Published in final edited form as:

J Am Diet Assoc. 2010 December ; 110(12): 1818–1819. doi:10.1016/j.jada.2010.09.018.

Low-glycemic load diets: how does the evidence for prevention of disease measure up?

Cari L. Meinhold¹

¹ Division of Cancer Epidemiology and Genetics, National Cancer Institute, National Institutes of Health, Rockville, MD

The glycemic index, a physiologic assessment of the available carbohydrate content of food through its effect on postprandial glycemia, was developed approximately three decades ago as a tool for the management of diabetes (1). Carbohydrate-containing foods that cause a sharp, acute spike in postprandial glucose are assigned a high glycemic index value, whereas foods that are digested and absorbed more slowly, inducing a smaller but more prolonged increase in glucose, are assigned a lower value. Practically speaking, the glycemic load, calculated as the product of the glycemic index and the carbohydrate content of a given food, may be more useful than the glycemic index because it accounts for portion size in addition to carbohydrate quality (2). Several randomized controlled trials have since supported the use of the glycemic index and load as a method for postprandial glucose control among people with type 2 diabetes (3). The utility of the glycemic index and load for healthy individuals to prevent the onset of type 2 diabetes and other metabolic conditions, however, is less clear but is of considerable interest given the rapidly growing prevalence of these conditions in countries such as the U.S. (4).

In this issue of the *Journal of the American Dietetic Association*, Finley and colleagues present a cross-sectional analysis of the association of dietary glycemic index and glycemic load with the metabolic syndrome, a cluster of metabolic abnormalities including insulin resistance, hypertension, abdominal obesity, and dyslipidemia. The metabolic syndrome is prevalent in nearly 24% of U.S. adults and is associated with an increased risk of diabetes and coronary heart disease (5). The study participants, consisting of apparently healthy male (n=9,137) and female (n=1,775) patients of the Cooper Clinic in Dallas, TX, completed a medical questionnaire and a three-day dietary record and provided a fasting blood sample. Standard measurements were taken of their height, weight, waist circumference and blood pressure. The participants also completed a symptom-limited maximal treadmill test to measure cardiorespiratory fitness. After controlling for age, exam year, smoking status, alcohol intake, total energy, dietary fat, protein, and fiber, and cardiorespiratory fitness, the authors found that glycemic index, but not load, was associated with a greater prevalence of the metabolic syndrome, while both glycemic index and load were positively associated with certain components of the metabolic syndrome, including low high-density lipoprotein cholesterol (HDL-C), large waist girth, and elevated triglycerides. There were some unexpected findings, however, including the inverse associations of high glycemic index and load with fasting glucose concentrations in men.

Address for correspondence and reprints: Cari L. Meinhold, MHS, 6120 Executive Boulevard, EPS 7051, Rockville, MD 20852, meinholdc@mail.nih.gov, Phone: 301-402-7482, Fax: 301-402-0207.

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Although large prospective studies on this topic are lacking, cross-sectional studies have shown relatively consistent positive associations for glycemic index and load with metabolic risk factors for diabetes and cardiovascular disease, including low HDL-cholesterol (6–11), triacylglycerol (6,9–10), and C-reactive protein (10–12) among apparently healthy individuals. However, the Cooper Center Longitudinal Study is unique in being one of the largest of such studies, though not the only one (8), to utilize food records, or diaries, to assess dietary intake. Unlike food frequency questionnaires (FFQ), food records do not rely on a participant's memory of past dietary habits or require certain cognitive abilities including the quantification of the average frequency of consumption and average portion sizes of each food item over a long period of time, typically the past 12 months (13). Also, most FFQs are not designed to directly measure dietary glycemic index or load. The open-endedness of food records allows for the reporting of a substantially wider range of food items and specific details which can influence the glycemic index of a carbohydrate-containing food, including cooking and preparation methods and whether food was consumed individually or as part of a meal (2,14). Therefore, dietary records may be a more valid tool for measuring usual dietary glycemic index and load compared to FFQs.

Nonetheless, random or systematic error resulting from the limitations of the dietary record collection may have biased the results of the current study. For instance, the variation in diet may not have been adequately captured with only three days of dietary records, particularly since this time period did not cover all four seasons. The food records were completed at home without the assistance of a trained professional, which may have introduced some measurement error. Perhaps even more importantly, the process of recording food intake may have actually led to temporary changes in diet that more closely conform to current dietary recommendations (13).

Regardless of whether diet is ascertained from an FFQ or dietary records, it is often difficult to isolate an association of only one particular aspect of the diet, such as glycemic index or load, when there is a high correlation with other foods or nutrients. Therefore some observational studies examining the association of dietary glycemic index or load with markers of disease risk may, in fact, be measuring another related exposure-disease association. Randomized clinical trials designed to directly examine the impact of an intervention, such as changing to a low-glycemic load diet, compared to usual intake or a high-glycemic load diet, on measures of metabolic risk factors would, theoretically, be more ideal. While several intervention studies of this sort have been conducted, a recent review of these studies concluded that the effect remains unclear because the assigned diets often differed by other dietary factors (i.e., fiber, fat, and protein content), included a small number of study participants, and/or were conducted over a short period of time (15).

In the absence of long-term, well-controlled intervention studies of glycemic index and load with the metabolic syndrome and related conditions among healthy individuals, we must rely on evidence from observational studies with high-quality dietary and covariate information, such as the current study by Finley and colleagues. Although the cross-sectional design of the current study is a limitation because we cannot assess whether the self-reported measures of dietary intake actually precede the outcome, for practical reasons (i.e., time and expense), there are currently few large prospective studies with the level of detail required to examine the associations of glycemic index and load with metabolic syndrome-related conditions.

Despite the limitations of the available studies, there is increasing evidence that low-glycemic load diets could prevent diabetes (16–17), cardiovascular disease (17), and some cancers, including endometrial cancer and esophageal adenocarcinoma (18–20). In light of these findings, adherence to a low-glycemic load diet, provided it meets current dietary

recommendations including those related to dietary fat content and portion control, seems prudent (2).

Acknowledgments

This work was supported by the intramural research program of the Division of Cancer Epidemiology and Genetics, National Cancer Institute, National Institutes of Health. I wish to thank Dr. Amy Berrington de González for her thoughtful comments on the manuscript.

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