consistent carbohydrate distribution.

Everyone, including people with T2DM, needs carbohydrate for normal body function. Carbohydrate breaks down into glucose in the body. The quantity and type of carbohydrate influence the blood glucose level, and the total amount of carbohydrate eaten is the primary predictor of glycaemic response.<sup>[11, 12]</sup> The range of carbohydrate intake reported for most people with diabetes is 45–46% of total energy intake.<sup>[11, 12, 14, 18, 27]</sup> The recommended percentage of energy should be individualised, based on the diabetes patient's eating habits and the diabetes dietary management goals for weight and glycaemic control. The preferred carbohydrate sources are complex carbohydrate, which includes starchy-staples, vegetables, legumes, whole grains and dairy because of their favorable effect on glycemic control. The carbohydrate requirements and distribution are based on diabetes patient's eating habits, diabetes treatments (insulin, OHA), physical activity levels, occupation and daily routine. A high intake of processed foods with a high GI may be associated with poor glycaemic control, increased triglycerides and low levels of HDL. It is also important to include foods that have low GI and are rich in dietary fibre.<sup>[3, 4, 11]</sup>

In addition, the quantity and amount of carbohydrate in each meal is also important. The healthy plate model for diabetes should have no more than four to six fist-sized portions. Evidence shows that the focus should be on carbohydrate distribution over the day and the amount (weight) consumed at each meal.

Carbohydrate distribution should also take into consideration the diabetes treatment regime. Types and dosage of medication (OHA) and insulin should match the quantity, types and timing of carbohydrate intake. More flexible carbohydrate distribution is possible with people on insulin. Monitor the carbohydrate consumed at each meal and snack by testing both pre- and postprandial blood sugar level. People with diabetes should be encouraged to reduce intake of refined carbohydrates or added sugars and instead focus on carbohydrate from staple root crops, vegetables, legumes, fruits, dairy and whole grains.

### **Sugars** (Refer for PGHL pg 14)

Sugars are naturally present in a wide range of foods, including fruits, grains and milk. Sugars in the form of white, brown or raw sugar, honey, syrups and extracts are added to foods. Sugary drinks include fruit drinks, powdered

drinks, cordial, carbonated or fizzy drinks, energy drinks, sports drinks and flavoured waters. Some of these drink products are available with non-nutritive sweeteners instead of sugar.

There are no specific sugar recommendations in diabetes management. People with diabetes should be encouraged to reduce sugar intake in line with recommendations for the general population.

Sugars, also known as nutritive sweeteners, provide energy in the form of carbohydrate. In 2015 the term 'free sugars' was adopted to include monosaccharides and disaccharides added to food and beverages by the manufacturer, cook or consumer and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates. They contribute to free sugar intake, as the sugars they contain are no longer held within a cell structure, as they would be in a whole fruit. Consuming fruit juice adds calories to the diet and may contribute to weight gain. In those who are overweight, the reduction of free sugars should be part of a strategy to decrease energy intake.<sup>[11]</sup>

Food sources of sugars may be a more important consideration than the type of sugar. A high intake of sugars in the form of sugar-sweetened beverages (SSBs) is linked to obesity and dental caries. They are sometimes referred to as soft drinks, fizzy drinks or sugary drinks. The consumption of SSBs and processed low-fat or non-fat food products with high amounts of refined grains and added sugars is strongly discouraged. This includes the use of any caloric sweetener such as high-fructose corn syrup and sucrose to reduce the risk of gaining weight and worsen the cardio-metabolic risk, i.e. one's chances of having diabetes, heart disease or stroke.<sup>[11]</sup>

### Types of sugars

**Sucrose** is a disaccharide made up of glucose and fructose. Commonly known as table sugar, it is found naturally in sugar cane and sugar beet. Foods high in sucrose, such as table sugar, honey, cookies, biscuits and cakes, are generally high in calories. Therefore these foods should be eaten sparingly in the context of an overall healthy eating pattern.

**Fructose** is a monosaccharide found naturally in fruit. It is the sweetest of all carbohydrate. Consumption of fruit may result in a better glycaemic control compared with isocaloric intake of sucrose or starch. Fructose is less likely to have a detrimental effect on triglycerides as long as intake is not excessive (>12 % energy).

The main metabolic disturbance of fructose and sucrose in people with diabetes is an elevation of triglycerides (TG) at doses of >10% of total energy.<sup>[3]</sup> The most common sugars present in foods are sucrose, glucose, fructose, maltose and lactose, all of which occur naturally.

Fructose is also a component of added sugars found in sweetened beverages and processed snacks. The term 'free fructose' refers to fructose that is naturally occurring in foods such as fruit and does not include the fructose that is found in the form of the disaccharide sucrose; nor does it include fructose in high-fructose corn syrup.

- Glucose, fructose and sucrose are found in honey, cooked or dried fruit, and in small amounts in some raw fruit (especially berries), vegetables, especially carrots, onions, swede, turnip and tomatoes.
- Maltose is produced by starch breakdown and is found in cereals.
- Lactose is found in milk and milk products.

Type of sugar	Definition
Intrinsic sugars	Sugar held within cell structures of foods, as in fruits and vegetables
Free sugars	Free sugars include monosaccharides (e.g. glucose) and disaccharides (e.g. sucrose) added to foods and beverages, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates. Free sugars also include white, brown and raw sugars.  Free sugars contribute to overall energy density of diets by providing significant energy without specific nutrients.
Milk sugars	Sugars naturally present in milk and milk products (e.g. lactose and galactose)

All sugars will raise blood sugar levels. These include:

- brown sugar – caster sugar – corn syrup
- dextrose – disaccharides – fructose – glucose – golden syrup
- honey – icing sugar – lactose – malt extract – maltodextrins
- maltose – molasses – monosaccharides – raw sugar

A small amount of sugar (one or two teaspoons) can be included as part of a high-fibre, low-fat meal, e.g. scraping jam on a wholegrain slice of bread or using artificial sweeteners as an appropriate alternative to sugar-sweetened beverages.

Foods that are very high in sugar, such as cakes, biscuits, lollies and sweet drinks, contribute very little nutritional value, are often high in fat and add significant extra carbohydrate to the diet. They increase blood sugar levels dramatically. The recommendation is that these foods are best limited or used only as an occasional treat.

### 3. Eat three regular meals every day at a consistent time.

The body needs a regular supply of energy to maintain daily activity and growth. Regular meals help ensure regular blood sugar level and eating three meals regularly each day is recommended. This also helps to avoid overeating, which can happen if meals are skipped. Some people, including diabetics, often say that they do not feel hungry until their main meal in the evening. This can be for a number of reasons but the reality is they must eat three meals a day if they want to improve blood sugar and energy levels.

A snack is required to prevent one feeling very hungry, which could cause overeating at a meal. However, snack is not recommended for everyone. A snack is not a full meal, but a small amount of food, usually eaten between meals. Snacks are important for people who are on insulin and those who are physically active to avoid hypoglycaemia. Snacks for diabetics should contain 15 g of carbohydrate. For example one portion of fruit.

Eating meals and snacks at consistent times helps to keep blood glucose levels within target range. Diabetics should aim to eat something every two and a half to three hours and main meals no longer than four to five hours apart. Each meal should have a consistent amount of carbohydrate (e.g. 45–55 g) to keep the blood sugar level stable. The meal should include one portion of protein food (body-building food) at lunch and at dinner. Add plenty of colourful vegetables to each meal.







#### Snacks

Examples of healthy snacks to choose that contain 15 g carbohydrate:

- a small serve of raw fruit or half a small banana;
- a 200 ml glass of low-fat milk;
- three or four Arnott's Vita-Wheat crisp breads, or crackers;
- a bottle of low-fat, diet or lite yoghurt; and
- a slice of wholegrain bread.

