Centre for Diabetes and Endocrinology (CDE)

Position Statement on the role of low-carbohydrate diets for people with diabetes

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Summary

The CDE recognises the importance of medical nutrition therapy in the management of people with diabetes mellitus. However, the CDE wishes to emphasise the importance of a well-balanced comprehensive dietary strategy that has to be sustainable, cost-effective and individualised for each patient. We also wish to draw attention to the fact that "carb-free", "low-carb", "high-protein" and other such diets have shown no long-term benefit over conventionally balanced healthy eating plans. Healthcare professionals and patients should be aware of the scientific merits (or lack thereof) related to nutrition recommendations from various sources. Most importantly, they should receive their guidance from practitioners trained in diabetes rather than from the media.

Introduction

Low-carbohydrate (or high-protein) diets for the treatment of obesity are not new, and have fallen in and out of vogue for many years. They have been promulgated in many forms, from the Atkins Diet to the SureSlim weight loss programme and many more.

Recently, the concept of a low-carbohydrate diet has been revisited in the lay press, the Discovery Health Magazine and on television. These publications make no mention of caloric restriction and it would appear that although carbohydrates need to be severely restricted, calorie / energy intake is unlimited.

Of concern is that the current publicity implies that not only are these diets ideal for patients with both type 1 and type 2 diabetes as well as people with pre-diabetes, but that current dietetic principles are outdated. Furthermore, the distinction between type 1 and type 2 diabetes is not highlighted.

Nutritional recommendations for patients with type 2 diabetes

Nutritional therapy is fundamental for the effective management of diabetes, playing a vital role in helping people with diabetes achieve and maintain optimal glycaemic control. This helps to reduce the risk of long-term complications of uncontrolled diabetes. Weight management too remains a key aspect of the treatment of type 2 diabetes. However, the optimal macronutrient distribution for weight loss diets has not been established.

Individuals who have pre-diabetes or diabetes should receive individualised advice. A registered dietician familiar with the components of diabetes therapy best provides this. It is paramount that the cultural, social, ethnic, financial and personal preferences are taken into account when tailoring dietary guidance.

High-protein, high-fat diets are normally associated with a high intake of saturated fat and cholesterol originating primarily from animal sources. In these high-protein diets, initial weight loss is significant due to fluid losses from a reduced carbohydrate intake and lower energy intake. There is also the additive effect of ketosis-induced appetite suppression. The beneficial effect on insulin resistance is due to weight loss, not the change in calorie composition.

The promoters of high-protein diets promise successful results by encouraging high-protein food choices that are usually restricted in other diets. This therefore provides initial palatability.

Of further concern is that by their very nature, high-protein diets are expensive and not sustainable. In this country where approximately 13 million people live below the breadline and poverty is rife, it is clearly not practical to advise a high-protein diet for all. In addition to the cost considerations, high-protein diets can only be supplied to large populations through highly industrialised methods of production, which are ethically problematic and environmentally unsustainable. Furthermore, a proportion of South Africans adhere to predominantly vegetarian diets for moral, ethical, religious or cultural reasons.

Given that a large number of people with type 2 diabetes have silent or undetected coronary heart disease (CHD), in addition to atherogenic lipid profiles, it seems inappropriate to advocate a diet high in saturated fat. This would only serve to perpetuate their risk continuum.

It is therefore inappropriate to opt for a single approach in the management of a complex condition such as diabetes.

Low-Carbohydrate Diets

It is recognised that generally the intake of refined carbohydrates as well as those that are high in fat has increased in recent years. Whilst high-carbohydrate diets are not promoted for people with diabetes, the emphasis should be on portion control and a choice of good-quality high-fibre carbohydrates.

Low-carbohydrate diets have been attractive as a means of losing weight, as well as optimising blood glucose control, especially in people with type 2 diabetes. There has been much debate about whether this is both safe and effective.

A position statement has been put out from Diabetes UK (DUK)[1]. The evidence relating to low-carbohydrate diets from 1998-2009 was reviewed[2].

It was concluded that:

- There is evidence that low-carbohydrate diets can lead to reductions in body weight and improvements in HbA_{1c} in the short term (less than 1 year).
- Weight loss from a low-carbohydrate diet may be due to a reduced energy (calorie) intake and not specifically because of the associated carbohydrate reduction.
- Although there may be a benefit in the short term, there is no long-term safety data or benefit of following this diet.

It has been recognised by organisations such as Diabetes UK (DUK) and the American Diabetes Association (ADA)[3] that a range of approaches to weight loss should be considered. The overall aim is that energy intake should be less than energy expenditure. The most suitable means of achieving this should be negotiated between the patient and their dietician.

How much carbohydrate is in a low-carbohydrate diet?

Carbohydrate is a component of food that is a source of energy, which is digested into glucose. It is an essential fuel, especially for the brain.

If carbohydrate intake is severely restricted and glucose stores are exhausted, fat stores will be broken down and used as energy. During this process, ketones are produced and excreted in the urine - this is the ketosis discussed above. Approximately 50-70 g per day of carbohydrate is required to prevent ketosis.

The ADA recommends at least 130 g of digestible carbohydrate per day[3]. This is based on providing adequate glucose as the fuel for the central nervous system without reliance on glucose production from ingested protein or fat. Although the necessary energy for the brain can be supplied on lower carbohydrate diets, the long-term metabolic effects of very low-carbohydrate diets are not clear.

Due to these restrictions and food eliminations, certain essential micronutrients and fibre may be lost. This may require dietary supplementation.

DUK recommends that for a 2000 kcal (8400 kJ) diet, 45%-60% of the total energy should be supplied by carbohydrate (225-300 g per day).

