The Nutritional Management of Diabetes

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Nutritional management plays an important role in preventing diabetes, managing existing diabetes, and slowing the rate of development of diabetic complications.

Key concepts:

- Managing diet is a priority for overall health and wellbeing for people with diabetes
- Glycaemic index and glycaemic load are useful measures for making good food choices
- Including soluble fibre in the diet can help to maintain glycaemic control
- The purchase of special "diabetic" foods is unnecessary. It is more important to be able to understand food labels

What constitutes good food for people with diabetes?

The goals of nutritional management for people with diabetes or pre-diabetes (those with impaired fasting glycaemia or impaired glucose tolerance) are:

- Achievement and maintenance of blood glucose levels and blood pressure levels that are as close to normal as possible.
- Achievement and maintenance of a lipid profile that reduces cardiovascular risk.
- Delaying or preventing diabetic complications.
- Achievement and maintenance of healthy body weight goals with an emphasis on regular and consistent physical activity as appropriate.
- Addressing individual nutritional needs taking into account personal and cultural preferences.
- Maintaining the pleasure of eating.

For people with diabetes, managing diet and glucose intake becomes a priority for overall health and wellbeing.

Some topics that people with diabetes may ask you about include:

- Glycaemic index
- Dietary fibre
- Carbohydrate counting
- Diabetic foods
- Artificial sweeteners
- Prescription special foods

Glycaemic index and glycaemic load

The glycaemic index (GI) of a food is based on the rate at which glucose is released into the bloodstream following ingestion. High GI foods (e.g. white bread) are rapidly digested and absorbed, resulting in a greater rise in blood glucose levels.

It has not yet been determined whether choosing low GI foods in place of high GI foods has a clinically useful effect on overall glycaemic control in people with diabetes. Some research has shown a benefit that is similar to that achieved by pharmacological agents,[1] while other research has failed to show this.[2,3]

A limitation of the glycaemic index is that it does not take into account the amount of carbohydrate consumed (i.e. portion size), which is an important determinant of glycaemic response.

Both the type and amount of carbohydrate in the diet is important to achieve optimal glycaemic control. Glycaemic load (GL) takes into account how much carbohydrate a serving of food contains as well as its GI. This may be a more useful measure for managing glycaemic control.

For example, watermelon has a high GI (around 72) due to its sugar content, but only contains five grams of carbohydrate per one hundred grams, therefore it has a minimal glycaemic effect. The GL of watermelon is around 3.6 which takes both GI and carbohydrate amount into consideration. This is compared to a bread roll which also has a high GI (around 95), but its higher GL (around 48) than watermelon reflects the amount of carbohydrate in the portion size (fifty grams of carbohydrate per one hundred grams).

Knowing the GI and GL of foods can be useful in assisting people with diabetes to make good food choices.

Glycaemic Index	
Low <55	Oats, barley, legumes, pasta, pumpernickel (coarse rye) bread, apples, oranges, milk, yogurt.
Medium 55–69	Pineapple, beetroot, melon, new potato, white rice
High 70–99	White bread, watermelon, baked potato, parsnip
100	Pure glucose

Glycaemic Load	
Low <10	Carrots, apples, watermelon, pineapple, pear, peanuts, kidney beans, chick peas, lentils, pop corn, wheat bread
Medium 10–19	Banana, new potato, kumara, apple juice, orange juice
High >20	Pasta, cous cous, white rice

GL = [carbohydrate (g) x GI]/100

Dietary fibre

There are two types of fibre that occur in foods – soluble and insoluble. Only soluble fibre which is found in fruit, vegetables, legumes and oats affects glycaemic control. Adding soluble fibre to a meal increases the viscosity and the stomach and bowel take longer to empty, therefore increasing the feeling of satiety. In addition the fibre forms a thin film on the intestinal surface which causes glucose to be absorbed more slowly. Including soluble fibre with a high glucose food can decrease the expected rise in glucose levels.

High fibre diets have been shown to be associated with lower blood glucose levels and to significantly lower total cholesterol. There is, however, inconclusive evidence that increasing dietary fibre above recommended levels will influence glycaemic control in people with diabetes.[4] The adequate intake for dietary fibre is set at 25 g/d for adult women and 30 g/d for adult men.

Carbohydrate counting

Carbohydrate counting is a process increasingly used for younger people with type 1 diabetes. Carbohydrate counting allows an increased variety of food and more flexibility in meals and snacks.

There are two levels of carbohydrate counting; basic and advanced.

Basic carbohydrate counting matches insulin doses to servings of carbohydrate. One carbohydrate serving is equal to 15g of carbohydrate (e.g. one slice of bread, one small piece of fruit, half a cup of fruit juice, one cup of non-fat milk or two small cookies).

This form of carbohydrate counting allows increased flexibility in meal planning while keeping the amount of carbohydrate consistent from day to day. It is most often used for patients on fixed doses of insulin.