## Meals

Sample meals (NZ diabetes and health food guidelines – but use Pacific food choices instead)

Two examples of an ideal breakfast	
<p>1 cup of porridge + one small banana + ¼ cup of yoghurt</p> <ul style="list-style-type: none"><li>• Use low-fat, low-sugar yoghurt and raw or unsweetened fruit.</li><li>• Use Weetbix or other recommended cereals for variety.</li></ul> 	<p>2/3 cup of baked beans with one slice of wholemeal bread + tomato</p> <ul style="list-style-type: none"><li>• Use a scraping of margarine on the bread.</li><li>• Add spinach or mushrooms for variety.</li></ul> 
Two examples of an ideal lunch	
<p>Chicken and salad wholegrain roll with fruit</p> <ul style="list-style-type: none"><li>• Use a scraping of margarine.</li><li>• Use tinned fish, beef or reduced cheese for variety.</li></ul> 	<p>1 cup of salmon rice salad + 1 pottle of diet yoghurt</p> <ul style="list-style-type: none"><li>• Use a small amount of heart-friendly dressing</li><li>• Use shredded chicken, slices of cold meat or hard-boiled egg for variety.</li></ul> 
Two examples of an ideal dinner	
<p>Roast beef with kumara and vegetables (½ cup roasted kumara, 1 small potato, ½ cup of pumpkin and broccoli/cauliflower)</p> <ul style="list-style-type: none"><li>• Use chicken, lamb, pork or fish for variety.</li><li>• Remove fat from meat.</li><li>• Eat half a plate of non-starchy vegetables</li></ul> 	<p>1 cup of rice with 1 cup of chickpea, pumpkin and spinach curry</p> <ul style="list-style-type: none"><li>• A roti bread can replace the rice.</li><li>• Lentil dhal, chicken or meat-based curries add variety.</li></ul> 

#### 4. Eat plenty of non-starchy vegetables every day. Half the plate should contain non-starchy vegetables.

(Refer to figure 1. Page 13)

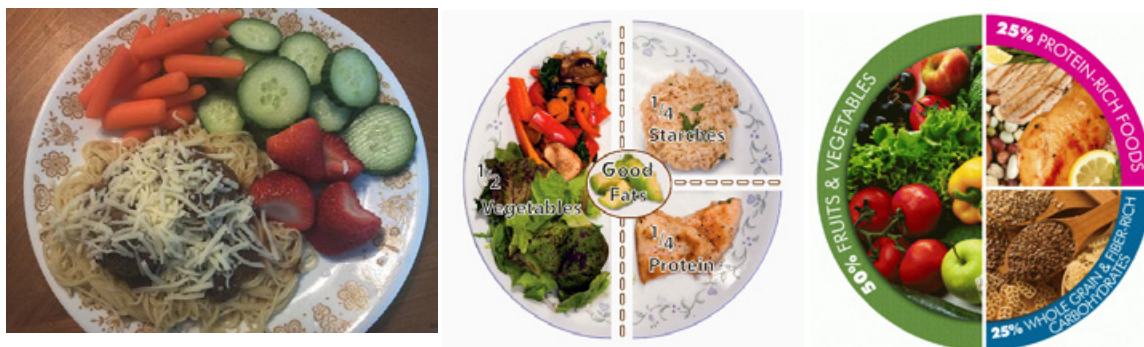
Vegetables provide vitamins and minerals and dietary fibre, as well as many other phytonutrients (beneficial chemicals found in plants). Eating a variety of colourful vegetables, including frozen and canned vegetables, is recommended to ensure that the body gets the full range of required vitamins and minerals.

Vegetables are plant foods and seeds. They include roots and tubers (potatoes, turnips, carrots), bulbs (onions, leeks and garlic), stems (celery), leaves (lettuce, cabbage, parsley, *bele*), flowers (broccoli and cauliflower), fruit (tomatoes, pumpkin, zucchini). The nutritional composition and usage pattern of the roots and tubers is somewhat different to that of the stems, leaves and flowers.

Green leafy vegetables have a very high water content, are exceptionally low in energy and are high in micronutrients. Some vegetables are rich in specific micronutrients. For example, carrots are a major source of B-carotenes; spinach, taro and *bele* leaves are rich in folic acid and iron; broccoli is relatively rich in calcium; and green leafy vegetables are the main dietary source of Vitamin K.

The healthy plate model focuses on eating more vegetables that are low in carbohydrate and calories and high in vitamins, mineral and fibre. Choose a selection of different coloured vegetables each day. For example, include folate green leafy vegetables, pro-vitamin A (caroteneids) in yellow, orange, red and green vegetables and potassium in a wide range of vegetables.

**Serving:** At least three or four servings at each meal: Example – half a cup of cooked vegetables, one cup of raw green vegetables or salad, one tomato or carrot.



Eating fruits and vegetables is good for everyone. It is important to eat plenty at meal times and have them as snacks to avoid hunger. Eating fruits and vegetables can help to get the vitamins, minerals and fibre that the body needs every day to keep each individual healthy.

#### 5. Eat three or four portions of fruit every day. Avoid eating two or more portions of fruit at one time.

Fruits contain fructose, which is the sweetest carbohydrate and is known as 'free fructose'. Fructose is naturally occurring in some foods, such as fruit. It provides energy and counts towards carbohydrate intake, which can increase blood sugar level. However, fructose is a better choice than sucrose (table sugar) [11]. So adding a fruit (fructose) to breakfast cereals is better than adding table sugar (sucrose).



**For example** (Can use a Pacific breakfast instead)  
Three Weetbix + milk with one banana instead of table sugar.

People with T2DM can have three or four portions of fruit per day. As with fruit sugar, fruits are not 'free food', and one needs to avoid eating two or more portions of fruit at one time. Fruit is recommended to be included in all meals and snacks each day. However, fruit juice is not recommended.

The high-fructose fruits that should be avoided include apples, cherries, mangoes, watermelon and pears. A moderate amount of low-fructose fruits, such as honeydew melon, cantaloupe, bananas, blueberries, strawberries and oranges, is recommended, if they are well spaced throughout the day. The main metabolic disturbances of fructose and sucrose in people with diabetes is an elevation of triglycerides (TG) [3].

In addition, fruit are classified as protective food, as they provide useful amounts of potassium, folate, antioxidant (vitamin C and carotenoids) and dietary fibre. People with T2DM cannot live on fruits alone as they are low in energy, fat, protein, sodium, calcium, zinc. They should be part of a mixed diet.

(Refer to figure 1. Page 13 for examples of portion size – 1 portion = 1 cupped hand)

- Spread the fruit you eat over the day.
- Eat one portion only at each meal or snack.
- Eat fresh raw fruit when it is available in season.
- Canned, frozen and dried fruit all count.
- Choose canned fruit in natural fruit juice or non-nutritive sweetened water.

One portion of fruit (15 g carbohydrate) is a good snack or part of a main meal.





## 6. Drink plenty of safe and clean water each day. Avoid drinking fruit juice and other sweet drinks.

Water is essential for life. The balance of life is defined by the balance of water between the different parts within the body.<sup>[4]</sup> This balance is required for absorption and distribution of all nutrients. The amount of water an adult contains is approximately 35–45 litres which is about 60% of total body weight.

The body needs water for key processes like digestion, absorption, transporting food, removing waste and controlling the body's temperature (thermoregulation). The body gets around 20% of its total water intake from solid food (700–800 ml). It also produces around 250 ml from breaking down food within the body. Most of the body's needs come from the fluid a person drinks. Plain water is the best choice of drink because in most cases it is exactly what the body needs. The body loses water through the skin and lungs (known as insensible water loss), sweat, faeces and urine. The body makes sure it has enough water to function adequately by balancing output with input.

Plain water contains no sugar or energy so it will not increase a person's blood sugar level and total energy intake (important for weight control). Clean safe water is the best drink. Aim for at least 6–8 cups of fluid each day.

Many people enjoy herbal teas, which provide fluid while not adding extra energy. For variety, choose from;

- lemon grass, orange/lemon leaves;
- tea or coffee – black tea and coffee are also popular and there is evidence that both can provide benefit for health, such as antioxidative properties;
- tea and coffee – both contain caffeine (a stimulant) and tea contains tannins, which lower the amount of iron that the gut absorbs, so moderate amount of coffee and tea are recommended;
- diet or zero soft (fizzy) drinks (zero sugar)
- artificially sweetened cordials, powdered drinks or chocolate drink powders;
- unflavoured mineral or soda water; and
- diet or low-energy drinks (different from reduced sugar drinks).

