

Moderated intake of carbohydrates has moderate glycaemic benefits in type 1 diabetes

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The two major determinants of blood glucose in people living with type 1 diabetes are exogenous insulin and food. Both of which are needed to survive. However, there is no consensus regarding the ideal ratio between the main sources of energy, i.e. carbohydrates, fat and protein.¹ This leaves 8.75 million people living with type 1 diabetes with very little guidance in making daily food choices, the concerns of which are apparent given not only their acute impact on glycaemia, but also the potential development and progression of diabetes complications.^{2,3} To address this gap in guidelines, in this issue of *The Lancet Regional Health—Europe*, Isaksson et al. conducted a study of two diets differing in carbohydrate content in adults with type 1 diabetes who had not achieved recommended glycaemic targets.⁴ Their hypothesis was that by reducing intake of carbohydrates—the macronutrient with the biggest impact on blood glucose in type 1 diabetes—glycaemic peaks would be mitigated. In a randomised, cross-over study, participants followed each diet for four weeks separated by a four-week washout period. The two study diets had identical overall caloric content and complied with contemporary nutritional guidelines. However, in the Traditional Diet, 50% of the total daily energy was derived from carbohydrates, 30% from fat, and 20% from protein, whereas in the Moderate Diet, only 30% of total daily energy sourced from carbohydrates, 50% from fat, and 20% from protein. The study's primary outcome was difference in mean glucose, which was assessed by masked continuous glucose monitoring during the last 14 days of each 4-week intervention period.

The 50 individuals who completed the study had a mean age of 48 years, a body mass index of 29 kg/m², and a haemoglobin A1c of 69 mmol/mol. There was an equal split between men and women. The majority (66%) were treated with multiple daily insulin injections and the remaining 34% were using an insulin pump. Prior to study inclusion, carbohydrates accounted for 40% of their total daily energy intake. This corresponds to 200 grams of carbohydrate per day.

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The main finding of the study was a significant difference in mean glucose of 0.6 mmol/L in favour of the Moderate Diet. Moreover, participants decreased time spent in hyperglycaemia at the advantage of an increased time spent in the target range 3.9–10.0 mmol/L by more than 1 h per day when carbohydrate intake was reduced. Effect sizes were moderate but should still be considered clinically relevant, even though only 16% of participants achieved the recommended target of >70% of time in 3.9–10.0 mmol/L.⁵ No cases of severe hypoglycaemia or diabetic ketoacidosis were reported.

Changes in diet are difficult to implement and sustain both in real life and in research settings. Four-day food diaries completed during the latter part of each intervention period highlighted a notable lack of adherence to study diets. Specifically, carbohydrates accounted for 34.2% of total daily energy intake during the Moderate Diet and only 40.5% during the Traditional Diet. Accordingly, the intended 20%-difference between diets in carbohydrate energy share was not realized. Nonetheless, there was still a significant effect of the smaller reduction in carbohydrate intake.

The actual difference in daily carbohydrate intake between the two diets was approximately 30 grams. To put this into perspective, it equates to the carbohydrate content of three potatoes, 300 mL of orange juice, or a handful of raisins. If just one of such servings is substituted with fat or protein on a daily basis, for instance with a piece of cheese, glycaemia may improve.

When carbohydrate intake is lowered, energy must be obtained from other sources if body weight is to be kept stable. The Moderate Diet with the lowest carbohydrate content had a larger share of energy coming from fat than the Traditional Diet (43.4% vs 37.4%). However, this did not impact lipid levels. It should be noted though that many carbohydrate-reduced eating patterns are based on markedly larger amounts of fat and significantly less carbohydrates than both the Moderate and the Traditional Diet.⁶

Diets with restricted carbohydrate content are attracting increasing attention. Yet, evidence of their efficacy and safety is still sparse.⁷ Variations in the specific ratio between carbohydrates, fat, and protein may very well affect glycaemic outcomes and other cardiovascular risk factors. Beyond this the quality of energy sources, degree of diet implementation, and type of insulin regimen (automated vs manual insulin bolus delivery) are of great importance and worthy of consideration. All in all, Isaksson et al. have made a



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commendable contribution to this extremely complex research domain. However, sustained efforts to deepen our understanding of dietary macronutrient composition are essential for providing evidence-based nutritional guidance that meet the needs and preferences of all individuals living with type 1 diabetes.

Contributors

SS conceptualised and wrote the commentary.

Declaration of interests

SS has previously been employed by and has received speaker's fee from Novo Nordisk A/S.

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