



## Should a Low Carbohydrate Diet be Recommended for Diabetes Management?

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The current dietary recommendations for diabetics are not significantly different from that of the general population; a high carbohydrate, low fat diet. Glycaemic fluctuations are unavoidable when consuming even moderate intakes of carbohydrates, exacerbating hyperglycaemia and dyslipidemia both of which are associated with the development of diabetic complications. The aim was to carry out a literature review to evaluate if restricting carbohydrate intakes was a safe and effective management strategy for diabetes.

A literature review was conducted using primary electronic databases to identify randomised control trials and intervention studies published between 2001–2015. Inclusion criteria were studies that were conducted in adults with diabetes and assessed the impact of restricted carbohydrate intakes on metabolic outcomes. They also specified the amount of carbohydrates in grams per day or percentage of total daily energy intake (TEI). Primary outcomes were changes in glycated haemoglobin levels and weight from baseline. Secondary outcomes were changes in lipoproteins, glycaemic variability and adjustments in medication.

There were significant reductions in glycated haemoglobin levels reported across the literature with the greatest reduction  $-2.2\%$  ( $p < 0.001$ ) correlating with the lowest carbohydrate intakes ( $30\text{gm/d}$ )<sup>(1)</sup>. A decrease of  $-0.7\%$  ( $p < 0.001$ ) was reported at 4 years for those consuming  $\leq 75\text{gm/d}$ <sup>(2)</sup>,  $-1.1\%$  ( $p < 0.001$ ) at 22 months for those following  $80\text{--}90\text{gm/d}$ <sup>(3)</sup> and  $-0.9\%$  ( $p < 0.05$ ) at 2 years when consuming up to  $120\text{gm/d}$ <sup>(4)</sup>. Decreases in bodyweight ranged from  $-8.6\text{ kg}$ <sup>(3)</sup> to  $-0.9\text{ kg}$ <sup>(2)</sup> with greater reductions reported at 2 years in subjects following the low carbohydrate diet ( $-4.7\text{ kg}$ ) compared to the low fat diet ( $-2.9\text{ kg}$ )<sup>(4)</sup>. Effects on fasting blood glucose were immediate dropping from  $11.7\text{ mmol/l}$  to  $7.0\text{ mmol/l}$  requiring an immediate reduction in medication<sup>(3)</sup>. 52% of subjects consuming 14% (TEI) from carbohydrates reduced their medication ( $p = 0.01$ ) compared to 21% following a diet of 53% (TEI)<sup>(5)</sup>. A reduction or elimination of medication lead to a decrease in hypoglycaemic events<sup>(1)</sup> with a two-fold greater decrease in glycaemic variability ( $p = 0.09$ ) and greater periods in euglycaemic ranges ( $p = 0.07$ )<sup>(5)</sup>. There were significant improvements in lipoprotein profiles observed despite increases in dietary fat. When comparing intakes of 58% fat and 14% carbohydrates (TEI) (35% MUFA, 13% PUFA, 10% SFA) to 30% fat and 53% carbohydrate (TEI) the low carbohydrate group significantly decreased triglyceride levels ( $p = 0.001$ ) and increased high density lipoprotein levels ( $p = 0.007$ )<sup>(6)</sup>. It was also reported that there was a significant decrease in the psychological stress associated with diabetes management alongside a reduction in negative moods between meals<sup>(7)</sup>.

A carbohydrate restricted diet can provide a safe and effective solution for improving diabetes management and should have a place within the diabetic guidelines. The diet was effective in reducing postprandial hyperglycemia and glycaemic variability resulting in low levels of glycaemia without the risk of hypoglycaemia. The ability of the diet to reduce the symptoms of dyslipidemia is of particular importance and when compared to the traditional low fat diet for weight loss, the low carbohydrate diet was comparable and in some instances better. There were significant reductions or cessation of diabetic medication reported throughout the literature alongside a reduction in the psychological aspects of living with a long-term disease. It is possible that the current dietary advice may actually accelerate beta cell exhaustion with elevated blood glucose diminishing the islet cells ability to produce insulin.

1. O' Neill DF, Westman EC & Bernstein RK (2003) *Metab Syndr Relat Disord* **1**, 291–298.
2. Nielsen J, Gando C, Joensson E & Paulsson C (2012) *DMS* **4**, 23.
3. Nielsen JV & Joensson E (2006) *Nutr Metabolism* **3**, 22.
4. Shai I, Schwarzfuchs D, Henkin Y *et al.* (2008) *N Engl J Med* **359**, 229–241.
5. Tay J, Luscombe-Marsh ND, Thompson CH *et al.* (2015) *Am J Clin Nutr* **102**, 780–790.
6. Tay J, Luscombe-Marsh ND, Thompson CH *et al.* (2014) *Diabetes Care*, **37**, 2909–2918.
7. Saslow LR, Kim S, Daubenmier JJ *et al.* (2014) *PLoS ONE* **9**, 4, e91027.