### **Avoid drinking**

- drinks with more than 2.5 g of carbohydrate per 100 ml;
- fruit juice, including squeezed fruit juice and fruit juice with no added sugar and smoothies;
- soft drinks and tonic water;
- flavoured water;
- flavoured milk and milk tea;
- energy drinks; and
- cordials.

## 7. Choose and prepare foods with less fat, particularly saturated fat.

There is no ideal percentage of energy from fat for people with T2DM so this should be individualised. Research suggests approximately 30% of total energy can come from fat (mostly unsaturated fat), which results in beneficial effects on lipid profiles, blood pressure and weight.<sup>[3, 4, 11, 16]</sup> Regardless of the macronutrient mix, total energy intake should be appropriate to achieve weight management goals.

Fat is particularly high in energy (calories/kilojoules) and consumption will lead to weight gain. The key recommendation for T2DM who are overweight is that calorie intake should be reduced to encourage weight loss. Those who are overweight or obese need to reduce high energy foods, especially those high in fats, for weight loss and better glycaemic control.<sup>[5, 11, 28]</sup>

People with diabetes have about a two-fold increased risk of developing a range of cardiovascular diseases compared to those without diabetes, so the recommendations need to be the same as for those with cardiovascular diseases. The quality of fat (types of fatty acids) consumed is more important than total fat (quantity) in the diet in terms of supporting metabolic goals and reducing risk of CVD.<sup>[3]</sup>

Fatty acids are categorised as being saturated and unsaturated (monounsaturated or polyunsaturated). Trans-fatty acids may be unsaturated, but they are structurally different and have negative effects on the body. Reduction in saturated fats and cholesterol consumption is an important goal to reduce the risk of CVD. Diabetes is a strong independent risk factor for CVD over and above the adverse effects of elevated cholesterol. Dietary approaches resulting in a reduction in total and low-density lipoprotein (LDL) cholesterol and improvements in blood pressure have been shown to improve CVD outcomes in people with and without diabetes.<sup>[3-5]</sup>

Specifically, in people with T2DM, research findings conclude that intensive multicomponent lifestyle interventions show significant benefits in reducing blood pressure, cholesterol and HbA1c.

- Eating too many calories or kilojoules from any source will lead to weight gain. Fat is particularly high in calories/kilojoules and it is easy to eat too much.
- Saturated fat can raise blood cholesterol levels and increase the risk of heart disease.

There is only one type of cholesterol, but it is carried around the body by different 'carriers' (lipoproteins) that have different tasks. There are three types of carriers: LDL (low density lipoprotein), HDL (high density lipoprotein) and VLDL (very low-density lipoprotein). This makes up the lipid profile as explain below.

**LDL-cholesterol** (known as 'bad' cholesterol) The role of LDL in the body is to transport cholesterol to all organs for use in building cells. It is like a large dump truck and dumps cholesterol in the artery walls.

**HDL-cholesterol** (known as 'good' cholesterol). The role of HDL in the body is to carry extra cholesterol away from the arteries to the liver.

- Triglycerides are the most common form of fat in the body. The role of triglycerides is to store and transport fat in the blood. Extra energy from food and alcohol that the body does not need is converted to triglycerides. High triglycerides increase the risk of heart attack and stroke.

**Total cholesterol** is a rough measure of all the cholesterol and triglycerides in the blood.

The **total cholesterol/HDL cholesterol ratio** is the ratio of total cholesterol to HDL cholesterol. This ratio is used to measure an individual's risk of heart attack and stroke.

The recommended percentage of calories from fat depends on the desired glucose, lipid and weight outcomes. The recommendations for dietary fats are summarised below and Table 1 illustrates the effects on lipid profiles.

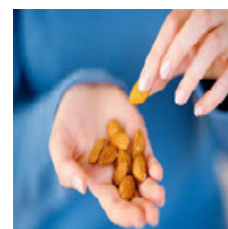
- Saturated fats (SFA): There is strong evidence that suggests a reduction in saturated fat intake and replacement with unsaturated fat is effective in reducing the risk of CVD.
- Polyunsaturated fats (PUFA): The current recommendation for CVD prevention is to replace dietary SFA with PUFA.
- Trans-fatty acids: These are created in an industrial process that adds hydrogen to liquid vegetable oils to make them more solid fats, used in shortening and margarines. Trace amounts can be produced in the heating and frying of oils at high temperatures. They are also found naturally in beef, mutton, lamb and dairy fat.

**Table 1: Major types of dietary fats, their effects on lipid profile and sources.**

Type of fat	Effects	Sources
Saturated fats – Avoid eating saturated fats	<ul style="list-style-type: none"> <li>↑ total cholesterol</li> <li>↑ LDL (bad cholesterol)</li> <li>↓ HDL (good cholesterol)</li> <li>↑ risk of blocking arteries</li> <li>↑ risk of heart disease and stroke</li> </ul>	<ul style="list-style-type: none"> <li>• Meat and fat on meat, lard, chicken skin, egg yolk</li> <li>• Full fat milk, cheese, butter, ghee, lard and dripping, hard margarine and baking fats</li> <li>• pies, pastries, biscuits, cakes</li> <li>• Mature coconut flesh, coconut cream and coconut oil</li> <li>• Palm oil and processed foods made with palm oil, such as take-away fried foods, noodles, potato crisps, cakes, cookies, pies, pastries and crackers</li> </ul>
Trans fatty acid – Avoid eating trans fatty acid	<ul style="list-style-type: none"> <li>↑ LDL (bad cholesterol)</li> <li>↓ HDL (good cholesterol)</li> <li>↑ Triglycerides</li> <li>↑ risk of blocking arteries</li> <li>↑ risk of heart disease and stroke</li> </ul>	<p>Partially hydrogenated oils – some margarine, shortening</p> <p>Processed foods made with hydrogenated oils such as some baked goods – cakes, cookies, biscuits, doughnuts, fried foods, pies</p>
<p>Mono-unsaturated fats</p> <p>Eat some but not too much of these fats and oils (mono-unsaturated and poly-unsaturated fats) or spreads made from these oils</p>	<ul style="list-style-type: none"> <li>↑ HDL (good cholesterol)</li> <li>↓ total cholesterol</li> <li>↓ LDL (bad cholesterol)</li> <li>↓ risk of heart disease and stroke</li> <li>-source of essential fatty acids</li> </ul>	<ul style="list-style-type: none"> <li>• Oils (canola, olive) nuts (pistachio, almonds, hazelnuts, macadamia, cashew, pecan, peanuts) flaxseeds, walnuts, safflower, sesame and the oils from these nuts.</li> <li>• Corn oil, canola oil, grape seed oil, linseed or flax oil, safflower oil, sesame oil, soybean oil, sunflower oil, walnut oil, wheat germ oil</li> <li>• Avocados and avocado oils</li> <li>• Oily fish (canned and fresh) - mullet, mackerel, sardines, salmon, tuna, herrings</li> <li>• Lean meat</li> </ul>
Poly-unsaturated fats	<ul style="list-style-type: none"> <li>↑ Total cholesterol</li> <li>↓ LDL (bad cholesterol)</li> <li>↓ HDL (good cholesterol)</li> </ul>	<ul style="list-style-type: none"> <li>• Corn oil, grape seed oil, linseed or flax oil, safflower oil, sesame oil</li> <li>• Soybean oil, sunflower oil, walnut oil. wheat germ oil</li> </ul> <p>Oily fish (canned and fresh) – mullet, mackerel, sardines, salmon, tuna, herrings</p>

Healthy choices: (there is some evidence that people with diabetes need to take more care)

- We need some but not too much heart-friendly fat and oil in our diet.
- Peanut butter or raw nuts with no added salt can be a good source of fat.
- Two level teaspoons of peanut butter or a small handful of nuts is about 30 g fats. They are high in calories, so amounts need to be watched.
- For weight control, one serve of nuts replaces other oils and spreads.
- Use a little coconut milk or use coconut fibre flavoured light evaporated milk instead of coconut milk or cream.
- Eat less processed meat, refined carbohydrates and SSBs (flavoured milk, etc.)
- Limit take-aways, baked goods – pastries, pies and cakes
- Use low-fat milk and milk products, including cheese and yoghurt.
- Trim fat from meat, skin poultry.
- Use lite (low fat) coconut cream where relevant.
- Eat plenty of colourful vegetables and fruit.



