



EVIDENCE-BASED HEALTH PROMOTION

A low-carbohydrate diet reduces obesity and may improve dyslipidaemia compared with a low-fat diet[☆]

KEYWORDS

Low-carbohydrate diet;
 Ketogenic diet;
 Low-fat diet;
 Obesity;
 Hyperlipidemia;
 Ketonuria;
 Randomised controlled trial

Summary

Question Is a low-carbohydrate diet more effective in treating obesity and hyperlipidemia than a low-fat diet?

Study design Randomised controlled trial.

Main results People on the low-carbohydrate diet lost significantly more weight compared with those on the low-fat diet after 24 weeks (mean change in body weight -12.0 kg with low-carbohydrate diet v -6.5 kg with low-fat diet; mean difference: -4.6 kg, 95% CI -6.8 to -2.5 kg). The low-carbohydrate diet significantly increased HDL levels and reduced triglyceride levels compared with the low fat-diet, but had no significant effect on total cholesterol and LDL cholesterol (see Results table 1). Adverse effects were more frequent with the low-carbohydrate diet than with the low-fat diet. (See Results table 2).

Authors' conclusions A low-carbohydrate diet reduced weight and improved triglyceride and HDL levels compared with a low-fat diet, but was associated with more adverse effects.

© 2004 Published by Elsevier Ltd.

Results table 1

Lipid levels at 24 weeks

| | Low-fat diet | Low-carbohydrate diet | P value |
|--|--------------|-----------------------|-------------|
| Total cholesterol (change from baseline) (mmol/L) | 5.85 (-0.35) | 6.11 (-0.21) | $p > 0.2$ |
| Triglyceride level (change from baseline) (mmol/L) | 1.84 (-0.31) | 0.94 (-0.84) | $p = 0.004$ |
| LDL cholesterol (change from baseline) (mmol/L) | 3.64 (-0.19) | 4.11 (+0.04) | $p = 0.2$ |
| HDL cholesterol (change from baseline) (mmol/L) | 1.40 (-0.04) | 1.57 (+0.14) | $p < 0.001$ |

HDL=high density lipoprotein; LDL=low-density lipoprotein.

[☆] Abstracted from: Yancy WS, Olsen MK, Guyton JR, et al. A low-carbohydrate, ketogenic diet versus a low-fat diet to treat obesity and hyperlipidemia. A randomized, controlled trial. *Ann Intern Med* 2004; 140: 769–777.

Results table 2

Adverse effects at 24 weeks

| | Low-carbohydrate diet | Low-fat diet | P value |
|------------------|-----------------------|--------------|-------------|
| Constipation | 68% | 35% | $p < 0.001$ |
| Headache | 60% | 40% | $p < 0.03$ |
| Halitosis | 38% | 8% | $p < 0.001$ |
| Diarrhoea | 23% | 7% | $p < 0.02$ |
| Muscle cramps | 35% | 7% | $p < 0.001$ |
| General weakness | 25% | 8% | $p < 0.01$ |
| Rash | 13% | 0% | $p < 0.006$ |

Further details

Question

How effective is a low-carbohydrate diet compared with a low-fat diet in treating obesity and hyperlipidemia?

Study design

Randomised controlled trial.

Setting

An outpatient research clinic in the Center for Health Services Research in Primary Care, Department of Veterans Affairs Medical Centre and Duke University Medical Centre Durham North Carolina, USA.

Participants

120 volunteers (aged 18 to 65), with no serious medical conditions who were overweight (body mass index 30-60 kg/m²) and dyslipidaemia (total cholesterol level >5.17 mmol/L, low density lipoprotein (LDL) cholesterol level >3.36 mmol/L or triglyceride level >2.26 mmol/L). People who were pregnant, breastfeeding, or who had taken any prescription medication in the previous 2 months (other than oral contraceptives, oestrogen therapy or thyroid medication) were excluded. People who had been on a diet or taken diet pills in the previous 6 months, or with baseline ketonuria were also excluded.

Intervention

Volunteers were randomly assigned to a low-carbohydrate, ketogenic diet or a low-fat, low-cholesterol, reduced-calorie diet for 24 weeks. The low-carbohydrate diet consisted of unlimited amounts of meat, poultry, fish, shellfish and eggs, 4 oz of hard cheese and less than 20 g of carbohydrate per day. Participants also received a daily nutritional supplement that included multivitamins. The total energy intake for the low-fat diet was calculated as 500 to 1000 kcal less than the energy intake needed for weight maintenance (calculated by body weight in pounds x 10). The daily energy intake included fat (<30% of total), saturated fat (<10%) and cholesterol (<300 mg). One-hour group meetings for people on both diets were held twice a month for 3 months, then once a month for 3 months. The meetings included supportive counselling, questionnaires and advice about diet, menu planning and exercise. Biomedical measurements were also taken.

Main outcomes

Body weight; body mass index; serum lipids and lipoproteins (measured at the start of the diet and after 8, 16 and 24 weeks); adverse effects (constipation, headache, halitosis, muscle cramps, diarrhoea, general weakness and rash).

Notes

LDL cholesterol increased slightly from baseline with the low-carbohydrate diet.

Sources of funding: The Robert C. Atkins Foundation, New York, USA.

Abstract provided by Bazian Ltd, London

Available online at www.sciencedirect.com

