Systematic review of interventions in the management of overweight and obese children which include a dietary component

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CRD summary
This review assessed interventions with a dietary component for treating overweight and obese children and adolescents. The authors concluded that there is insufficient evidence to determine the effectiveness of dietary interventions or to recommend a specific dietary approach. The pooled analysis results might not be reliable. The authors appropriately highlight the need for better quality studies with long-term follow-up.

Authors' objectives
The main objective was to determine the optimal dietetic treatment and management for overweight and obese children and adolescents.

Searching
The authors reported searching MEDLINE (including PREMEDLINE), CINAHL, EMBASE, AUSTROM, Dissertation Abstracts, Current Contents, the Cochrane CENTRAL Register and DARE. The report included search strategies for the first three of these databases plus AUSThealth and Current Contents. The Journal of the Dieticians' Association of Australia, International Journal of Obesity and the Journal of Human Nutrition and Dietetics were searched by hand. U.S., UK and Australian government reports were also searched. The main search covered the years 1975 to 2003; a supplementary search was conducted in 2004 to identify the latest results from specific studies. Reference lists in retrieved articles were checked for additional studies. Published and unpublished studies in the English language were eligible for inclusion.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) and non-randomised study designs (including pre- and post-intervention, longitudinal, cohort, case-control and time series) were eligible for inclusion. Studies of poor methodological quality were excluded (the definition of poor quality was not reported).

Specific interventions included in the review
Studies of interventions that focused on diet and were delivered by a nutritionist or other health professional were eligible for inclusion. Eligible delivery settings included one-to-one, groups, obesity clinics, commercial programmes, train the trainer, community groups, gyms, schools, the Internet and e-mail. Interventions could include physical activity, sedentary behaviour modifications and cognitive-behavioural therapy (CBT). Programmes that involved the family or were directed exclusively at parents were included. Very few of the included studies tested dietary intervention alone; most included physical activity, behavioural therapy, CBT or decreasing sedentary behaviour as components of the intervention. Some studies provided financial incentives. The duration of interventions ranged from one session to 18 months.

Participants included in the review
Overweight or obese participants under 18 years of age were eligible for inclusion. The definitions of overweight or obese included a body mass index (BMI) equal to or more than the age equivalent adult BMI of 25, the 85th percentile of the age appropriate BMI, or 120% of the ideal body weight for the height. The participants in the included studies were aged from 3 to 18 years. Numerous studies grouped pre- and post-pubescent participants together.

Outcomes assessed in the review
Studies that reported the BMI, BMI percentile, percentage overweight for age, waist measurements or body composition (percentage body fat or lean body mass or skin folds) as the primary outcome were eligible for inclusion.
A wide variety of measurements of weight status were used in the included studies, such as percentage overweight, BMI, BMI z-score, BMI percentile, percentage body fat and lean body mass, percentage weight loss, percentage ideal weight, weight excess for height, Rohrer's index and weight for length index. The duration of follow-up ranged from no follow-up to 12 years. Dietary outcomes were also reported.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected studies and a third reviewer resolved any disagreements.

Assessment of study quality
Two reviewers independently assessed study quality using published critical appraisal tools that considered potential sources of bias. In the event of any disagreement the studies were assessed by a third reviewer.

Data extraction
Two reviewers independently extracted the data using a standardised instrument. A third reviewer resolved any disagreements. Mean and standard deviation values for weight status post-intervention and at first follow-up were extracted for analysis. Reported tests of statistical significance were extracted. Other data extracted included details of the dietary interventions, measurement of compliance, retention rates, and whether or not analysis was by intention-to-treat.

Methods of synthesis
How were the studies combined?
A meta-analysis was used to combine the results from RCTs that provided sufficient data and had a 'true' control arm (i.e. no intervention, waiting list or usual care). Pooled estimates of weight status post-intervention and at follow-up were calculated as the standardised mean difference (SMD) with 95% confidence intervals (CI). Multiple intervention arms within trials were included separately compared with the control group. It appeared that a random-effects model was used if heterogeneity was statistically significant, otherwise a fixed-effect model was used. Non-randomised study results were summarised in a narrative.