*Example of portion size of nuts*

## 8. Choose and prepare food with less salt

(Refer to Pacific guidelines for healthy living – booklet page 8)

Salt is a chemical compound, sodium chloride (NaCl). Sodium plays a very important role in maintaining the fluid balance in the body. A high salt (sodium) intake can lead to fluid retention and is linked to high blood pressure, which will contribute to the development of stroke, cardiovascular problems and kidney diseases.

The effect of sodium on an individual is determined by that person's sodium sensitivity, which is impractical to assess. The recommendation for people with T2DM is the same as that for the general population – less than 2 g per day (the equivalent of 5 mg salt/one level teaspoon per day)

All types of salt contain sodium, including table salt, rock salt, vegetable salt, sea salt, monosodium glutamate (MSG) and any ingredient beginning with sodium (e.g. sodium bicarbonate).

### Guidelines

- Minimise added salt.
- Use iodised salt.
- Limit the use of high salt foods and seasonings to less than four servings per day.
- Use minimal salt in cooking.
- Do not add salt to meals.
- Use low-salt herbs and spices for seasoning food to taste.

Serving size examples:

- 1 tsp seasoning paste, 1/6 stock cube or 1/2 tsp stock powder
- 1/3 tsp gravy mix or 1 tbsp liquid seasoning

Choose whole foods or less processed foods that are low in sodium, including fresh or frozen vegetables and fruit, meat, fish and poultry.

Serving size examples:

- 30 g lean ham/pastrami
- 1 tbsp pickles or 1tsp marmite/vegemite
- 1 tsp soy sauce
- 20–30 g cheese
- ½ cup canned/packed soup
- 50 g canned or smoked salmon/tuna
- 30 g other smoked fish/sardines

Choose the food with the lowest amount of sodium by comparing the food labels.

Amount of sodium
• Low-salt foods have less than 120 mg of sodium per 100 g
• Moderate-salt foods have 120–600 mg of sodium per 100 g
• High-salt foods have more than 600 mg of sodium per 100 g

## 9. Reduce or avoid consumption of alcohol

The same precautions regarding alcohol consumption in the general population apply to people with T2DM [3, 5, 11, 29]. Alcohol is known to have both beneficial and harmful effects on the biochemical basis of carbohydrate and the psychological consequences of the disease.

(Refer to PGHL page 24)

Alcohol is a concentrated form of energy with one gram providing seven calories (29 kilojoules) and may lead to weight gain. Many alcoholic drinks or drink mixes contain additional kilojoules from added carbohydrate. Drinking alcohol should be avoided or limited by those who are overweight, have high blood pressure or high TG because it may lead to obesity and also affect glycaemic control. It may also be associated with the risk of hypoglycaemia, especially in people with T2DM who are on insulin or OHA. It is essential that alcohol is taken with carbohydrate-containing food in order to avoid hypoglycaemia.

In line with recommendations for the general population, there is no safe level of intake so intake should be kept low. People with diabetes should aim to keep intake below the maximum consumption recommended for people without diabetes and only when diabetes is well controlled. The standard drinks measure is a simple way to work out how much alcohol a person is drinking. One standard drink equals 10 grams of pure alcohol (approximately two teaspoons). Evidence suggests that more than three or four units (28 g) of alcohol per day increases the blood pressure and that drinking between meals may accelerate the problem. Low to moderate intake of alcohol is associated with lower incidence of CVD but a reduction in alcohol intake in individuals with high blood pressure has been shown to be effective in lowering blood pressure, especially if more than 3–4 units (28 g) alcohol per day are consumed.<sup>[5, 11]</sup> Different types of alcoholic drinks have different alcohol content, which means that the number of standard drinks varies with the type of alcohol. The number of standard drinks in each can, bottle or cask, also varies.

**Examples:** One small bottle of beer (330 ml) contains 508 kilojoules and one standard drink of wine (100 ml) has around 350 kilojoules.



## Guidelines

- Limit alcohol to less than three drinks each day for men; two drinks or fewer each day for women.
- Check out the size of your glass: one standard drink is 100 ml wine, 30 ml spirits or 300 ml beer.
- Aim to have at least two alcohol free days each week.
- Avoid alcohol high in sugar. Some sweet wines, dessert wines, port, sherry, liqueurs and ready-to-drink premix/alcopops are high in sugar and calories/kilojoules.

## 10. Reduce energy intake and increase daily physical activity for weight loss.

The macronutrient composition of a healthy eating pattern should be individualised within the appropriate energy intake.<sup>[11]</sup> Reducing energy intake while maintaining a healthful eating pattern is encouraged in order to promote healthy weight loss for people with T2DM. Losing weight will improve insulin sensitivity and glucose tolerance and reduce lipid levels and blood pressure.<sup>[3, 11, 12]</sup> Intensive lifestyle interventions, including nutrition therapy, physical activity and behaviour change with ongoing support, are required.

There is strong and consistent evidence that modest persistent weight loss is beneficial for people with T2DM.<sup>[5, 11]</sup> The majority of people with T2DM are overweight or obese and are therefore insulin resistant. The aim is to lose at least 5% of body weight by reducing energy intake and increasing daily activity.

### Physical activity

Physical activity is a general term that includes all movement that increases energy use and is an important part of the diabetes management plan. **Exercise** is a more specific form of physical activity that is structured and designed to improve physical fitness. Both physical activity and exercise are important. Exercise improves blood glucose control, reduces cardiovascular risk factors, contributes to weight loss and improves well-being.<sup>[2, 5, 12]</sup><sup>[11]</sup> Regular physical activity improves glycemic control in people with T2DM and reduces the risk of diabetes complications. This risk reduction is consistent over a range of intensity and frequency of activity, with a dose-related effect.

Physical activity is an important part of management and people should be encouraged to participate in appropriate exercise after a thorough medical check. People with diabetes should perform aerobic and resistance exercises regularly.<sup>[30]</sup>

For patients with T2DM who are on a diet alone or a diet and Metformin there is no anticipated risk of hypoglycaemia, while those taking sulfonylureas are potentially at risk of hypoglycaemia if vigorous exercise is taken soon after a dose of these agents. The medication dose may need to be reviewed to avoid potential episodes of hypoglycaemia, especially if exercise requires a greater intake of carbohydrate.

There is greater risk of hypoglycaemia for people with T2DM who are on insulin. Consultation with the doctor and the diabetes care team is critical for adjustments of insulin dosage with a physical activity plan.

### Exercise burns fat

Examples of how much physical activity it takes to burn off energy from the following:

- 1 bottle of soft drink (600 ml)      1.00 hour walking
- 1 packet instant noodles            1.15 hours walking
- 1 serving fish and chips            2.45 hours walking

## PART 3: SPECIAL TOPICS WITH INFORMATION AND RESOURCES

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### Type 1 diabetes mellitus (T1DM)

An insulin regimen should be based on an individual's preferred meal routine, food choices and physical activity regime [11] and should reflect cultural and ethnic preferences [16]. Education to support people with Type 1 diabetes mellitus (T1DM) aims to identify and quantify their dietary carbohydrate intake for glycaemic control.

The amount and type of carbohydrate is the main nutritional consideration for people with T1DM in terms of glycaemic control. Both the amount and type have an effect on blood glucose levels. On a meal-by-meal basis, matching the insulin to the amount of carbohydrate consumed is an effective strategy for improving glycaemic control.

Those using fixed daily insulin doses should keep carbohydrate intake consistent on a day-to-day basis, both in respect to time and amount [4, 16]. However, those on rapid acting insulin can adjust the meal and snack insulin dose according to the carbohydrate content of the meal and snack.<sup>[31]</sup>

Intensive nutrition therapy allows greater flexibility in food choices. Tools that are taught include carbohydrate counting, exchange (portion) system, experience-based estimation of carbohydrate, the use of a carbohydrate: insulin ratio and the insulin sensitivity factor (correction factor).<sup>[11]</sup>

The dietary fibre effect on glycaemic control in T1DM is unclear. However, the first priority is to encourage achievement of the current recommendation for the general population of 30 g per day.

