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Review

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Efficacy and Safety of Low-Carbohydrate Diets

A Systematic Review

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Abstract

Context Low-carbohydrate diets have been popularized without detailed evidence of their efficacy or safety. The literature has no clear consensus as to what amount of carbohydrates per day constitutes a low-carbohydrate diet.

Objective To evaluate changes in weight, serum lipids, fasting serum glucose, and fasting serum insulin levels, and blood pressure among adults using low-carbohydrate diets in the outpatient setting.

Data Sources We performed MEDLINE and bibliographic searches for English-language studies published between January 1, 1966, and February 15, 2003, with

key words such as *low carbohydrate*, *ketogenic*, and *diet*.

Study Selection We included articles describing adult, outpatient recipients of low-carbohydrate diets of 4 days or more in duration and 500 kcal/d or more, and which reported both carbohydrate content and total calories consumed. Literature searches identified 2609 potentially relevant articles of low-carbohydrate diets. We included 107 articles describing 94 dietary interventions reporting data for 3268 participants; 663 participants received diets of 60 g/d or less of carbohydrates—of whom only 71 received 20 g/d or less of carbohydrates. Study variables (eg, number of participants, design of dietary evaluation), participant variables (eg, age, sex, baseline weight, fasting serum glucose level), diet variables (eg, carbohydrate content, caloric content, duration) were abstracted from each study.

Data Extraction Two authors independently reviewed articles meeting inclusion criteria and abstracted data onto pretested abstraction forms.

Data Synthesis The included studies were highly heterogeneous with respect to design, carbohydrate content (range, 0-901 g/d), total caloric content (range, 525-4629 kcal/d), diet duration (range, 4-365 days), and participant characteristics (eg, baseline weight range, 57-217 kg). No study evaluated diets of 60 g/d or less of carbohydrates in participants with a mean age older than 53.1 years. Only 5 studies (nonrandomized and no comparison groups) evaluated these diets for more than 90 days. Among obese patients, weight loss was associated with longer diet duration ($P = .002$), restriction of calorie intake ($P = .03$), but not with reduced carbohydrate content ($P = .90$). Low-carbohydrate diets had no significant adverse effect on serum lipid, fasting serum glucose, and fasting serum insulin levels, or blood pressure.

Conclusions There is insufficient evidence to make recommendations for or against the use of low-carbohydrate diets, particularly among participants older than age 50 years, for use longer than 90 days, or for diets of 20 g/d or less of carbohydrates. Among the published studies, participant weight loss while using low-carbohydrate diets was principally associated with decreased caloric intake and increased diet duration but not with reduced carbohydrate content.

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