

Efficacy of calcium supplementation for management of overweight and obesity: systematic review of randomized clinical trials

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CRD summary

This review found evidence to suggest that calcium supplementation led to a small statistically significant reduction in weight in overweight/obese individuals, but the clinical relevance of this effect was unclear. These findings should be interpreted with caution (this was acknowledged by the authors) given the methodological limitations of the studies and their potentially limited generalisability to male populations.

Authors' objectives

To evaluate the efficacy of calcium supplements for the management of body weight in obese and overweight individuals.

Searching

MEDLINE, EMBASE, AMED, CINAHL and The Cochrane Library were searched from inception to September 2010 for studies in any language. Search terms were reported. Internet searches were performed to identify further studies. Relevant conference proceedings, medical journals, bibliographies of retrieved articles and the authors' personal files were screened for relevant data.

Study selection

Placebo-controlled double-blind randomised controlled trials (RCTs) that assessed the efficacy of orally administered calcium for body-weight reduction in overweight or obese individuals and that reported body weight or body composition were eligible for inclusion. Eligible studies had to involve treatment over at least a six month period. Studies that assessed calcium as part of other additional supplements were excluded.

Almost all of the included studies were conducted in USA; one was carried out in Iran. Characteristics of the reported participants varied and included: premenopausal, overweight/obese women (two studies); postmenopausal overweight/obese women (two studies); overweight female volunteers (one study); overweight/obese females (one study); and healthy obese and overweight male and female volunteers (one study). Across the studies the daily caloric intake ranged from 942 to over 2000kcal and the estimated dietary calcium intake varied from 1600mg to over 2,500mg (which exceeds the recommended daily allowance). All except one of the studies reported use of registered dieticians to assess dietary compliance. All studies except one used nutritional software to assess the dietary intake of participants. In two trials patients in the placebo group received a supplement of 200mg calcium daily. All of the studies reported body weight, four reported body mass index (BMI), four reported fat mass, two reported body fat and one reported adiposity.

Two reviewers independently assessed each study for inclusion. Disagreements were resolved through discussion.

Assessment of study quality

Consolidated Standard Reporting of Trials (CONSORT) guidelines were used to produce a quality assessment checklist to assess parameters of adequate randomisation, allocation concealment, blinding (assessor, care provider and patient), presence of attrition bias, intention-to-treat data and use of sample size calculations.

Two reviewers performed the quality assessment.

Data extraction

Changes in body weight, body fat and body mass index (BMI) were extracted as means with standard deviations.

Two reviewers independently extracted data from the included studies; disagreements were resolved through discussion.

Methods of synthesis

Studies were grouped according to outcome. Pooled mean differences (MD) with 95% confidence intervals (CIs) were calculated using a fixed-effect analysis. Statistical heterogeneity was assessed using the I^2 statistic (25%, 50% and 75% indicated low, medium and high statistical heterogeneity).

Sensitivity and subgroup analyses were performed to test the robustness of the analyses. A funnel plot was used to assess publication bias and identify outliers.

Results of the review

Six RCTs (794 participants) were included in the review. Sample sizes ranged from 43 to 340. Methodological quality of the studies was variable. Only two studies reported using adequate randomisation, allocation concealment and sample size calculations; one RCT reported adequate blinding of outcome assessors and use of intention-to-treat analysis. The authors reported that that five of the RCTs were not of good reporting quality.

There was a small but statistically significant reduction in body weight for calcium supplementation in comparison with placebo (MD -0.74kg, 95% CI -1.00 to -0.48, $I^2=9%$; seven RCTs) and body fat (MD -0.93kg, 95% CI -1.16 to -0.71, $I^2=44%$; seven RCTs). There was no statistically significant differences between calcium supplementation and placebo for BMI ($I^2=42%$; four RCTs).

None of the studies reported data on adverse events. Subgroup analysis revealed a statistically

significant decrease in body weight in premenopausal women that favoured calcium over placebo (three RCTs), but no decrease in body weight in postmenopausal women (three RCTs).

A funnel plot showed some evidence of publication bias; sensitivity analyses did not significantly alter the main findings.

Authors' conclusions

Evidence suggested that calcium supplementation resulted in a small, statistically significant weight loss in overweight and obese individuals, but the clinical relevance of this effect was unclear.

CRD commentary

This review assessed a clearly defined review question and searched a number of relevant resources to identify studies without any language restrictions. This suggested that risks of publication and language biases were likely to be low, but the authors reported that there was some evidence of publication bias. This analysis was based on a small number of studies and therefore may not be reliable. The risk of reviewer error and bias was also likely to be low for all stages of the review process. The methodological quality of the studies was assessed using relevant criteria and was reported as mixed and most of included studies had methodological flaws. This limited the reliability of the findings and was identified as a limitation by the study authors. Other data limitations were identified and included variation in the lifestyle factors between the studies and the poor reporting of the study methods. The menopausal status of the included participants differed between studies and further analyses were used to investigate this. The generalisability of the review findings appeared to be limited to women, as only one study included males and even in this study most participants were female. The clinical relevance of the findings was also unclear.

The findings of the review should be interpreted with caution (this was acknowledged by the authors) given the methodological limitations of the studies, questionable clinical relevance of the data and potential limited generalisability of the findings to male populations.

Implications of the review for practice and research

Practice: The authors stated that the clinical relevance of the review findings was unclear.

Research: The authors stated that further research was required and that it may be prudent for study investigators to determine whether there were any negative effects of calcium supplementation for reduction of body weight in overweight/obese individuals.

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