How were differences between studies investigated?
RCTs and non-randomised studies were summarised separately. A chi-squared test (Q statistic) was used to assess statistical heterogeneity in the meta-analysis (p<0.1 indicating significant heterogeneity). Differences in dietary interventions (including measurement and reporting of compliance, and dietary outcomes reported) and the measurements of weight status used in each of the included studies were tabulated. Differences between the dietary interventions were discussed at length in the text.

Results of the review
Eight-eight studies were included. Thirty-seven were RCTs involving over 2,200 participants in total and 51 were non-randomised studies (study design was not reported) involving approximately 6,000 participants.

Difference in study quality, interventions, length of follow-up, retention rates, range of outcome measures and analytical methods made comparisons problematic. None of the included RCTs reported methods of randomisation or allocation concealment, and only one blinded the outcome assessors. Only 3 RCTs and a non-randomised study evaluated dietary interventions alone.

A meta-analysis of 8 RCTs using a random-effects model showed a statistically significant decrease in weight status post-intervention compared with no intervention (SMD -1.82, 95% CI: -2.4, -1.23) (see CRD Commentary). Heterogeneity was statistically significant (p=0.0001, I-squared 86.5%). A meta-analysis of 4 RCTs using a fixed-effect model showed a statistically significant decrease in weight status at first follow-up compared with no intervention (SMD -0.64, 95% CI: -0.89, -0.39) (see CRD Commentary). The test for statistical heterogeneity was not significant.

The only non-randomised study that compared a dietary intervention alone against an appropriate obese control group
showed a significant reduction in the mean Rohrer's index, waist-to-hip ratio and daily energy intake. Some studies with more than 1 year' follow-up showed initial weight loss to be maintained, whereas others showed diminishing effects over time.

**Authors' conclusions**
While there was insufficient evidence to definitively determine the effectiveness of dietary interventions for child and adolescent obesity, the review indicated that interventions that include dietary modification are effective in achieving relative weight reduction in the short term. The effect appears to diminish with time. Better quality studies with long-term follow-up are needed.

**CRD commentary**
The review addressed a broad question and had wide inclusion criteria for the intervention, outcome measures and study designs. The literature search was extensive and undertaken by a professional librarian, hence one would expect it to be thorough. However, the restriction to articles reported in the English language could have introduced bias into the findings. Procedures to minimise reviewer bias and errors in the study selection, quality assessment and data extraction processes were followed. Systematic methods were used to extract the data and assess study quality, but the report did not state the criteria used to exclude studies on the basis of poor quality. Although the quality of the included RCTs was discussed at length, the lack of assurance that randomisation was adequate in any of the trials was not sufficiently taken into consideration in the interpretation of the results of the meta-analysis.

The main concern raised by the meta-analysis was the apparent inclusion of the same control groups more than once in the same analysis when trials had two or more intervention groups. Consequently, the pooled estimates of effect might not be reliable. The pooled estimates of SMD also could not be translated into units of any of the weight status measurement scales used in any of the individual studies. The narrative summary of results from the non-randomised studies focused on a small number of studies without explaining why they had been singled out. The authors' conclusion was appropriate in so far as there is insufficient evidence to definitively determine the effectiveness of dietary interventions. The review of the RCT component of this review has also been published separately (see Other Publications of Related Interest no.1).

**Implications of the review for practice and research**
Practice: The authors stated that it was difficult to make evidence-based recommendations on a specific dietary approach because details of the successful dietary approaches and the changes achieved and sustained were lacking.

Research: The authors stated that good-quality research is urgently needed to determine the optimal dietary approach to management of childhood overweight and obesity. It was recommended that studies have adequate power; avoid confounding by age or developmental status; report weight in a standardised way (e.g. BMI z-scores); specify the length of the intervention a priori; describe dietary protocols and the measurement of dietary outcomes in sufficient detail to allow replication; have adequate follow-up; and report compliance and diet-specific outcomes.

**Bibliographic details**

**Other publications of related interest**
Indexing Status
Subject indexing assigned by CRD

MeSH
Body Mass Index; Child; Combined Modality Therapy /methods; Diet, Reducing; Energy Intake; Obesity /complications /diet therapy /therapy; Weight Loss

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Record Status
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.