As there is little evidence for the optimum proportion of carbohydrates for people with diabetes, the DUK 2011 guidelines[2] recommend active carbohydrate management in terms of glycaemic control or weight loss rather than prescribing absolute intakes.

Following this, the following definitions have been suggested:

- *Moderate*-carbohydrate diet: 130-225 g per day (26-45 % of a 2000 kcal diet);
- *Low*-carbohydrate diet: less than 130 g per day (26 % of a 2000 kcal diet);
- *Very low*-carbohydrate, ketogenic diet: less than 30 g per day (6 % of a 2000 kcal diet).

It is clear that significant weight loss will improve glycaemic control. A pilot study of a Very Low Calorie (VLC) Diet consisting of 600 kcal per day was shown to be effective in reversing hyperglycaemia in newly diagnosed patients[4]. Acknowledging that VLCD or low-carbohydrate diets may be appropriate for a minority of patients, they must be supervised by an appropriately trained team that should include a registered dietician familiar with the methodology followed by the Newcastle group.

Finally, the acclaimed DASH (Dietary Approaches to Stop Hypertension) study[5] showed that a high-carbohydrate diet including fruit, vegetables, non-fat dairy products and wholegrain reduces blood pressure.

Risks and side effects of a low-carbohydrate diet

One of the main side effects is the risk of hypoglycaemia, which is heightened during physical activity. It is therefore necessary to consider overall control and ensure that blood glucose levels are monitored and medication adjusted accordingly. Other reported side effects include headaches, lack of concentration, fatigue and constipation.

Nutritional recommendations for patients with impaired glucose tolerance (pre-diabetes)

Several large and robust studies, including the Diabetes Prevention Program (DPP)[6], the STOP-NIDDM[7] and the Chinese Da Qing Diabetes Prevention Study[8] have been undertaken in people with impaired glucose tolerance or 'pre-diabetes'. These studies all had a treatment arm related to amending participant lifestyles to delay or prevent type 2 diabetes. In summary, the lifestyle intervention arms proved more efficacious than either medication or placebo in terms of the main outcome. Typically, the provision of nutritional guidance was undertaken by and monitored by a team, which included a dietician. None of these studies included a low-carbohydrate diet. In fact, the best outcomes were achieved with careful reduction in total calories and specifically a reduction in fat consumption.

Thus, good evidence exists for low-fat, reduced calorie diets for the prevention of diabetes. These studies have formed part of the annual ADA Clinical Practice Recommendations. The 2012 ADA Standards of Medical Care in Diabetes[9] endorse the fact that it is less costly to offer group intervention than for individuals to participate alone in respect of the lifestyle changes required to prevent diabetes. No evidence base exists to suggest that a low-carbohydrate diet should be used to prevent or delay diabetes. Thus, blanket recommendations for individuals as a means of delaying or preventing their diabetes by pursuing a low-carbohydrate diet alone remain untested, especially in the South African setting.

Due care should be taken in respect of this group of individuals. They must be willing to make durable behavioural changes. They will require the on-going support of a team of suitably qualified professionals and therefore be subjected to a consistent message based on current validated evidence.

Nutritional recommendations for patients with type 1 diabetes

The majority of patients with type 1 diabetes are not overweight, and the dietary approach should be to educate these patients on the impact carbohydrate consumption would have on their insulin requirements. This has been well demonstrated through the highly successful and validated DAFNE (Diet Adjustment For Normal Eating) programme, a taught-course for people with type 1 diabetes, which normalises food intake based on individual preferences and appetite. There is evidence that these programmes do not promote weight gain.

The use of a low-carbohydrate diet in individuals with type 1 diabetes may well promote ketosis and predispose these individuals to either ketoacidosis or to severe hypoglycaemia following exercise. Not only would a low-carbohydrate diet not be recommended for those with type 1 diabetes, but also it could be considered to be absolutely contraindicated.

Conclusion

We concur with the findings of the latest Diabetes Excess Weight Loss (DEWL) trial[9], which was a randomised controlled trial of high-protein versus high-carbohydrate over 2 years in type 2 diabetes. This study does not support the idea that high-protein intakes have any greater benefit on glycaemic control, lipid profile or blood pressure. This study reinforces the need to find ways to achieve sustained reduction in total energy intake as the primary focus to achieve long-term weight loss and supports a flexible approach to dietary composition for individuals with type 2 diabetes.

Future research should focus on reducing the barriers in sustaining the behavioural changes needed to achieve a reduction in energy intake in free-living individuals. Highly controlled dietary studies are unlikely to answer this challenge.

Ultimately total energy intake is the most important determinant of weight loss, regardless of macronutrient composition.

Finally, the degree of adherence will predict outcomes rather than the type of dietary strategy. Intuitively, a diet is more successful if an individual finds it acceptable and enjoyable.

"How skilled are we as healthcare professionals in helping patients to lose weight?" writes the esteemed diabetologist, Hannele Yki-Järvinen [11]. "Did you ever get training in such skills? I didn't. I learned how to write a prescription and have learned since that what I would need the most is what I know the least: how to help, encourage and support the patient to take control."

The CDE endorses the notion that there is no one more suitably qualified to offer appropriate dietary guidance than is a registered dietician. Widespread advocacy of only one particular diet in the context of diabetes or pre-diabetes is inappropriate. Unless a comprehensive diet history is taken and the social, personal preferences, cultural sensitivities and economic means of the individual and family are taken into account, dietary guidance is at best unhelpful and at worst potentially harmful.

The Endocrinologists associated with the CDE Network nationwide have reviewed this Position Statement.

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