Self-measurement of blood glucose is imperative for optimal glycaemic control and the evaluation of the diet-insulin-exercise balance.<sup>[11]</sup>

- Meal/insulin synchrony is verified by regular before-meal blood sugar measurement with a goal of <7 mmol/l
- 1½–2 hours post-prandial glucose measurements with a goal of <10 mmol/l<sup>[11]</sup>

- Individuals with T1DM may become insulin resistant and if weight loss is achieved this may lead to a reduction in insulin dose and improved glycaemic control. However, energy restriction is only necessary for those who are overweight/obese.<sup>[4]</sup>

### **Alcohol**

According to WHO, there is no safe level of alcohol intake but two standard drinks may be consumed by drinkers, although alcohol is associated with an increased risk of hypoglycaemia in those treated with insulin.<sup>[11]</sup> Advice includes insulin adjustment and additional carbohydrates or a combination of the two according to individual need.

Alcohol should be avoided or limited for people with T1DM who have other medical conditions, such as hypertension, hypertriglyceridemia, some neuropathies, and retinopathy, and during pregnancy.

### **Gestational diabetes mellitus (GDM)**

GDM is a temporary condition that results in elevated blood glucose levels during pregnancy. Symptoms can include thirst, dry mouth, tiredness and frequent urination – but often there are no symptoms. Leaving GDM untreated increases the risk of birth complications, high birth weight, prematurity and stillbirth. It also increases the mother's risk of pre-eclampsia and future diabetes. Following the dietary guidelines for pregnant women can help reduce the risk of GDM.

Hyperglycaemia during pregnancy is associated with adverse outcomes and therefore needs support to optimise glycaemic control and prevent complications. Individualised dietary advice is required to promote adequate nutritional intake, achieve optimal glycaemic control appropriate to gestational age, and monitor weight to ensure appropriate weight gain during pregnancy. Moderate physical activity is recommended.

Women with previous GDM have a higher risk of developing T2DM and their offspring are at higher risk of developing childhood obesity. Nutrition and dietary management, and lifestyle modification should continue as part of postnatal care.

Risk factors include obesity, previous macrosomic birth, history of GDM, family history of diabetes and excessive gestational weight gain. These place mothers at risk of GDM.

Management of GDM includes ensuring that high-risk mothers have been screened. For an initial indication, a finger-prick blood glucose test can be helpful. A fasting reading of over 7.0 mmol/L or a random glucose reading of over 11.1 mmol/L is considered high and should be further investigated with an Oral Glucose Tolerance Test (OGTT)

GDM can be controlled by following the general dietary guidelines for pregnant women outlined in this booklet, achieving a healthy level of weight gain during pregnancy, getting regular physical activity, and adherence to prescribed medication.

Note: Following healthy eating guidelines is the best way to prevent and control GDM. Currently there is no indication that specialised diets, such as a low glycaemic or low sugar diet are beneficial.



## Diabetes complications

### Short-term (acute) complications and treatment

#### Hypoglycemia

The lower limit of physiological blood glucose is 3.0 mmol/L. However, in people with diabetes treated with insulin or sulfonylureas, any values less than 3.5–4.0 mmol/L (it varies in different countries) should be treated as hypoglycemia. Hypoglycemic symptoms may occur at a higher threshold in people with poorly controlled diabetes.

Changes in food intake, physical activity and/or medication can contribute to the development of hypoglycemia.

#### Causes

- Insufficient carbohydrate at meals or snacks or being late for meals
- Too long a period between insulin and food
- Unplanned exercise that has not been compensated for by increased carbohydrate. The effect may continue for 8–12 hours, even up to 24 hours post-exercise
- Alcohol if taken in excess and/or without food
- Too much insulin or oral glycaemic agents (not Metformin or acarbos)

#### Symptoms

Symptoms vary from person to person and can include any of the following:

- headache, dizziness;
- pale and sweaty skin;
- extreme hunger;
- blurred vision;
- hand shaking;
- confusion, anxiety, irritability, emotional feelings; and
- tingling round lips and tongue.

N.B People with long-standing diabetes may have hypoglycemic unawareness and not be aware of symptoms until their blood glucose is less than 2 mmol/L, giving an insufficient warning that may result in a coma or a seizure.

#### Treatment

Glucose is the preferred treatment for hypoglycemia, as it results in greater and more rapid resolution of hypoglycemia. A 10 g and 20 g dose of oral glucose increases blood glucose levels by approximately 2 mmol/l and 5 mmol/l respectively.

Sucrose in the form of sweets or sugar dissolved in water is also effective and may be more palatable than glucose. The recommended dosage is 10–15 g glucose, either as:

- 3–4 dextrose energy tablets (3 g glucose per tablet);
- 3–4 vita tablets (3.1 g glucose per tablet);
- 2–3 B.D. glucose tablets (5 g glucose per tablet); or
- 1 tablespoon glucose powder in water.

If glucose is not available, the equivalent is:

- 1 tablespoon jam, honey, or sugar;
- 150 mls sweet soft drink or cordial;
- 6 standard jelly beans; or
- 8–10 small jelly beans.

Food containing fat (e.g. milk) should be avoided, as it slows down gastric emptying.

Repeat the treatment in 5–10 minutes if the blood glucose is still less than 4 mmol/L. When the blood glucose is above 4.0 mmol/L, a snack containing 15 g carbohydrate is required if a meal is not due. This helps to stabilise blood glucose levels and prevents hypoglycemia from recurring.

Establish the cause of hypoglycemia to prevent recurrent episodes.

### Illness

Illnesses such as colds, flu, infections, vomiting or diarrhoea can cause problems for people with diabetes. They can cause the blood sugar level to rise. People with diabetes may not feel like worrying about their diabetes. It is important to make sure that individuals take care to avoid problems that are more serious.

Advice should include the 4 Ts.

- **Take** medication, except Metformin if the patient cannot eat, is vomiting or has diarrhoea.
- **Test** blood sugar more often, three or four times a day.
- **Tell** somebody.
- **Top up** fluid or food as tolerated. A glass of fluid every hour is recommended if the blood sugar level remains high.

## Long-term complications

There is a range of negative effects that may develop with diabetes. Many of the complications are more likely to occur if the blood glucose level or the blood pressure is high over a long period.

Diabetes complications are divided into microvascular (due to damage to small blood vessels) and macrovascular (due to damage to larger blood vessels).

**Microvascular complications** include damage:

- to eyes (retinopathy) leading to blindness;
- to kidneys (nephropathy) leading to renal failure; and
- to nerves (neuropathy) leading to impotence and diabetic foot disorders (which include severe infections leading to amputation).

It is important to know the appropriate dietary advice for specific microvascular complications identified above.

**Diabetic nephropathy:** Nutrition and dietary advice should be tailored to the stage of kidney disease in relation to potassium, phosphate, salt and energy intake, ensuring malnutrition is prevented.

**Protein intake:** A low protein diet is protective on the progression of diabetic nephropathy by improving the estimated glomerular filtration rate (eGFR). A low protein diet must be maintained in order to improve kidney function. However, restricted protein diets should be considered on an individual basis because of the risk of protein malnutrition.

**Macrovascular complications** include:

- cardiovascular diseases such as heart attacks, strokes and insufficiency in blood flow to the legs (including foot ulcers and gangrene); and
- hypertension – high blood pressure.

### Minimise the risk

There is evidence that good glycaemic control minimises the risk of getting diabetes complications. Following the healthy guidelines will help people with diabetes to avoid and/or delay getting diabetes complications. For example:

- eat less salt – this is important to minimise getting high blood pressure and kidney problems;
- eat less fat – this is important to minimise cardiovascular diseases; and
- eat a variety of fruits and vegetables (high in dietary fibre, vitamins and minerals, and antioxidants) – this is essential for good diabetes control and minimises the risk of both microvascular and macrovascular diabetes complications.

## Food label reading

Nutrition labelling is a recommended policy approach to promote and support healthier population food choices. The display of some nutrition information is mandatory in some countries, particularly on pre-packaged foods. Label information can be used to compare similar foods and can help consumers to select a variety of healthier items. Here are some examples of nutrition information to look out for.

### Drinks

Use drinks available in the Pacific region. Check to see if they meet the criteria recommended for people with diabetes.

