

DIETARY RECOMMENDATIONS FOR DIABETES MANAGEMENT AND PREVENTION

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RECOMMENDATIONS FOR DIETARY MANAGEMENT FOR DIABETES

Diabetes is the fastest growing non-communicable disease in the western world (1). Diabetes affects 4.7 million people in the UK with the rate of diagnosed diabetes doubling in the past 10 years (2). It is predicted that 1 million people are living in the UK with undiagnosed diabetes (3). Diabetes costs the National Health Service on average £1.5 million per hour (4). 94,600 of the Welsh population are living with diabetes of which 90% of those are living with diabetes mellitus (also known as type 2, T2DM), 8% with type 1 insulin dependent diabetes and 2% with rarer forms of diabetes (5).

Each week in the UK, 500 premature deaths, 170 amputations, 680 stroke, 2000 cases of heart failure and 530 heart attacks are due to diabetes. Due to the presence of uncontrolled or unmanaged diabetes 10,350 individuals are living with end stage kidney failure and 1,700 with sight loss (6).

The age of diagnoses of T2DM is between 49-55 years old, with increasingly younger people living with the disease. Whilst males and females can get diabetes, it is males who are at an increased risk. This is due to males being biologically more susceptible to developing T2DM at a lower body mass index (BMI) than women of similar age (7). However, the age of 'at-risk' individuals and diagnosis is getting younger, largely due to excessive body fat from a combination of poor dietary habits made up of high glycaemic index sugary foods, low fibre intake and a lack of activity (8). Dietary intervention and regular activity are the most effective means to control body weight and blood glucose levels, thus positively impacting a reduction of fat mass, hypertension and the management of T2DM (9).

Historic advice from the medical profession to manage diabetes has been directed towards consuming a low-fat diet, that is high in complex carbohydrates (CHO), with a glycaemic index of 55 or lower based on the NHS 'EatWell' guide. However, growing evidence from a wealth of research is shifting advice from a low fat and high-CHO diet, to that of a reduced, to low-CHO diet that has moderate fat intake and high fibre. This shift has been subject to great interest recently with Diabetes UK teaming with the NHS to launch the Low Carb Plan in combination with Diabetes UK, specifically designed for those with T2DM (10). Furthermore, UK diets are largely over supplied in sugar, processed CHO's and deficient in dietary fibre (11).

Current research

Current research spans a range of dietary methods and strategies to treat, manage and possibly reverse T2DM. A collection of research was reviewed to establish the direction of current dietary recommendations and future projections for dietary intervention to treat T2DM.

Table 2; A selection of studies on dietary intervention and outcome for T2DM

Paper	Author and year	Concluding message
Low carb and ketogenic diets in type 1 and type 2 diabetes	Bolla, Caretto and Piemonti, 2019	Reducing CHO intake is effective in those with T2DM- improving glycaemic control, more so than a ketogenic diet due to easier adherence. Programming needs should be personalised to the individual. Highlighted the need for exercise intervention.
Effect of a high-protein, low carbohydrate diet on blood glucose control in people with type 2 diabetes	Cannon and Nuttall, 2014	Results proved that a diet with a ratio of CHO:Protein:Fat at 20:30:50 was more effective than the control diet of 50:15:30 (as recommended by SACN) at decreasing and controlling blood glucose over a 5 week period. Long term effects were not determined due to study length.

The use of low carbohydrate diet in type 2 diabetes – benefits and risks	Czyewska-Majchrzak et al, 2014	The use of low carb diets aid weight reduction and glucose control in T2DM, however the need to ensure an adequate dietary fibre intake is essential to benefit complete health status. The need for personalised nutrition is essential to prevent mismanagement of macronutrients or misinterpretation of the diet strategy.
Self-Management Education for Adults with Type 2 Diabetes	Norris et al, 2012	Education of nutrients to improved glycaemic control and to improve diabetes care is an integral part of comprehensive diabetes care.
Prevention and management of type 2 diabetes: dietary components and nutritional strategies	Ley et al, 2014	Emphasis on overall diet quality, several dietary patterns such as Mediterranean, low glycaemic index, moderately low CHO, and vegetarian diets can be tailored to personal and cultural food preferences and appropriate calorie needs for weight control and diabetes prevention and management.
Diabetes UK Position Statements Diabetes UK evidence-based nutrition guidelines for the prevention and management of diabetes	Dyson et al, 2018	To prevent the risk of T2DM the need to increase dietary fibre intake and reduce body weight is paramount with the need for moderated CHO intake. To manage T2DM the need to reduce body weight and have glycaemic control is essential; methods such as increased exercise and CHO control is required.
In type 2 diabetes, randomisation to advice to follow a low-carbohydrate diet transiently improves glycaemic control compared with advice to follow a low-fat diet producing a similar weight loss	Guldbrand et al; 2012	Weight changes did not differ between the diet groups, while insulin doses were reduced significantly more with the low Cho diet at 6 months, when compliance was good. Thus, aiming for 20% of energy intake from carbohydrates is safe with respect to cardiovascular risk compared with the traditional low-fat diet and this approach could constitute a treatment alternative
Low-carbohydrate diet in type 2 diabetes: stable improvement of bodyweight and glycemic control during 44 months follow-up	Neison and Joensson, 2008	A reduced carbohydrate diet is effective in motivated patients and can be recommended for overweight patients with type 2 diabetes. There has been no sign of a negative cardiovascular effect.
The interpretation and effect of a low-carbohydrate diet in the management of type 2 diabetes: a systematic review and meta-analysis of randomised controlled trials	Huntriss, Campbell and Bedwell, 2018	Reducing dietary CHO may produce clinical improvements in the management of type 2 diabetes. Further research is needed to understand the true effect of dietary carbohydrate restriction on HbA1c independent of medication reduction and to address known issues with adherence to this dietary intervention. Clarity is needed regarding appropriate classification of a low-CHO diet.
Overweight and diabetes prevention: is a low-carbohydrate–high-fat diet recommendable?	Bourns 2018	Persons with type 2 diabetes or borderline diabetes are recommended to restrict their daily intake of rapidly digestible CHO (sugars, syrups, potato, white rice, white bread, etc.). In addition, it is recommended that when switching to a diet that includes a higher portion of fat, people should primarily select products that are rich in unsaturated fatty acids.
Dietary patterns and management of type 2 diabetes: A systematic review of randomised clinical trials	Papanichiu et al, 2019	Vegetarian and Mediterranean dietary patterns may be effective in improving glycaemic control in people with diabetes.

