Efficacy of lifestyle education to prevent type 2 diabetes: a meta-analysis of randomized controlled trials

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CRD summary
This review concluded that exercise and/or dietary education is effective in reducing 2-hour plasma glucose and the incidence of type 2 diabetes in high-risk adults. However, it is not possible to determine the reliability of the authors’ conclusions, owing to the lack of an assessment of study quality and the poor reporting of review methods.

Authors' objectives
To evaluate the effectiveness of lifestyle education in preventing type 2 diabetes.

Searching
MEDLINE and ERIC were searched from January 1966 to November 2004 for relevant studies reported in the English language; the search terms were reported. In addition, reference lists were handsearched.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) (including cluster designs) with at least 6 months’ follow-up were eligible for inclusion in the review.

Specific interventions included in the review
Studies of lifestyle education programmes (combining diet and exercise, or solely dietary education) compared with a conventional programme (e.g. usual exercise with or without dietary advice) were eligible for inclusion. The majority of the included interventions combined dietary education and exercise. There were no details of exercise or dietary prescriptions.

Participants included in the review
Studies of adults who were at high risk of type 2 diabetes, defined as having impaired glucose tolerance, impaired fasting glucose, and borderline according to criteria from the Japanese Diabetes Society, were eligible for inclusion. The included studies comprised males and females aged between 39 and 58 years, with a body mass index ranging from 24 to 34. The majority of participants had impaired glucose tolerance.

Outcomes assessed in the review
Studies measuring the incidence of type 2 diabetes and/or plasma glucose levels, defined as the difference in value 2 hours after a 75-g oral glucose load (2-hour plasma glucose) at 1 year follow-up, were eligible for inclusion. Follow-up in the included studies ranged from 6 months to 6 years.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

Mean differences (baseline to 1 year between study groups) in blood glucose levels and the relative risk (RR) or hazard ratio, with 95% confidence intervals (CIs), for the incidence of type 2 diabetes were calculated.
Methods of synthesis
How were the studies combined?
The studies were combined in a meta-analysis using fixed-effect (general variance-based method), random-effects (DerSimonian and Laird) and Bayesian (Monte Carlo Markov chain) models. A funnel plot was reported to have been used to examine the potential influence of selection bias, including sample size, mean age, publication year, baseline values of 2-hour plasma glucose, and body mass index.

How were differences between studies investigated?
Differences between the included studies were explored using a chi-squared test. Sensitivity analysis was performed according to the intervention type and duration of follow-up.

Results of the review
Nine RCTs (n=5,260) were included in the review. Of these, eight (n=2,026) were included in the meta-analysis.

A statistically significant effect for lifestyle interventions was reported from the pooled analysis of 5 studies; this showed a reduced incidence of type 2 diabetes (RR 0.55, 95% CI: 0.44, 0.69) (the random-effects result was concordant with other models). There was no evidence of heterogeneity and the exclusion of one large study did not alter the main finding.

The pooled results from 8 studies showed a statistically significant reduction in 2-hour plasma glucose (reduction of 0.84 mmol/L, 95% CI: 0.39, 1.29) following a 1-year lifestyle education intervention (the random-effects result was concordant with other models). There was significant heterogeneity amongst the studies (p<0.001) and this prompted subgroup analyses according to length of study and type of intervention. Results of the latter did not alter the main finding, except when the Bayesian model was used.

Data were not available to confirm the potential for selection bias.

Authors’ conclusions
Lifestyle education is effective in reducing 2-hour plasma glucose and the incidence of type 2 diabetes in high-risk individuals.

CRD commentary
The review question was clear and was addressed by specific inclusion criteria for the participants, intervention, outcomes, and study design. The search strategy was limited largely to two electronic databases and further restricted to English language articles. Unpublished material does not appear to have been considered; this suggests that relevant studies might have been missed and there may be a risk of publication bias. The review process was not adequately described in order to judge the transparency of the methods employed, and there was no reported assessment of validity of the included studies; this means that the further potential for error and bias cannot be ruled out. Although the authors' conclusions reflect the evidence presented, various limitations in the review process mean that it is not possible to determine their reliability.

Implications of the review for practice and research
Practice: The authors stated that lifestyle education-based approaches should be the focus of attention in preventing type 2 diabetes.

Research: The authors did not state any implications for research.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.