BDA PDSG Position Statements on Low Carbohydrate Diets in Paediatric Diabetes

Jennie Brown
Paediatric Diabetes Dietitian
Whiston Hospital

Background

- LCD raised in some regional paediatric diabetes networks
- Increasing reports of families interested in this approach
- Families with Diabetes described a strong presence online advocating this approach
- Need for resources for healthcare professionals looking at paediatric diabetes specifically
- Advert put out for interested PDSG members to form a working group

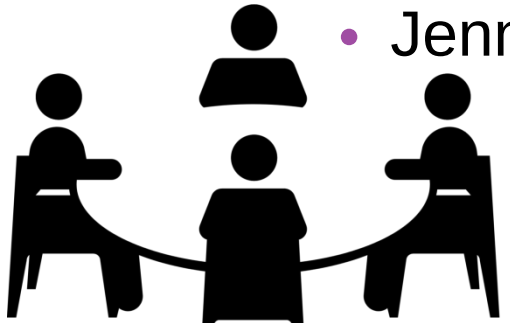
Huge Thanks to All Working Group Members

T1 Group

- Frances Hanson, Leeds
- Susan Durham-Shearer, Brighton & Sussex
- Anne-Marie McKillup, Guy's & St Thomas' ,London
- Jennie Brown, Whiston
- Aisling Pigott, Cardiff

T2 Group

- Meredith Purvis, Kings London
- Adele Swart, Lewisham & Greenwich
- Aisling Piggott, Cardiff
- Laura Bull, UCLH London
- Raphaella Rookes,Gloucester
- Jennie Brown, Whiston



Resources Available on Low Carbohydrate Diets and Diabetes

Paediatric & Adult

- Diabetes UK position statement (May 2021) (T1 & T2)
- JDRF Position Statement (2018) (T1)
- Review: Seckhold et al (2018). The ups and downs of low-carbohydrate diets in the management of Type 1 diabetes: a review of clinical outcomes. *Diabetic Medicine,* 326-334 (T1)

DIABETES UK

Position statement

Low carb diets for people with diabetes

Last reviewed: May 2021

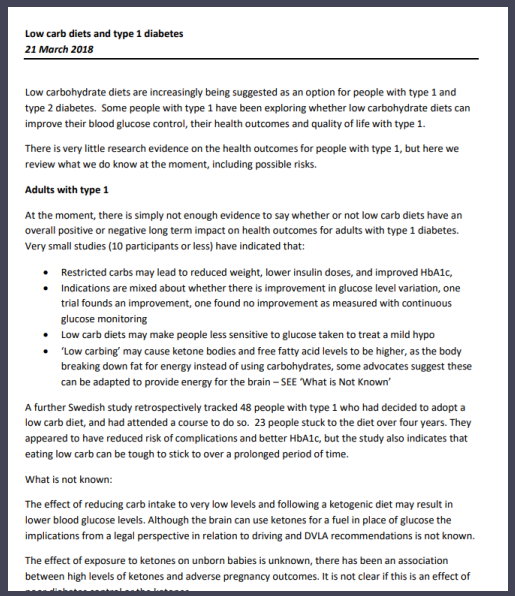
KEY POINTS:

- Lower carbohydrate diets are effective in the short term in managing weight and improving glycaemic management and cardiovascular risk factors in adults with type 2 diabetes who have obesity or overweight. This includes low carb diets providing 50 – 130g of carb a day.
- Healthcare professionals should support any evidence-based dietary approach that helps achieve long-term weight reduction, and this can include a low carbohydrate diet.
- People who chose to follow a low carb diet should be supported to make changes to relevant diabetes medications and to monitor blood glucose to reduce the risk of hypoglycaemia.
- There is absence of strong evidence to recommend low carb diets to people with type 1 diabetes.
- There is evidence that low carb diets can affect growth in children and should not be recommended.
- Whether people chose to follow a low carb diet or not, they should be encouraged to include foods with good evidence to support health. This includes fruit and vegetables, wholegrains, dairy, seafood, pulses, and nuts.
- People should be encouraged to reduce their intake of red meat and processed meat, sugar-sweetened foods, particularly sugar-sweetened drinks, and refined grains such as white bread.

Introduction

The role of carbohydrate (carb) foods in the diet is often misunderstood and has been hotly debated over recent years. Many question the need for carbohydrates and how much to include in the diet.

and the general public, Diabetes UK has produced this information to clarify our position on carbohydrates for people with diabetes. This position is based on Diabetes UK's evidence-based nutrition guidelines published in 2018, subsequent updates from relevant publications and the recent report from the Scientific Advisory Committee on Nutrition (SACN) co-chaired



Low carb diets and type 1 diabetes

21 March 2018

Low carbohydrate diets are increasingly being suggested as an option for people with type 1 and type 2 diabetes. Some people with type 1 have been exploring whether low carbohydrate diets can improve their blood glucose control, their health outcomes and quality of life with type 1.