		Evidence on the long-term efficacy of low CHO diets on individuals with type 2 diabetes is not conclusive. Intermittent fasting and macrobiotic regimes in diabetes control although promising, more conclusive research is required.
Diet and Carbohydrate Food Knowledge in Gestational Diabetes: Challenges and Opportunities for Lifestyle Interventions	Ali et al, 2017	Studies have reported beneficial effects of high fibre, low glycaemic index foods on blood glucose in gestational diabetes.
Dietary Interventions and Type 2 Diabetes in Youth: a Fresh Look at the Evidence	Perkison et al, 2018	Recent evidence is mixed, with four studies showing improvements to insulin concentrations and insulin resistance in obese children and adolescents associated with energy restriction and/or change to CHO consumption
Diets rich in natural fibre improve carbohydrate tolerance in maturity-onset, non-insulin dependent diabetics	Kay et al, no date	The first study to demonstrate the ability of an institutionally supervised diet of natural foodstuffs rich in fibre to improve CHO tolerance in maturity-onset, non-insulin dependent diabetics. This finding is relevant to the dietary management of diabetics.
The prevention and control the type-2 diabetes by changing lifestyle and dietary pattern	Asif, 2012	Adoption of a healthy dietary pattern rich in fibre and fresh produce together with physical activity are the cornerstone in the prevention of type-2 diabetes
Enlisting Gut Bacteria And Fiber To Fight Diabetes	Goodman, 2019	The study suggests that the bacteria that help us regulate our appetite and control our blood sugar get out-competed by other bacteria that suppress those all-important signals. Research concluded that high-fibre diets are effective in the management of T2DM and high fibre intake can be implemented into the diet with little planning.

Summary of papers

Recently a surge of research into the effectiveness of specific diets on T2DM has been observed. Reoccurring themes drawn from the research demonstrate the effectiveness of low-CHO diets in the control and management of T2DM and the need to reduce high glycaemic foods to prevent those at risk of T2DM. The research highlights the benefits of lowered-CHO diets to improve the health in the general population.

The need to increase dietary fibre is common in all populations, however evidence of high-fibre intake for those with T2DM aids to control blood glucose and increases gut health by feeding a diversity of gut microflora that are essential for health. CHO is the primary nutrient affecting postprandial blood glucose levels. Both the amount and type of CHO are important. Some studies have reported beneficial effects of high fibre, low glycaemic index foods on blood glucose.

Whilst recommendations of 30g fibre/day is the recommended intake for adults, the amount defined as 'low-CHO' is less clear, with research ranging from 30g-150g CHO per day. However, some studies used a ratio of nutrients which can be factored into the daily diet. Clarity of nutrient quantity is required to avoid dangers to health and prevent individual misinterpretation. Also, the need for personal intervention and personalised nutrition is highly recommended to provide individual macronutrient values so that the dietary strategy can be maintained, as part of a lifestyle management plan. Due to the busy lifestyles and the growth of 'on-the-go' nutrition products, the need for

convenient low-CHO, high-fibre food swaps that provide quality nutritional benefits are highly desirable in the market place. This will also aid the implementation and adherence by individuals to new dietary strategies.

The use of low CHO-high fibre diets and food products are not only limited to benefit and appeal to the diabetic populations. The use of functional foods also appeals to the health, active, healthy aging and weight management markets.

Conclusion

The evidence strongly suggests that low-CHO, high-fibre diets are effective in controlling of blood glucose and body fat loss; the two main factors in the prevention, control and management of T2DM.

Studies are yet to be published on the long-term outcome of low CHO-high fibre diets on the treatment of diabetes, but credible projections, predict positive results as a long-term management strategy.

Low-CHO and high-fibre diets are not exclusively beneficial to diabetics. Low-CHO, high-fibre diets research presents a collective of scientific evidence in the management of body fat and treatment of obesity, aiding health and reducing the risk of some diseases.

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