The number of carbohydrate servings at each meal can be planned. For example a typical carbohydrate meal plan may be:

Breakfast: three carbohydrate servings (45g)

Lunch: three carbohydrate servings (45g)

Dinner: four carbohydrate servings (60g)

Snack: one carbohydrate serving (15g)

Total carbohydrates for the day: 165g

Advanced carbohydrate counting is where the number of grams of carbohydrate at a meal is calculated and the insulin dose adjusted to cover this amount of carbohydrate and bring glucose levels back to target ranges. An insulin-to-carbohydrate ratio is used to calculate this amount of insulin.

An insulin-to-carbohydrate ratio is determined by calculating, for each individual patient, how many grams of carbohydrate one unit of insulin covers. For example, if someone consumes 75g of carbohydrate and requires five units of insulin to return glucose to baseline levels, then the insulin-to-carbohydrate ratio is one unit of insulin/15g of carbohydrate.

Basic mathematic skills are required for carbohydrate counting and the ability to read food labels and weigh and measure portions of home-prepared foods.

"Diabetic" or low sugar foods

It is not necessary for people with diabetes to buy special foods, it is more important to be able to understand product labels.

- Be aware that diabetic or sugar free foods may still be high in kilojoules (energy) and fat.
- "No added sugar" does not mean that the product does not contain sugar, natural sugar from fruit or berries may be present.
- Sugar free foods may still affect blood glucose levels, depending on the other ingredients they contain.

Fructose is a sugar alternative that is often added to diabetic or low sugar foods. It is found naturally in fruits and berries and some foods including honey and some root vegetables. It has the same energy value as sugar but a lower glycaemic index (19 compared to 61 for sucrose). Fructose requires less insulin than sucrose for metabolism.

In moderation, fructose containing foods are considered as healthy choices, but in excess, fructose may affect triglycerides and LDL cholesterol.[5] This is a particular problem when in the form of high fructose corn syrup (roughly half fructose and half glucose), which is added

to soft drinks, canned fruits, deserts and processed food products. In this form it is linked with complications of insulin resistance syndrome and may be associated with the development of non-alcoholic fatty liver disease.[6]

Using honey in preference to sugar does not provide any advantage for people with diabetes. The glycaemic index of honey is around 55 as compared to 61 for table sugar.

Artificial sweeteners

Sorbitol, a polyol (sugar alcohol), is a nutritive sweetener and found in many diabetic or low kilojoule food products. It is about 60% as sweet as sucrose with one-third fewer kilojoules. Sorbitol is only partially and more slowly absorbed than sugar and produces lower blood glucose levels. Other polyols commonly used in New Zealand include mannitol, xylitol, lacitol and isomalt. Polyols may cause bloating, flatulence or diarrhoea if consumed in large quantities.

In New Zealand there are five common non-nutritive sweeteners (providing no kilojoules or energy).

Aspartame (Equal) is around 200 times sweeter than sugar but is used in very small amounts so the energy content is almost zero. People with phenylketonuria cannot use aspartame. Despite many myths otherwise, aspartame is considered to be safe and not associated with any adverse health effects. Many foods such as milk, meat, fruit and vegetables contain aspartic acid which is one of the two amino acids which make up aspartame. An adult would need to consume around 14 cans of aspartame sweetened drink to exceed the recommended daily intake.

Saccharin (Sucaryl and Surgromax) is around 300 to 500 times sweeter than sugar and withstands heat, so can be used in baking. Saccharin is not recommended for use in children aged under two years or pregnant women.

Sucralose (Splenda) is made from sugar but is around 600 times sweeter. It does not affect blood glucose levels. It can also be used for baking.

Cyclamate is 30 to 50 times sweeter than sugar. It is often used in soft drinks, dairy products and chocolate. The UK Food Standards Agency advises parents not to give children aged up to four years more than 180 ml of cyclamate containing drinks per day as this would exceed the recommended daily allowance. In New Zealand, cyclamate is not recommended for use in children aged under two years or pregnant women.

Acesulfame-K is 180 to 200 times sweeter than sugar and is often blended with other sweeteners such as aspartame and sucralose.

None of these artificial sweeteners contribute to dental caries, so are appropriate for use in chewing gum and sweets. Aspartame and sucralose are the only sweeteners recommended during pregnancy.

Prescription special foods

People with diabetes do not require prescriptions for special foods unless they become significantly malnourished and cannot gain adequate energy and nutrients from diet alone.

Products currently available in New Zealand on the pharmaceutical schedule for malnutrition in people with diabetes are:

- Oral feed 1 kcal/mL (Resource Diabetic, Diasip, Glucerna)
- Enteral feed 1 kcal/mL (Diason RTH, Glucerna RTH, Resource Diabetic TF RTH)

These products are for use as a supplement or as a complete diet. Prescriptions must be initiated by a specialist. When renewing a prescription for these items, GPs should consider whether the treatment is still appropriate, whether the product is being used, whether the patient is benefitting from the product and whether there are any other suitable alternatives.

Resources

"Diabetes and healthy food choices". Available from Diabetes New Zealand. Phone 0800 DIABETES (0800 342 238) or email info@diabetes.org.nz

Diabetes New Zealand website:

www.diabetes.org.nz

Glycaemic index and glycaemic load of foods:

www.mendosa.com/gilists.htm

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