

Two Types of Very Low-Carbohydrate Diets

The report¹ based on survey data that reveal that a very low-carbohydrate diet (VLCD) might be effective in some patients with type 1 diabetes mellitus may represent an important advance in the therapy of this condition if researchers in randomized clinical trials confirm its potential advantages in terms of better blood glucose control with less risk for hypoglycemia. However, there are several issues of concern. One is the general use of the term “very low-carbohydrate dieting” to describe the diet when there are in fact 2 distinct forms.

One type of ketogenic diet is the very low-calorie diet, or semistarvation ketogenic diet,^{2,3} which is severely hypocaloric and provides <800 kcal per day and usually <400 kcal per day and is intended for the weight loss phase in the medical treatment of obesity. When these diets to allow for starvation ketosis (which reduces hunger) occur, 0 to <50 g of carbohydrates are provided, and dietary fat intake is markedly reduced.

A second type of ketogenic diet, called a eucaloric ketogenic diet,⁴ is also used to restrict carbohydrate intake to a similar degree but contains substantially more total calories because fat is intended to provide sufficient energy to allow growth in children while helping to establish seizure control, maintain weight and athletic performance in adults of a normal weight,⁴ and recently, allow modest weight loss in moderate-to-severe obesity complicating type 2 diabetes mellitus by reducing hunger with improved glucose control and reduced medication use.⁵ To avoid confusion, the diet described in the present article should be viewed as being in the second category.

A second concern is that although no greater risk of adverse events was

noted from the survey, there should be clinical concern in subsequent trials that patients who have mild starvation ketosis with lower ambient serum insulin levels could develop diabetic ketoacidosis more rapidly with the onset of intercurrent illness and the development of insulin resistance, although there is some experimental evidence in animals that β -hydroxybutyrate has substantial anti-inflammatory activity.⁶

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CONFLICT OF INTEREST: I am a consultant to Virta Health, which is studying ketogenic diets in type 2 diabetes mellitus.

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Management of Type 1 Diabetes With a Very Low-Carbohydrate Diet: A Word of Caution

The public often looks to nutrition to improve health, and reporting on nutrition findings from the scientific literature in the popular media often reveals unproven benefits.¹ Lennerz et al² present data collected via an online community and conclude that exceptional glycemic control in type 1 diabetes with a low risk for adverse events is possible with a VLCD, and research is needed to confirm the generalizability of these findings. Although it may be true that a VLCD can be useful, we find the study of Lennerz et al to fall well short of the level of scientific evidence that merits the media and professional attention it seems to have garnered. The online community was not a general type 1 diabetes community; rather, this was a community following a specific type of VLCD as promoted by the authors of 1 book. And of the estimated 1900 community members, only 493 responded to an eligibility survey, with 316 being included in analyses (17%) and 148 with confirmed medical data, representing only 8% of the community.² Of the small subset of participants with self-reported lipid concentrations ($n = 82$; 4% of the community), 62% had dyslipidemia,² which clearly is not desirable.

We suspect that only individuals who “believe” in the VLCD approach as promoted by the authors of the book would be in the community and respond to this survey. We can appreciate the effort made by the authors to confirm the diagnosis of type 1 diabetes, glycemic control (the hemoglobin A1c), and adherence to the diet; however, ultimately, those efforts pale in comparison with the problem of selection bias. Furthermore, respondents who report following the VLCD likely have other attributes that are likely contributors

to excellent glycemic control, such as careful monitoring of blood glucose (blood sugar) levels, meticulous attention to insulin administration, vigilant exercise management, etc, which can confuse or confound attribution of the VLCD to glycemic outcomes. Nutrition guidance for patients and families living with type 1 diabetes must be made on the basis of appropriate scientific evidence, not on what more closely resembles testimonials. We agree with the authors that VLCDs may confer benefits for some patients with type 1 diabetes and that rigorous science is needed on this topic. The problem we now face is that it is far too easy for the potential benefits and safety of VLCDs to be publicized broadly on the basis of this report because although findings were definitive, they could be used to potentially mislead the public and add to the substantial confusion that exists around whether VLCDs should be used in type 1 diabetes. Promulgating such methodologically weak although enticing data broadly through the media creates a risk that patients or providers may pursue such plans without adequate insulin adjustment, resulting in serious issues with hypoglycemia as well as risk for nutritional deficiencies without adequate monitoring because of the substantially reduced intake of fruits and vegetables while on the VLCD.^{3,4}

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Authors' Response

Mayer-Davis and colleagues criticize the professional and media attention to our study, but we do not think that the suppression of information about a novel treatment of type 1 diabetes is in the public interest.

For decades, the professional diabetes establishment focused almost exclusively on drug and technology development to the neglect of research into nutritional therapies. Unfortunately, the management of type 1 diabetes remains suboptimal, placing many at increased risk for life-threatening complications.

In our study, we document exceptional glycemic control, low rates of complications, and high patient satisfaction among a community of children and adults following a VLCD. In our study design, we included an extensive review of medical records and a survey of diabetes medical care providers to confirm diagnoses and validate reported data.

The study was observational, and we fully acknowledged the limitations of

this design in our article. But to document a phenomenon that is not thought possible by many diabetes professionals, this design is an appropriate next step. The estimates by Drs Mayer-Davis, Laffel, and Buse regarding potential selection bias may be exaggerated because a significant number of members in the social media community were likely not active or did not have type 1 diabetes themselves.

In any event, those at *Pediatrics* considered the findings of sufficient importance to commission an accompanying commentary.¹

The American Diabetes Association considered our study of sufficient merit to publish a DiabetesPro SmartBrief.²

The *New York Times* coverage was balanced, including opinions from 2 highly regarded diabetes experts with no role in the study.³ In that article, we urged caution, saying “because our study was observational, the results should not, by themselves, justify a change in diabetes management.”

Of special significance, reader comments on the *New York Times* article included hundreds of testimonials from people with type 1 diabetes who overwhelmingly reported remarkable benefits from a low-carbohydrate diet that were often dismissed by their doctors.

Of course, media hyperbole can be a problem in any research area of interest to the public. Scientists, physicians, and public health experts are certainly within their rights to correct misleading stories. However, we should avoid selective enforcement against research that challenges (versus supports) conventional thinking. On that account, we would note that a relatively high-carbohydrate diet is actively promoted for people with type 1 diabetes despite the lack of any high-quality clinical trials revealing superiority.

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