- Carbohydrate less than 1g per 100 ml – suitable
- Carbohydrate 1 g – 2.5 g per 100 ml – one or two glasses a day
- Carbohydrate greater than 2.5 g per 100 ml – best avoided
- Check total carbohydrates per 200 ml standard serve

Nutrition Facts	
Serving Size 1 Bottle (355 mL)	
Amount Per Serving	
Calories	160
	% Daily Value*
Total Fat	0g 0%
Sodium	35mg 1%
Total Carbohydrate	39g 13%
Sugars	38g
Protein	0g
* Percent Daily Values are based on a 2,000 calorie diet.	

**INGREDIENTS:** CARBONATED WATER, INVERTED CANE SUGAR, CITRIC ACID, NATURAL AND ARTIFICIAL FLAVORS, SODIUM BENZOATE AND POTASSIUM SORBATE (AS PRESERVATIVES), RED 40, CALCIUM DISODIUM EDTA (TO PROTECT FLAVOR).

## Recommendations

Suitable drinks (carbohydrate less than 1g per 100 ml)	1–2 glasses a day	Best avoided (greater than 2.5 g per 100 ml)
<b>Water/Coffee/Tea</b>		
Tap water (if safe) Spring water / Zero sugar drinks Signature range spring water Pure NZ water H2Go Zero flavoured /Pure H2Go Tea /Coffee (no sugar)	Refresher light Mizone Active water	H2GO Energy Drink Aqua Life Flavoured sparkling water Powerade isotonic Mizone Isopower / Folavoured Sports Water Nescafe, cappuccino Hot chocolate Mocha Mocha skinny Iced tea /iced coffee Coconut water /juice
<b>Cordials</b>		
Thriftee, Hansells Quench Bickford's diet lime cordial Weight Watchers' Sweet Navel Orange, Select Lemon /Lime Juice	Ribena Lite Baker Hall Pam's Low Calorie Lemon / Lime & Barley Weight Watchers' Lemon & Lime	Sugar-sweetened cordials Milo (3 teaspoons) Barkers' Lite Lemon & Barley Unsweetened blackcurrant Refresh / Raro Vitafresh low calorie
<b>Carbonated drinks / fruit juice (sugar content relative to other drinks)</b>		
Crystal Clear sparkling Diet lemonade Gingerale Ginger beer Tonic , Diet Lift Chi Herbal Zero Sugar Sugar Free energy drinks Sprite Zero Coke Zero Pepsi Max Fanta Zero Powerade Zero Sugar Sugar free L&P 7Up Light	Bundaberg diet ginger beer Weight Watchers' Drinking Chocolate Cocoa made with water Avalance sugar free Drinking chocolate	All ordinary fizzy drinks, e.g. Coca-Cola, Lemonade, Sprite, Fanta, L&P, Just Juice Bubbles Chi Mineral Water Energy drinks – Red Bull, Gatorade, V Drink Demon G, Froce E2, V8 Vegetable and Fruit Juice Tomato Juice Just juice (50% less sugar) Prune Juice Ribena Primo flavoured milk

## Cereals

- Total fat < 10 g per 100 g
- Saturated fat < 2 g /100 g
- Sugar <15 g /100 g
- Or < 20 g if dried fruit is the main source sugar when combined with whole grains
- Fibre > 6 g / 100 g

## Carbohydrate counting

Carbohydrate (CHO) counting is essential for people with diabetes who are on insulin (T1DM). People who have T2DM need to make sure their carbohydrate intake is consistent, as per the guideline. Nutritional labels state what the manufacturer considers is a serving and grams of total carbohydrate.

Carbohydrate counting resource (diabetes diet group) is especially helpful for foods without labels, such as fruits and vegetables.

- Banana weight 105 g (with skin) provides 15 g carbohydrate
- One cup mashed potato provides 30 g carbohydrate
- Two slices of bread provide 32 g carbohydrate
- One serving of crackers (30 g, 3½ crackers)
  - carbohydrate – 19 g
  - sugar – 2.6 g
  - fat – 3.4 g (saturated fat 1.8 g)
  - energy – 126.9 cal

Example of a meal that contains carbohydrate using carbohydrate counting resources and food labels.

<b>Food</b>	<b>carbohydrate (g)</b>
2 eggs	nil
tomatoes	nil
2 slices bread	32 g
1 fruit	15 g
<b>Total</b>	<b>47 g</b>

## Special foods to watch out for

### Sugar-free biscuits

- Murray sugar free 15 g (3 biscuits)                      CHO 21 g                      630 KJ
- Krisple 18g (2 biscuits)                                      CHO 11.8 g                      350 KJ

### Sugar-free sweets

- Generally appropriate – useful when craving something sweet. Often contain sorbitol – can cause diarrhoea – self limiting

### Sugar-free chocolates

- High in fat and kilojoules – better to have small squares of regular chocolate occasionally .

### Sugar-free jam

- Beerebberg 15 g serv                                      CHO 2.8 g
- Pams regular jam 10 g serve                              CHO 6.4 g

### Fruit juice 100 ml

- No added sugar    CHO 10.6 g
- Regular fruit juice    CHO 10.3 g

**Weight watchers** – often very expensive choice with little advantage

- Muesli bar weight watchers CHO 21 g 488 KJ
- Nice and natural chocolate CHO 16.3 g 528 KJ

## Non-nutritive sweetener/artificial sweetener

People with diabetes who are accustomed to sugar-sweetened products (nutritive sweeteners) such as sugar, honey, syrup, can have non-nutritive sweeteners instead.

- For a sweet taste, a person can choose to use liquid, tablet or powder artificial sweeteners in place of sugar in drinks and food.
- A variety of different sweeteners is recommended, rather than just one type, and the amount should be reduced over time.

Non-nutritive sweeteners are not an essential part of the diet. They provide the sweet taste without having a significant effect on glycaemic control, no effect on blood sugar level, and they can reduce overall calorie and carbohydrate intake and hence weight loss.

### WHO recommendations for safe daily use of artificial sweetener:

- Aspartame 40 g/kg/day
  - For a 65 kg adult this means 6.5 L diet cola or 170 equal tablets
  - For a 30 kg child this means 3 litres diet cola or 70 equal tablets
- Saccharin – 5 mg/day
- Cyclamate 11g mg/kg/day
  - For a 65 kg adult this means 1.2 litres Thrifty or 2 teaspoons sucaryl
  - For a 30 kg child this means 0.5 litres Thrifty or 0.9 teaspoons sucaryl
- Sucralose – 15 mg/day
- Stevia – 4 mg/kg/day

Be aware – foods containing sweeteners may be high in fat and calories or kilojoules, e.g. sugar-free chocolate.

Sweetener code numbers:

- Sorbitol 420
- Acesulphame K 950
- Aspartame 951
- Cyclamate 952
- Saccharin 954
- Sucralose 955

## Common myths versus scientific evidence

### **Myth 1: Avoid sugar and anything that is white**

**Scientific evidence:** Current scientific evidence does not support the long-held belief that sucrose and sugar be restricted for glycaemic control. Several studies have demonstrated that equivalent carbohydrate amounts of sugars and starches produce similar responses in glycaemia. Therefore, it is misleading to blame sugar as the cause of hyperglycaemia, when all carbohydrates raise blood glucose. In addition, the generalisations to 'stay away from anything white' or 'avoid all fruit juices' can send confusing messages. Indeed, whole grain products such as whole wheat and bread, brown rice, and whole grain cereals are often richer in fibre but that does not mean the 'white' version cannot be consumed.

### **Myth 2: A low glycaemic index diet is recommended for anyone with diabetes**

**Scientific evidence:** The glycaemic index (GI) is a system of classifying carbohydrate foods according to their impact on blood glucose. Foods with the highest GI have the most impact on blood sugar level: high GI is >70, medium GI is 55–70 and low GI is 55.

A common belief among Pacific Islanders is that taro and starchy root crops are bad for people with diabetes, and starchy fruits like green banana, pumpkin, and breadfruit are good. These are low GI foods. However, rating food only on GI can be misleading because it does not address the whole pattern of factors that can affect the glycaemic effect of food. For example, the total amount of carbohydrate intake is of highest importance; a banana by itself has a different impact on blood sugar from a banana sandwich with wholemeal bread. A more useful measure that has been developed is the glycaemic load (GL), which takes into account both GI and the amount of carbohydrate in a single serving. Ripe bananas are fruit so must be good but bananas are high energy foods, rich in carbohydrate, their consumption should be limited.