There is very little research evidence on the health outcomes for people with type 1, but here we review what we do know at the moment, including possible risks.

Adults with type 1

At the moment, there is simply not enough evidence to say whether or not low carb diets have an overall positive or negative long term impact on health outcomes for adults with type 1 diabetes. Very small studies (10 participants or less) have indicated that:

- Restricted carbs may lead to reduced weight, lower insulin doses, and improved HbA1c,
- Indications are mixed about whether there is improvement in glucose level variation, one trial founds an improvement, one found no improvement as measured with continuous glucose monitoring
- Low carb diets may make people less sensitive to glucose taken to treat a mild hypo
- 'Low carbing' may cause ketone bodies and free fatty acid levels to be higher, as the body breaking down fat for energy instead of using carbohydrates, some advocates suggest these can be adapted to provide energy for the brain – SEE 'What is Not Known'

A further Swedish study retrospectively tracked 48 people with type 1 who had decided to adopt a low carb diet, and had attended a course to do so. 23 people stuck to the diet over four years. They appeared to have reduced risk of complications and better HbA1c, but the study also indicates that eating low carb can be tough to stick to over a prolonged period of time.

What is not known:

The effect of reducing carb intake to very low levels and following a ketogenic diet may result in lower blood glucose levels. Although the brain can use ketones for a fuel in place of glucose the implications from a legal perspective in relation to driving and DVLA recommendations is not known.

The effect of exposure to ketones on unborn babies is unknown, there has been an association between high levels of ketones and adverse pregnancy outcomes. It is not clear if this is an effect of

DIABETICMedicine

DOI: 10.1111/dme.13845

Invited Review

The ups and downs of low-carbohydrate diets in the management of Type 1 diabetes: a review of clinical outcomes

R. Seckold[1,2], E. Fisher[1], M. de Bock[3], B. R. King[1,2] and C. E. Smart[1,2]

[1]Department of Paediatric Diabetes and Endocrinology, John Hunter Children's Hospital, Newcastle, NSW, [2]Faculty of Health and Medicine, University of Newcastle, Callaghan, NSW, Australia and [3]Department of Paediatrics, University of Otago, Christchurch, New Zealand

Accepted 23 October 2018

Abstract

Dietary management has been a mainstay of care in Type 1 diabetes since before the discovery of insulin when severe carbohydrate restriction was advocated. The use of insulin facilitated re-introduction of carbohydrate into the diet. Current management guidelines focus on a healthy and varied diet with consideration of glycaemic load, protein and fat. As a result of frustration with glycaemic outcomes, low-carbohydrate diets have seen a resurgence in popularity. To date, low-carbohydrate diets have not been well studied in the management of Type 1 diabetes. Studies looking at glycaemic outcomes from low-carbohydrate diets have largely been cross-sectional, without validated dietary data and with a lack of control groups. The participants have been highly motivated self-selected individuals who follow intensive insulin management practices, including frequent blood glucose monitoring and additional insulin corrections with tight glycaemic targets. These confounders limit the ability to determine the extent of the impact of dietary carbohydrate restriction on glycaemic outcomes. Carbohydrate-containing foods including grains, fruit and milk are important sources of nutrients. Hence, low-carbohydrate diets require attention to vitamin and energy intake to avoid micronutrient deficiencies and growth issues. Adherence to restricted diets is challenging and can have an impact on social normalcy. In individuals with Type 1 diabetes, adverse health risks such as diabetic ketoacidosis, hypoglycaemia, dyslipidaemia and glycogen depletion remain clinical concerns. In the present paper, we review studies published to date and provide clinical recommendations for ongoing monitoring and support for individuals who choose to adopt a low-carbohydrate diet. Strategies to optimize postprandial glycaemia without carbohydrate restriction are presented.

