Dietary management of children with type 1 diabetes

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Abstract

Effective dietary management of children with type 1 diabetes helps to optimize glycaemic control and leads to improvements in clinical and metabolic outcomes. Current recommendations are based on healthy eating principles for children and families with the aim to promote healthy life-long eating habits whilst maintaining social and psychological well-being. The intake of energy and essential nutrients should aim to maintain ideal body weight, promote health and growth, optimize glycaemic control, whilst minimizing the risk of chronic complications. Recent advances include the use of intensive insulin regimes together with accurate and consistent carbohydrate counting, as well as low glycaemic index food choices which have been shown improve glycaemic control. The use of continuous glucose monitoring has provided us with an insight into the effect of the composition of meals on glucose levels and the opportunity to tailor insulin therapy and dietary advice on an individual basis. This article reviews the aims of dietary management and the current understanding of what diet is optimal for children and young people with diabetes.

Keywords Carbohydrate; child; diabetes; diet; education; glycaemic index

Introduction

Effective dietary intervention can contribute to improving clinical and metabolic outcomes in children with type 1 diabetes. Recent NICE guidelines have set tighter targets for glycaemic control and there is a move towards intensive insulin therapy with continuous blood glucose monitoring. In order to achieve these targets for glycaemic control, children and carers require sound knowledge about how to adjust insulin according to different food choices.

Dietary recommendations are based on healthy eating principles suitable for all children and families with the aim of improving diabetes outcomes and reducing cardiovascular risk. Nutritional advice must be adapted to cultural and family traditions as well as the psychosocial needs of the individual child.

A paediatric dietitian with experience in childhood diabetes should be part of the multidisciplinary paediatric diabetes team. Their role is to provide education, monitoring and support to patients, parents, carers and families both at diagnosis and during ongoing management. They should be involved in the planning, content and timing of snacks/meals in the context of each child's individual circumstances, lifestyles and insulin action profiles. This will be constantly changing with the requirements of the developing child. Education and lifestyle counselling should be adapted to individual needs and delivered in a patient-centred manner.

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Aims of dietary management

The overall aim is to target healthy eating principles, optimize glycaemic control and reduce cardiovascular risk factors. This involves:

- Encouraging healthy eating behaviours
- Three balanced meals a day with healthy snacks if appropriate
- Providing sufficient energy intake for optimal growth and development
- Maintaining an appropriate body mass index (BMI)
- Maintaining a balance between food intake, energy expenditure and insulin action profiles to attain optimal glycaemic control without excessive hypoglycaemia
- Prevention and treatment of hypoglycaemia, hyperglycaemia and exercise related problems
- Reducing the risk of microvascular complications through optimizing glycaemic control
- Modifying nutritional intake to prevent and treat dyslipidaemia, hypertension and obesity
- Maintaining a good quality of life

Healthy eating

Children with type 1 diabetes have the same nutritional requirements as their healthy counterparts

They require a regular intake of starchy carbohydrates, unsaturated fats and lean protein throughout the day to meet their requirements for energy and protein, and to grow and develop adequately. A healthy dietary routine consisting of three meals a day maximizes their chances of meeting their micronutrient requirements to prevent any future deficiencies (See Figure 1). Snacks in between meals are not necessary, except in children under five years, who may struggle to meet their daily energy and protein requirements from meals alone due to their reduced gastric capacity.

Growth development and energy balance

Energy intake should be sufficient to achieve optimal growth and body weight

At diagnosis, appetite and energy intake are often increased to restore preceding catabolic weight loss. Energy intake should be reduced when weight is restored. Children's growth rate is continually changing. Rapid growth in infancy and puberty increases nutritional requirement and insulin requirement so regular review during these periods is required to adjust insulin doses where necessary. Failure to reduce energy intake after these periods of rapid growth have stopped can lead to excessive weight gain.

The prevalence of childhood obesity is increasing worldwide and caused by excess energy intake and insufficient physical

