An integrative literature review of lifestyle interventions for the prevention of type II diabetes mellitus

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CRD summary
The authors concluded that a diet plus exercise programme was the most effective lifestyle intervention for preventing type II diabetes. These conclusions should be regarded with a degree of caution due to wide variability among the included studies and poor reporting in the review.

Authors’ objectives
To evaluate the effectiveness of lifestyle interventions for prevention of type II diabetes.

Searching
MEDLINE, CINAHL and Cochrane Database of Systematic Reviews were searched from 1996 to 2007. Search terms were reported. Reference lists of retrieved articles were handsearched. The search was limited to published peer-reviewed studies in English.

Study selection
Studies of lifestyle interventions to prevent type II diabetes in adults were eligible for inclusion. Studies of pharmacotherapy were excluded with one exception (a study that also included a lifestyle intervention). Studies that included participants with pre-existing diabetes were excluded.

Participants in most included studies had impaired glucose tolerance and/or other risk factors for diabetes; some studies included participants without specific risk factors. Some studies were restricted to only men or only women. Studies were conducted in Europe, Asia and USA. Prevention programmes included a variety of dietary, exercise and/or counselling interventions (and in one study metformin). Nearly all studies gave education on healthy living to participants. Dietary interventions varied (for example, low fat diet, balanced diet, reduced dietary intake at night, with or without caloric restriction). Exercise interventions included a wide range of activities (such as walking, cycling, swimming). Counselling interventions included nutritional and behavioural approaches. Studies compared different interventions against one other and/or against control groups that received usual care (where stated). Outcomes reported in the review were body weight and incidence of diabetes (or glucose tolerance test result), which were the most commonly reported items among a range of measures in the primary studies.

The authors stated neither how the papers were selected for the review nor how many reviewers performed the selection.

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

Data extraction
The authors stated neither how the data were extracted for the review nor how many reviewers performed the data extraction.

Methods of synthesis
The studies were combined in a narrative synthesis organised by type of intervention, supported by tables.

Results of the review
Twelve studies were included in the review (n=87,577), which appeared to comprise: 10 controlled clinical trials (n=5,648), at least two of which were randomised; one prospective cohort study (n=70,102); and one post-hoc cohort analysis (n=11,827). Duration of follow up varied from one to eight years.
Short term outcomes, diet or exercise alone versus active comparators or controls: Statistically significant decreases in plasma glucose (p<0.05) were noted initially in the intervention groups in four out of five studies of diet. A statistically significant decrease in weight (but not plasma glucose) was noted in the intervention group in one of three studies of exercise.

Short term outcomes, diet plus exercise versus active comparators or controls: Five out of seven studies initially reported a statistically significant reduction in plasma glucose and five reported a statistically significant decrease in weight or body mass index in the intervention groups.

Counselling: Four studies included counselling components. One randomised controlled trial reported increased weight reduction when behavioural email counselling was added to an internet weight loss programme.

Longer term outcomes (12 studies): Three studies of diet and/or exercise versus controls included one (n=577) that reported the interventions significantly decreased diabetes incidence at six years. A second study (n=3,234) reported lower diabetes incidence in the intervention group over 2.8 year follow-up (cumulative incidence 14.4% versus 28.9%), but it was unclear whether this was statistically significant. Post hoc analysis in the third study (n=1,1827) reported higher rates of diabetes in the intervention groups. Five of eight studies of lifestyle interventions reported initial positive results, but noted reduced benefits over time. Two studies of diet and exercise and one of diet alone reported statistically significant weight loss at two years or more. There was no statistically significant difference between the groups at five years (one study).

Cost information
One study (n=3,234) reported that direct medical costs associated with the interventions were: lifestyle group $2,919 (approximately 2,142 euros); metformin group $2,681 (1,967 euros); and placebo group $218 (160 euros).

Authors' conclusions
A diet plus exercise programme was the most effective lifestyle intervention for preventing diabetes mellitus.

CRD commentary
The objectives of the review were clear, but inclusion criteria were not defined in detail and at least one study was included in which no intervention was delivered. Relevant sources were searched for studies, but the restriction to published studies in English meant that the review was prone to publication and language biases. The processes of study selection and data extraction were not described. It did not appear that study validity was systematically assessed. Overall very little information was reported about the primary studies (such as design, type of controls, dropout rates, duration of intervention). The decision to combine the studies by narrative synthesis appeared appropriate, but insufficient information was given about the statistical or clinical significance of the findings. There was marked clinical and methodological heterogeneity across the studies and many of the results related to surrogate outcomes (such as weight loss) rather than diabetes incidence. All these factors made it difficult to assess the potential for bias and error in the review. The authors’ conclusions should be regarded with a degree of caution due to wide variability among the included studies and poor reporting in the review.

Implications of the review for practice and research
Practice: The authors stated that lifestyle interventions for diabetes prevention can be delivered in a variety of settings and venues and can target at-risk populations, with nurses well suited to help deliver such programmes.

Research: The authors stated that future research should investigate long-term maintenance programmes for diabetes prevention, such as the use of booster interventions. Further research that compared pharmacological and lifestyle interventions was also needed.

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