### **Myth 3: Carbohydrate counting is only for type 1 diabetes**

**Scientific evidence:** Carbohydrate counting is not exclusively for T1DM; it is also beneficial for T2DM. Health professionals can help the person with diabetes to identify sources of carbohydrate and appropriate portion sizes of foods in 15 g carbohydrate portions. Therefore, initial education should emphasise portions and 15 g serving sizes, followed by reading the food labelling and understanding the nutrition information on it. Furthermore, patients on insulin should make sure they monitor their blood glucose frequently when using carbohydrate ratios and correction factors.

### **Myth 4: A low-carbohydrate diet is best for losing weight**

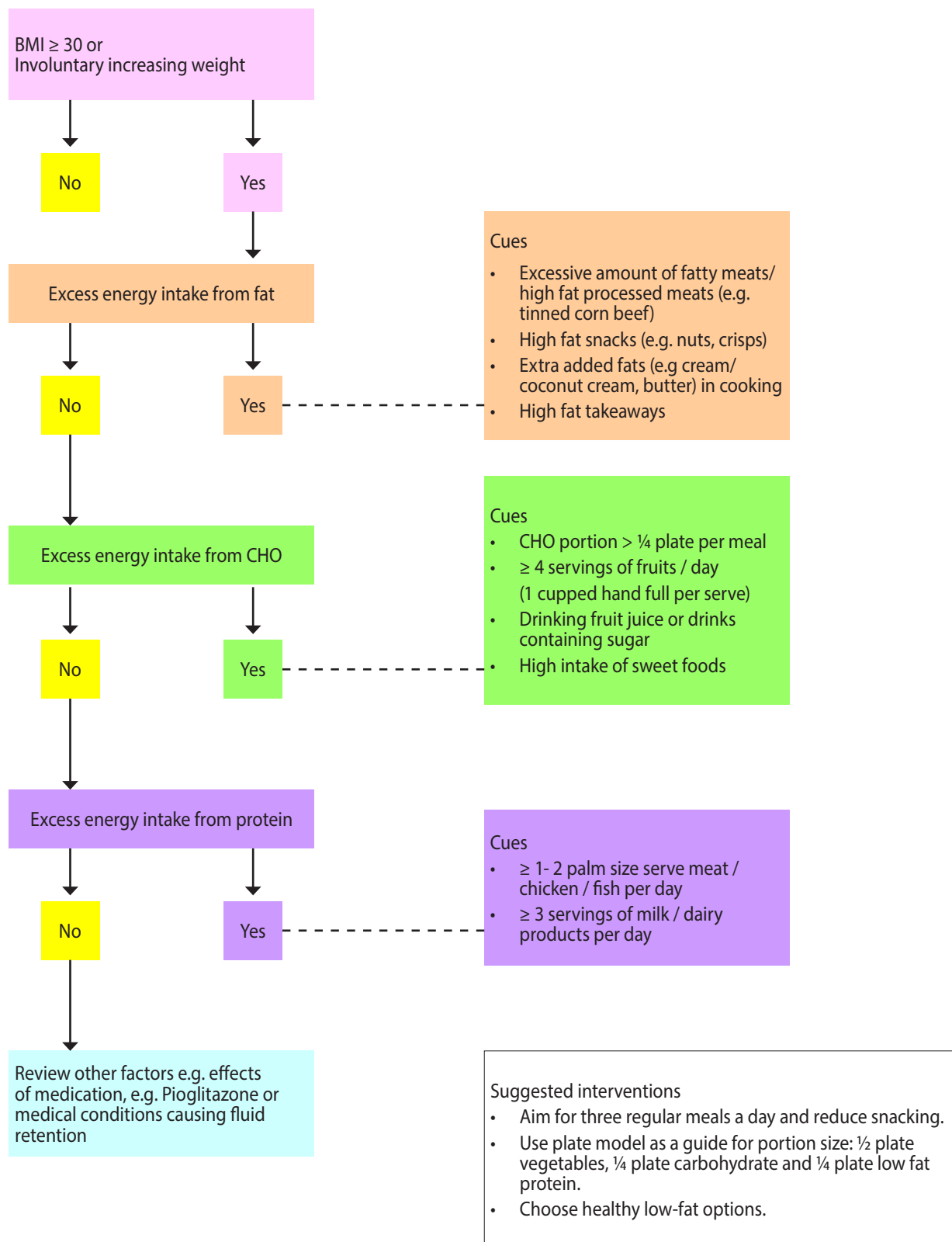
**Scientific evidence:** A low carbohydrate diet is not effective. The key message is overall energy intake reduction. While some people with diabetes may find short-term success, a low carbohydrate diet is not a long-term solution. In addition, glucose is the primary source of energy for the brain and the central nervous system so restricting carbohydrate to less than 130 g/d is not recommended except for a short-term period (up to one year).

### **Myth 5: A diabetic diet for women is 1,200 calories and for men is 1,400 calories**

**Scientific Evidence:** There is no such thing as a 'diabetic diet'. There is no set way to define and prescribe a meal plan for people with diabetes. It is important to take into account that each meal plan will be uniquely based on individual eating patterns and metabolic needs. It is equally important to take into account the person's cultural eating patterns/styles, personal preferences and medical needs. It is important to identify which are the most important metabolic priorities and lifestyle modification. For example, if the priority is glucose control then the initial focus may be on carbohydrate control and meal timing consistency. However, if the focus is on weight loss then the priority for the meal plans would be overall calorie reduction and an increase in energy expenditure. If hyperlipidemia is being addressed, a reduction in saturated and trans fats will be the focus. Therefore, a meal plan high in carbohydrate may be appropriate for some patients but not for others.

# APPENDIX 1: Dietary intervention: from Dietitian NZ

Dietary intervention: provide basic nutrition education as appropriate and if little progress, refer to dietitian.





HbA1c > 53 mmol/mol  
Wide variation in blood glucose: high BG > 10mmol/l

Excessive carbohydrate (CHO)

No

Yes

Cues

- CHO portion >¼ plate
- > 4 small servings of fruits/ day (1 small cupped handful per serve)
- Drinking fruit juice or drinks containing sugar
- High intake of sweet foods

Suggested intervention

- Reduce sugar containing drinks / food
- Healthy plate model -
- Reduce CHO portion
- 2- 4 small serve fruits / day

Inconsistent CHO intake

No

Yes

Cues

- Uneven CHO at meals
- Meals without CHO or missing meals
- Extra snacks between meals
- Diabetes medication taken at incorrect times

Suggested Intervention

- 3 regular meals per day
- Even CHO intake throughout the day
- Appropriate timing of diabetes medication and food intake