Diabet. Med. 36, 326–334 (2019)

Introduction

Low-carbohydrate diets are not a new approach in Type 1 diabetes management. Prior to the discovery and use of insulin, the mainstay of Type 1 diabetes management was restrictive diets with the use of severe carbohydrate and calorie restriction [1,2]. The discovery of insulin allowed the reintroduction of carbohydrates into the diet and the methods of increasing the carbohydrate intake are described in early papers [3,4]. Intensive diabetes management to improve HbA_{1c} concentration and defer the development of microvascular complications was demonstrated by the Diabetes Control and Complications Trial and used carbohydrate counting to achieve this [5]. The Dose-Adjustment for Normal Eating (DAFNE) programme encouraged empowerment and introduced the concept to

diabetes management of being able to eat 'what you like', provided that insulin was given to cover the carbohydrate quantity [6]. This was a counter to the meal plans with prescribed carbohydrate amounts to which individuals with Type 1 diabetes found it difficult to adhere [7]. New insights into the effects of fat, protein and glycaemic index on postprandial glycaemia have facilitated insulin-dosing strategies to further optimize postprandial glycaemia [8].

It appears that dietary management has now come full circle, with increased interest from some in restrictive diets for Type 1 diabetes and with corresponding decreases in the dose of insulin in an effort to minimize glycaemic variability and reduce HbA_{1c} levels. This contrasts with the current clinical approach which is based on replacement of endogenous insulin levels to maintain physiological function in the context of a healthy diet, whilst attempting to optimize glycaemia.

Correspondence to: Carmel Smart.

Resources Available on Low Carbohydrate Diets and Diabetes

Paediatric Only

- Protocol: Rydin et al (2021). Medical management of children with type 1 diabetes on low-carbohydrate or ketogenic diets. *Pediatric Diabetes,* 1-7 (T1)
- PEN Practice Questions (T1 & T2) ..awaiting publication

Received: 15 April 2020 | Revised: 21 October 2020 | Accepted: 15 December 2020
DOI: 10.1111/pedi.13179

ORIGINAL ARTICLE

WILEY

Medical management of children with type 1 diabetes on low-carbohydrate or ketogenic diets

Amy A. Rydin | Gail Spiegel | Brigitte I. Frohnert | Anne Kaess | Lauren Oswald | Darcy Owen | Kimber M. Simmons

Barbara Davis Center for Diabetes, University of Colorado School of Medicine, Aurora, Colorado, USA

Correspondence
Kimber M. Simmons, Barbara Davis Center for Diabetes, 1775 Aurora Court Mail Stop A140, Aurora, CO 80045, USA.
Email: kimber.simmons@cuanschutz.edu

Funding information
National Institutes of Health National Institute of Diabetes and Digestive Kidney Diseases, Grant/Award Numbers: 5 K12 DK094712-08, 5 T32 DK063687

Abstract

Objectives: Low-carbohydrate and ketogenic diets are becoming increasingly popular choices for people with type 1 diabetes (T1D) aiming to achieve optimal glycemic control. A carbohydrate-restricted diet in children has been associated with negative health effects including poor linear growth and inadequate bone mineralization. Guidelines for monitoring children and adolescents choosing to follow a carbohydrate-restricted diet do not exist. We aimed to create a clinical protocol outlining how to clinically and biochemically follow patients choosing a carbohydrate-restricted diet with the goal of medical safety.

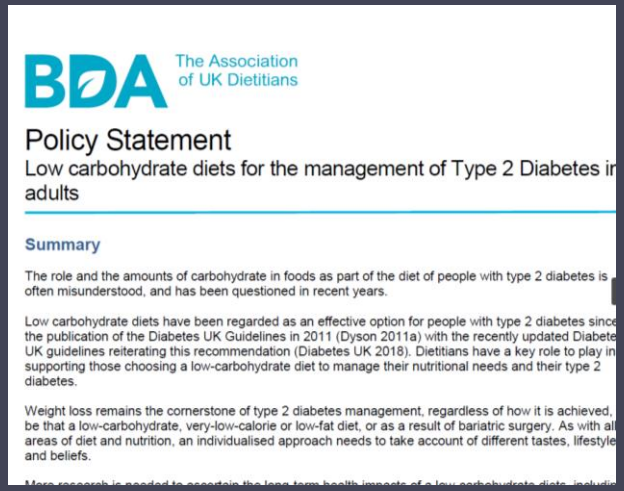
Methods: An interdisciplinary committee was formed and reviewed current consensus guidelines for pediatric patients on carbohydrate-restricted diets for epilepsy and metabolic disorders. A literature search was done to determine management strategies for children with T1D on a low-carbohydrate or ketogenic diet. Key health

PEN The Global Resource for Nutrition Practice

Resources Available on Low Carbohydrate Diets and Diabetes

Adult Only

- BDA Policy Statement (T2)
- SACN (2021) (T2)


