Effect of high-carbohydrate or high-cis-monounsaturated fat diets on blood pressure: a meta-analysis of intervention trials

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CRD summary
This review found that diets high in carbohydrate were associated with a slightly higher blood-pressure than diets high in cis-monounsaturated fat. The authors stated that the magnitude of difference may not justify making dietary recommendations for the management of blood-pressure. While the conclusions reflect the evidence presented, the limited search and lack of a quality assessment undermine their reliability.

Authors' objectives
To assess the effect of cis-monounsaturated fat (cis-MUFA) and carbohydrate on blood-pressure (BP).

Searching
MEDLINE was searched from inception to August 2006; the key terms were provided. The search was not restricted by language. The reference lists of selected articles were screened for relevant studies.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs), including crossover and parallel-group trials, and non-randomised trials were eligible for inclusion.

Specific interventions included in the review
Studies that compared high-carbohydrate diets with high-cis-MUFA diets were eligible for inclusion. To be included the study diets had to be isoenergetic. The diets in the included studies varied in duration from 3 to 14 weeks. The proportion of total energy intake varied between studies.

Participants included in the review
Studies in which the body weight of the participants remained stable throughout the study were eligible for inclusion. Studies conducted in pregnant women were excluded. The included studies were conducted in adults who were normotensive, hyperlipidaemic or healthy, or in adults with type 2 diabetes mellitus, pre-hypertension or stage 1 hypertension.

Outcomes assessed in the review
Studies that reported BP values were eligible for inclusion.

How were decisions on the relevance of primary studies made?
One reviewer selected relevant studies from the lists of articles. Two additional reviewers checked the full-paper copies of relevant studies.

Assessment of study quality
The authors did not state that they assessed validity. However, one reviewer extracted details of the randomisation status and RCT design (crossover, parallel-group), one reviewer checked this information, and any discrepancies were resolved by discussion.

Data extraction
One reviewer extracted the data and a second reviewer checked them. Any discrepancies were resolved by discussion amongst the reviewers. For crossover studies, the systolic and diastolic BP at the end of each diet phase were extracted. For parallel-group studies, changes in systolic and diastolic BP from baseline to end of study diet were extracted. The variance was derived or estimated. For those studies with multiple comparisons or time points, a composite effect size and variance were calculated.
Methods of synthesis
How were the studies combined?
A meta-analysis was used to estimate the pooled mean difference (MD) with 95% confidence intervals (CIs) using both fixed-effect and random-effects models. Results using the random-effects model were presented in the final analysis. Publication bias was assessed using funnel plots and Egger’s regression test.

How were differences between studies investigated?
Heterogeneity was assessed using Cochran’s Q statistic and by observing differences in study design, diet composition and participant population. Subgroup analyses were conducted by including only randomised trials in the meta-analysis and randomised crossover studies.

Results of the review
Ten studies (n=448) were included: 6 randomised crossover trials, 1 randomised parallel-group trial and 3 non-randomised crossover trials.

Diets rich in carbohydrate resulted in significantly higher systolic BP (10 studies; MD 2.6 mmHg, 95% CI: 0.4, 4.7, p=0.02) and diastolic BP (10 studies; MD 1.8 mmHg, 95% CI: 0.01, 3.6, p=0.05) than diets rich in cis-MUFA.

When only randomised trials were included in the analyses, the results were non significant (7 studies; p=0.06 and p=0.09). Similar results were observed when only randomised crossover studies were included in the analyses (6 studies; p=0.11 for both systolic and diastolic BP).

There was no evidence of publication bias.

Authors’ conclusions
Diets high in carbohydrate may be associated with a slightly higher BP than diets high in cis-MUFA. However, the magnitude of difference may not justify making dietary recommendations for the management of BP.

CRD commentary
The review addressed a clear question with well-defined inclusion criteria. Only one database was searched, thereby increasing the chance of missing pertinent studies, and the authors made no attempt to search for unpublished studies, which might have introduced publication bias. However, publication bias was assessed using funnel plots and a statistical test. The potential for language bias was reduced by the inclusion of studies published in languages other than English. More than one reviewer was involved in some stages of the systematic review process, thus limiting reviewer bias and error. The validity of the studies was not, however, assessed, so the results of the studies and any synthesis of them may not be reliable. The authors discussed sample size limitations of the included studies, as well as several potential sources of heterogeneity. While the conclusions reflect the evidence presented, the limited search and lack of a quality assessment undermine their reliability.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that additional well-designed studies with larger sample sizes are required to assess the effect of high-carbohydrate and high-cis-MUFA diets on BP. Future studies should carefully control possible confounders such as the glycaemic index and several nutrients, including dietary fibre.

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