Inadequate Physical activity

No

Yes

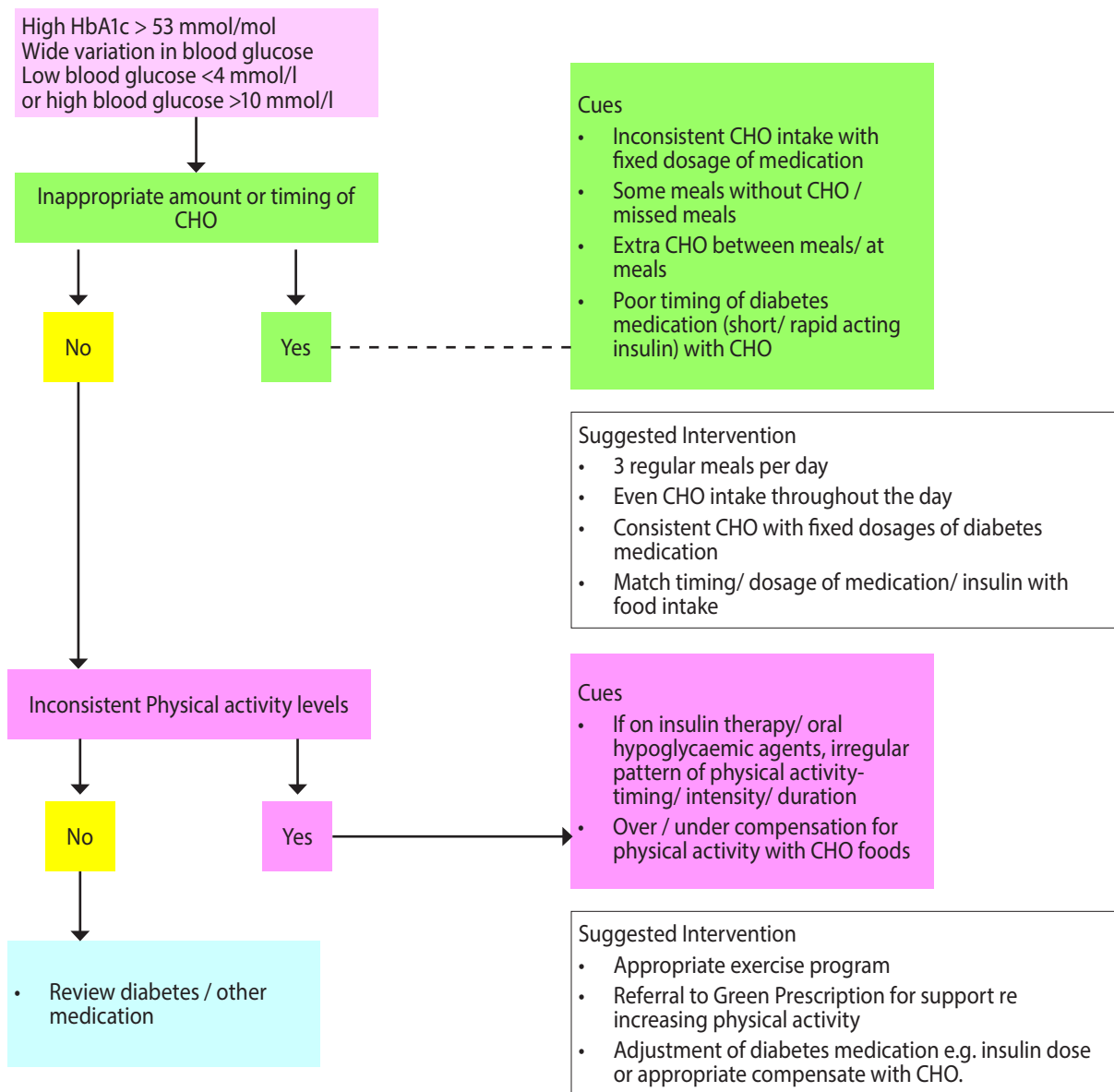
Cues

- Sedentary type job, e.g. desk type job,
- Sedentary past time, e.g. computer, TV
- Medically unfit/ physically unfit or physical impairment e.g. stroke

Suggested Intervention

- Appropriate exercise program according to tolerance if medically fit

• Review diabetes / other medication



Nutrition Assessment: Food intake – 24 diet recall.

Find out the time, type and amount of food and drinks that have been consumed in the past 24 hrs. Ask what time. Start with the first meal of the day, the time, type and amount of food and drinks that were consumed and repeat for the past 24 hrs.

Meal and times	Food/Drink	How much
Breakfast 8.00 a.m.	Bread (white) – toast	4 slices
	Spread – butter	Thick
	Drink	1 cup
	<ul style="list-style-type: none"> <li>• Coffee</li> <li>• Milk (powder)</li> <li>• Sugar</li> </ul>	1 tsp 1 tbsp 1 tsp
Morning tea /snack		
Drink		
Lunch		
Drink		
Afternoon tea/snack		
Drink		
Dinner		

## APPENDIX 2: Food frequency – check list

Use this checklist to help quickly identify problem habits in your patient’s diet. This could be, for example, snacking or cooking practices which contribute excess energy and saturated fat intake or a low vegetable intake. Support your patient to set goals with the information gained. It may be useful to prioritise problem areas based on:

- the impact of the eating habit – is it contributing to the patient’s risk profile? Is it contributing excess calories or saturated fat?
- changing the habit – does your patient think that he/she can make a change?
- whether the change is realistic and consequently more likely to be maintained?

Use the following checklist to identify the problems:

1. How many meals does the patient have a day?

2. Which meals does the patient eat regularly?

Breakfast      Brunch/Morning tea      Lunch      Dinner

3. When does the patient eat a snack?

Morning      Afternoon      Evening      Overnight      Throughout the day

4. What does the patient eat?

Check to find out the type of food and drinks that are being regularly consumed. Are these foods high in energy?

Food/drink	How much	How often
<b>Snacks</b>		
Chocolate, lollies		
Cakes, biscuits, cookies		
Ice cream		
Twisties, Crisps		
Cheese		
Fizzy or energy drinks or fruit juice or cordial		
Alcohol		
<b>Vegetables</b>		
Carrots		
Tomatoes		
Cabbages		
Lettuce		
Taro leaves		
Bele leaves		
<b>Fruits</b>		
Banana		
Apples		
Guava		
Mangoes		

Carbohydrate (starchy vegetables)		
Taro		
Banana		
Yams		

5. Find out the type and amounts of milk and fats your patient is consuming

Milk	How much	How often
Homogenised milk		
Condensed milk		
Powder milk		
Fresh milk		
Other types of milk		
Spread		
Butter		
Margarine		
Other types of spread		
Cooking fats		
Dripping/lard/butter		
Margarine/oil		

6. Food shopping and cooking habits.

Check to find out your patient's shopping and cooking habits

- Who in their home usually does the cooking?
- Who usually does the food shopping?
- 

7. Assess physical activity

Check to find out about your patient's activity habits

How many days a week would some exercise/physical activity usually be undertaken

- Days per week
- Types of activity
- For how long

What types of physical exercise/activity are enjoyed, e.g. gardening, working in the bush allotment, walking, swimming, sports?

How often would he/she be able to engage in this?

## APPENDIX 3: Case study

The following case study demonstrates the process of nutrition assessment, nutrition diagnosis and the formation of nutrition intervention, which also includes education and treatment.

**Case 1 :** Mrs Selina Fono, female, 58 year-old Tongan. Diagnosed with T2DM in 2006. Strong family history of diabetes – both parents had T2DM, one brother and one sister. Poor diabetic control with HbA1c 86 mmol/mol. BMI 44. She is currently taking Metformin 1g TDS and Protaphane 40 unit nocte. Other prescribed medications include anti-hypertensive and lipid lowering tablets.

Mrs Selina has been referred for nutrition assessment and dietary management.

Nutrition assessment includes an assessment of food intake by using a 24-hour diet recall and food frequency checklist (Refer to Appendix 2)

Food intake: 24-hour diet recall (to identify daily food pattern)

Meal: times	Food items	Amount
Breakfast (10.00–10.30 a.m.)	Weetbix	4 pieces
	Milk (standard)	½ glass
	No sugar added	
	Drink – milk	1 glass
Morning tea (rarely)	Fruit – banana (ripe)	1 whole
Lunch (12.00–12.30 p.m.)	Cassava (boiled)	2 pieces
	Chicken (boiled)	1 leg
	Pork (boiled)	50 g
	Drink – water	
Afternoon tea (sometimes)	Fruit (banana)	1 whole
Dinner (6.00–6.30 p.m.)	Pork (boiled) with salt	50 g
	Cassava (boiled)	2 pieces (large)
	Drink: water	
Supper	None	

**Food check list:** A short questionnaire to quickly identify problem areas in your patient’s diet. This could be, for example snacking or cooking practices which contribute excess energy and saturated fat intake or a low vegetable intake.

Other factors that it is important to assess are:

- social-economic status and physical activity level
- occupation: does she work?
  - non-employed, stays home and looks after her 14-year old daughter
  - no main income, apart from what her parents and family can provide to support them, like meat, bread.
- household: how many people live at home, who does the cooking and shopping?
  - lives with husband and 14 years old daughter
  - husband works in the plantation to provide for the family
  - Selina cooks and prepares their food, and does shopping when they need to buy food from the local store.
- daily routine: is there any particular routine?
  - no particular routine, eats when she is hungry, prepares food for dinner, main family meal with her husband and daughter.
- physical activity: is there any particular exercise programme?
  - house work, no walking or exercise regime. On a nice warm day, she may do gardening, otherwise she stays in the house most of the time,

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