BDA The Association of UK Dietitians

Policy Statement

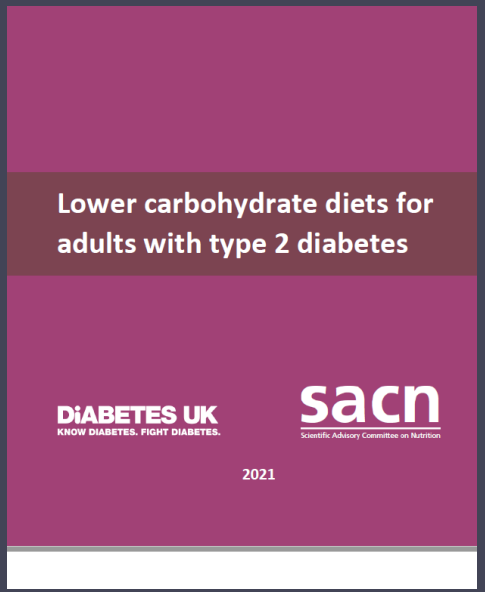
Low carbohydrate diets for the management of Type 2 Diabetes in adults

Summary

The role and the amounts of carbohydrate in foods as part of the diet of people with type 2 diabetes is often misunderstood, and has been questioned in recent years.

Low carbohydrate diets have been regarded as an effective option for people with type 2 diabetes since the publication of the Diabetes UK Guidelines in 2011 (Dyson 2011a) with the recently updated Diabetes UK guidelines reiterating this recommendation (Diabetes UK 2018). Dietitians have a key role to play in supporting those choosing a low-carbohydrate diet to manage their nutritional needs and their type 2 diabetes.

Weight loss remains the cornerstone of type 2 diabetes management, regardless of how it is achieved, be that a low-carbohydrate, very-low-calorie or low-fat diet, or as a result of bariatric surgery. As with all areas of diet and nutrition, an individualised approach needs to take account of different tastes, lifestyle and beliefs.



Development

- Literature Searches of key terms in databases for last 10y:
  - Medline
  - EMBASE
  - CINAHL

↓

- Compared against inclusion criteria and relevant articles selected for critical appraisal

↓

- Articles for inclusion were critically appraised and discussed in group to allow conclusions, themes & practice implications to be drawn

↓

- Write Up

↓

- Reviewed by both DSG & PDSG Committees & sent to BDA for final approval

Position Statement for T1D

- Total of 11 studies identified and reviewed (3 only conference abstracts)

- All available studies only met level 4 on the Oxford Centre for Evidence-Based Medicine Scale

- 4 of the studies related to concurrent epilepsy/seizure disorders and T1D

Position Statement for T1D

Position Statement:

Low Carbohydrate Diets for Children and Young People with Type 1 Diabetes

Summary/Recommendations

- There is limited evidence regarding the use of low carbohydrate (LCD) or very low carbohydrate diets (VLCD) in the treatment of children and young people with type 1 diabetes.
- The current available evidence has methodological limitations and meets only level 4 evidence on the Evidence-Based Medicine Scale (1)
- The available evidence suggests that LCD & VLCD are often associated with suboptimal nutrient intakes, growth disorders, unfavourable lipid profiles and potential for negative effects on bone health for children and young people with type 1 diabetes
- If a family chooses to pursue LCD or VLCD, enhanced monitoring of physical, biochemical, nutritional and psychological parameters are recommended as detailed in this statement. Any concerns arising from this monitoring should be discussed openly with the family and action plans made to address the concerns and reduce the risk of adverse complications
- Discussions with parents and families should be open and aim to foster a positive, collaborative relationship between the family and team. Consistent messaging from all team members is important
- Individual assessment with a dietitian should always be offered and encouraged to monitor and advise on nutritional adequacy on the modified diet
- Diabetic Ketoacidosis (DKA) may be more difficult to identify in those following LCD or VLCD. There should be a low threshold for medical review if the child is unwell or blood glucose levels are running higher than normal without explanation
- The use of continuous glucose monitoring (CGM) should be considered in line with local guidelines or policies
- Case studies suggest that a diagnosis of type 1 diabetes should not necessarily exclude children with intractable epilepsy from being considered for a therapeutic ketogenic diet. If recommended by the neurological team, input is required from both the neurological and diabetes teams

Table 3. Monitoring recommendations for children and young people following LCD or VLCD – adapted from Kossoff et al (12) and

