

Citation:

Nordmann AJ, Nordmann A, Briel M, Keller U, Yancy WS Jr, Brehm BJ, Bucher HC. Effects of low-carbohydrate vs low-fat diets on weight loss and cardiovascular risk factors: a meta-analysis of randomized controlled trials. *Arch Intern Med*. 2006 Feb 13;166(3):285-93.

PubMed ID: [16476868](#)

Study Design:

Meta-analysis

Class:

M - [Click here](#) for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

This meta-analysis compared the effects of low-carbohydrate diets without energy restriction vs energy-restricted low-fat diets on weight loss, blood pressure, and lipid values in randomized controlled trials with diet interventions of at least 6 months.

Inclusion Criteria:

To be included in this meta-analysis, trials were required to:

- use a randomized controlled design comparing the effects of a low-carbohydrate diet (maximum of 60 g of carbohydrate per day) with energy restriction vs a low-fat diet (diet allowing a maximum of 30% of daily energy from fat) with energy intake restriction in individuals with a body mass index (BMI) of at least 25.
- report changes in body weight by using an intention-to-treat analysis
- to have a follow-up of at least 6 months
- include individuals 16 years and older

Exclusion Criteria:

Cross-over trials or those with a sequential design were excluded.

Description of Study Protocol:**Recruitment**

The Cochrane Collaboration search strategy was used. Databases searched included: MEDLINE, EMBASE, PASCAL, GLOBAL HEALTH, HEALTH, Web of Science, and the Cochrane Library from January 1, 1980 to February 23, 2005. Also reviewed was UptoDate version 2005 and

Clinical Evidence Concise 2004 (issue 12).

Design: Meta-analysis

Blinding used (if applicable): all trials used concealed treatment allocation

Intervention (if applicable): not applicable

Statistical Analysis

- All statistical analyses were performed with Stata 8.2 software.
- Treatment effects across trials were pooled. Calculated weighted mean differences for outcome measures in the low-carbohydrate and the low-fat diet groups were made by means of a random effects model.
- The presence of publication bias was investigated by means of funnel plots.
- The heterogeneity was tested with the Cochran Q test and measured inconsistency of the treatment across trials.
- Sensitivity analyses were conducted to explore heterogeneity.

Data Collection Summary:

Timing of Measurements: not applicable

Dependent Variables

- The main end point was the weighted mean difference in weight loss from baseline to 6 and 12 months of follow-up between the 2 groups.
- Secondary end points were the attrition rates on diets and the weighted mean differences in percentage change of body weight, systolic and diastolic blood pressure, blood lipid levels (total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol and triglycerides), fasting glucose level, fasting insulin levels, and quality of life.

Independent Variables

- Low-carbohydrate diet (maximum of 60 g of carbohydrate per day) with energy restriction vs a low-fat diet (diet allowing a maximum of 30% of daily energy from fat) with energy intake restriction

Control Variables

Description of Actual Data Sample:

Initial N: 5 published articles fulfilled the inclusion criteria, including 447 individuals

- Brehm et al, 2003
- Foster et al, 2003
- Samaha et al, 2003/Stern et al, 2004
- Yancy et al, 2004
- Dansinger et al, 2005

Attrition (final N): as above

Age: mean ages of included individuals ranged from 42 - 49 years

Ethnicity: not reported

Other relevant demographics

Anthropometrics

Location: international studies

Summary of Results:

Key Findings:

- After 6 months, individuals assigned to low-carbohydrate diets had lost more weight than individuals randomized to low-fat diets (weighted mean difference, -3.3 kg, 95% confidence interval: -5.3 to -1.4 kg).
- This difference was no longer obvious after 12 months (weighted mean difference, -1.0 kg, 95% confidence interval: -3.5 to 1.5 kg).
- There were no differences in blood pressure.
- Triglyceride and high-density lipoprotein cholesterol values changed more favorably in individuals assigned to low-carbohydrate diets (after 6 months, for triglycerides, weighted mean difference, -22.1 mg/dL, 95% confidence interval: -38.1 to -5.3 mg/dL, and for HDL cholesterol, weighted mean difference, 4.6 mg/dL, 95% confidence interval: 1.5 to 8.1 mg/dL).
- Total cholesterol and low-density lipoprotein cholesterol values changed more favorably in individuals assigned to low-fat diets (weighted mean difference in LDL cholesterol after 6 months, 5.4 mg/dL, 95% confidence interval: 1.2 to 10.1 mg/dL).

Author Conclusion:

Low-carbohydrate, non-energy-restricted diets appear to be at least as effective as low-fat, energy-restricted diets in inducing weight loss for up to a year. However, potential favorable changes in triglyceride and high-density lipoprotein cholesterol values should be weighed against potential unfavorable changes in low-density lipoprotein cholesterol values when low-carbohydrate diets to induce weight loss are considered.

Reviewer Comments:

Note: All of the studies included in this paper are included in a more recent meta-analysis by Hession et al, 2008. Authors note that the quality of the included trials was moderate and dropout rates were substantial.

Research Design and Implementation Criteria Checklist: Review Articles

Relevance Questions

- | | | |
|----|---------------------------------------------------------------------------------------------|-----|
| 1. | Will the answer if true, have a direct bearing on the health of patients? | Yes |
| 2. | Is the outcome or topic something that patients/clients/population groups would care about? | Yes |

- | | | |
|----|-------------------------------------------------------------------------------------------------|-----|
| 3. | Is the problem addressed in the review one that is relevant to nutrition or dietetics practice? | Yes |
| 4. | Will the information, if true, require a change in practice? | Yes |

Validity Questions

- | | | |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1. | Was the question for the review clearly focused and appropriate? | Yes |
| 2. | Was the search strategy used to locate relevant studies comprehensive? Were the databases searched and the search terms used described? | Yes |
| 3. | Were explicit methods used to select studies to include in the review? Were inclusion/exclusion criteria specified and appropriate? Were selection methods unbiased? | Yes |
| 4. | Was there an appraisal of the quality and validity of studies included in the review? Were appraisal methods specified, appropriate, and reproducible? | Yes |
| 5. | Were specific treatments/interventions/exposures described? Were treatments similar enough to be combined? | Yes |
| 6. | Was the outcome of interest clearly indicated? Were other potential harms and benefits considered? | Yes |
| 7. | Were processes for data abstraction, synthesis, and analysis described? Were they applied consistently across studies and groups? Was there appropriate use of qualitative and/or quantitative synthesis? Was variation in findings among studies analyzed? Were heterogeneity issues considered? If data from studies were aggregated for meta-analysis, was the procedure described? | Yes |
| 8. | Are the results clearly presented in narrative and/or quantitative terms? If summary statistics are used, are levels of significance and/or confidence intervals included? | Yes |
| 9. | Are conclusions supported by results with biases and limitations taken into consideration? Are limitations of the review identified and discussed? | Yes |
| 10. | Was bias due to the review's funding or sponsorship unlikely? | Yes |

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