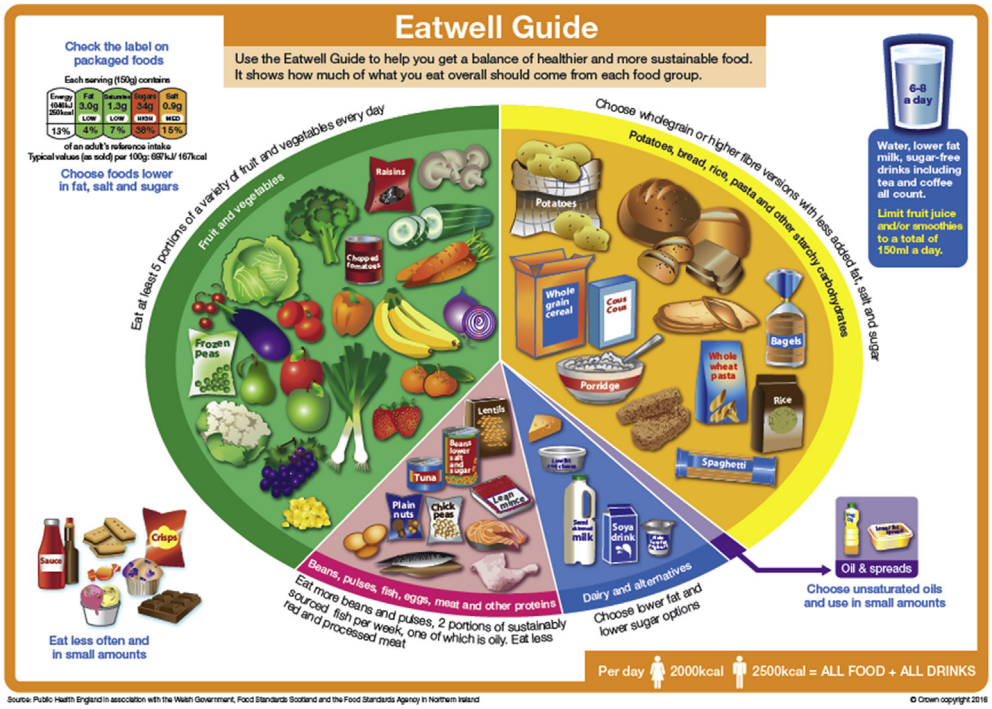

Figure 1 The Eatwell Guide. It shows how much of the different food components constitute a normal balanced diet. https://www.gov.uk/government/publications/the-eatwell-guide.

activity. In children with diabetes overinsulinization, snacking and treatment of hypoglycaemia may contribute further to obesity. Monitoring growth and BMI, promoting regular physical activity, prevention and appropriate treatment of hypoglycaemia are crucial in achieving a healthy BMI (Table 1).

Food components

Carbohydrates

Carbohydrates (starchy and sugary foods) are the main dietary source of glucose in children with type 1 diabetes. They are the body's principal supply of readily available energy and as such should form a major part of a child's diet. They should form 50–55% of total energy in children with and without diabetes.

Adequate carbohydrate consumption also enables the storage of excess glucose in the liver and muscles in the form of glycogen, and may safeguard children with diabetes against the episodes of hypoglycaemia that are likely to occur when glycogen stores become depleted.

Starchy carbohydrates include potatoes, pasta, rice, bread and cereals. These tend to release glucose slowly into the bloodstream and are often low in fat, high in dietary fibre and high in energy. Many varieties also contain micronutrients such as calcium, iron and B vitamins. Main meals should be based around starchy carbohydrates to ensure a regular supply of glucose throughout the day. Fruit, milk and yoghurt also contain slow release carbohydrates as well as providing other nutrients including calcium, vitamin D, vitamins A and C, and fibre.

Sugary carbohydrates cause a rapid rise in blood glucose levels and include foods such as sweets, chocolate, cake, biscuits and sugary drinks. These empty calories (which have no nutritional value apart from energy) increase the risk of tooth decay, and can make it very challenging for children with type 1 diabetes to control their blood glucose levels due to their high content of rapidly absorbed sugar. They are useful in the management of hypoglycaemia. However, their consumption should be discouraged in excess and in isolation from main meals.

Sucrose sweetened drinks may cause hyperglycaemia and large amounts should be avoided. Water, low calorie/no added sugar fruit squashes and diet fizzy drinks are all suitable to drink at any time. Fresh fruit juices contain a lot of natural sugar so should be drunk in small amounts and only with a meal. Milk contains lactose and should only be taken as part of a meal or snack.

Protein

Adequate protein intake is essential for growth. Protein intake should decrease from 2 g/kg/day in early infancy to 0.8 g/kg/day in adolescence. Lean sources of animal protein and sources of

Distribution of total energy intake amongst different food components

Total energy intake should be distributed as follows:

Carbohydrate 50–55%
- sucrose <10%

Fat 30–35%
- <10% saturated fat + trans fatty acids
- <10% polyunsaturated fat
- >10% monounsaturated fat (up to 20%)

Protein 10–15%

Table 1