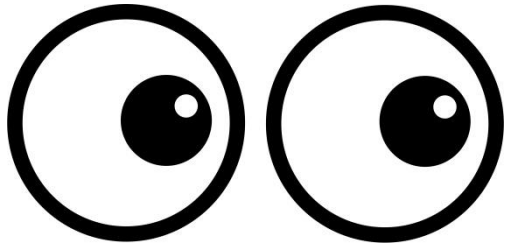
Nutritional evaluation by a registered dietitian at baseline, after 3 months then minimum annually while on LCD or VLCD	• Weight and Ideal weight for stature • Height and Height velocity • BMI
	• Review appropriateness of meal plan (calories, protein, fibre and fluid)
	• Review need for vitamin and mineral supplement
	• Assess adherence to diet in all settings inside and outside the home
Medical evaluation by diabetes specialist team at baseline then 3 monthly	• Glycaemia and insulin dosing
	• Level of ketosis (blood ketones) to establish baseline level of ketosis and frequency thereafter to be agreed by local diabetes team
	• Efficacy of the diet – is it meeting parental expectations?
Laboratory assessment at baseline, after 3 months and annually while on LCD or VLCD	• Complete blood count with platelets
	• Electrolytes to include serum bicarbonate, total protein, calcium, magnesium and phosphate
	• Serum liver and kidney profile (including albumin, AST, ALT, blood urea, nitrogen and creatinine)
	• Vitamin D level
	• Fasting lipid profile to include total cholesterol, HDL cholesterol, LDL cholesterol and non-HDL cholesterol
	• Urine analysis
	• Urine calcium and creatinine
Additional	• Bone mineral density (DEXA scan) at baseline then after 2 years of following LCD or VLCD
	• Renal ultrasound at baseline and annually while following LCD or VLCD
	• If DKA is suspected during times of sickness or high blood glucose levels there should be a low threshold for medical review including measurement of pH and bicarb
	• Screening for disordered eating behaviours at baseline and annually through routine psychological assessment or using a validated screening tool (24)

Position Statement for T2D

- Only 1 systematic review (which identified one case-control study) was found looking at low carb in T2 (which was actually looking at very low energy and low carb)
- Additional searches were conducted looking at low carb diets in:
  - Obesity
  - NAFLD

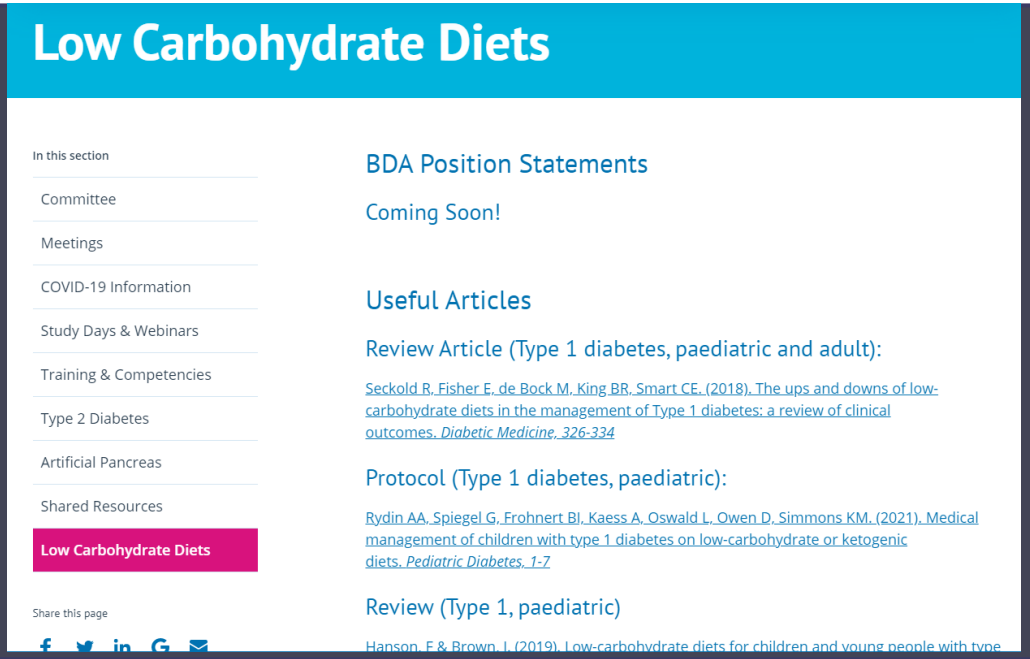
Position Statement for T2D

- The position statement is currently being written up
- Keep an eye out – coming soon
- Will be notified in newsletter



BDA PDSG Website

- Area of website to collate resources
- Position statements can be found here
- https://www.bda.uk.com/specialist-groups-and-branches/diabetes-specialist-group/paediatric-diabetes-sub-group/low-carbohydrate-diets.html



Thank you for listening

Any Questions?