Effect of vitamin D on falls: a meta-analysis

CRD summary
This review evaluated the effectiveness of vitamin D in preventing falls in older people. The authors concluded that vitamin D supplementation reduced the risk of falls by more than 20%. This seems a well-conducted review and the conclusions are likely to be reliable.

Authors' objectives
To assess the effectiveness of vitamin D in preventing falls in older people.

Searching
MEDLINE (1960 to February 2004), the Cochrane Controlled Trials Register (1960 to February 2004) and EMBASE (1991 to February 2004) were searched with no language restrictions; the search terms were reported. Reference lists and conference abstracts of the American Society for Bone and Mineral Research (1995 to 2002) were also searched, and experts were contacted.

Study selection
Study designs of evaluations included in the review
Double-blind, randomised controlled trials (RCTs) were eligible for inclusion. The duration of the studies ranged from 3 months to 3.5 years.

Specific interventions included in the review
Studies of any type of vitamin D were eligible for inclusion. The included studies evaluated cholecalciferol, ergocalciferol, calcitriol or calcidiol, with or without calcium. The comparators included placebo, calcium or dairy supplements, exercise, or other unspecified fall and fracture prevention strategies.

Participants included in the review
Studies of older community-dwelling or institutionalised people were eligible for inclusion. Studies of patients with alcoholism or unstable health states were excluded from the main analysis. Seven of the 10 studies were restricted to women. The mean age of the participants ranged from 71 to 85 years.

Outcomes assessed in the review
The primary outcome was the difference in the rate of falls between people taking vitamin D and those who were not. A fall was defined as unintentionally coming to rest on the ground, floor or other lower level. Studies that reported falls as coming to rest against furniture or a wall, or high trauma falls such as from a ladder, were excluded from the main analysis.

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 criteria used to assess study quality were randomisation, allocation concealment, blinding and withdrawals. The authors did not state how the papers were assessed for quality, or how many reviewers performed the quality assessment.

Data extraction
Three reviewers independently extracted the data. The data abstracted for each study were the odds ratio (OR) and the
associated 95% confidence interval (CI).

**Methods of synthesis**

How were the studies combined?
The pooled OR and 95% CI were calculated using fixed-effect and random-effects meta-analyses. The results of the random-effects meta-analysis were presented. The ORs were corrected to prevent overestimation of the relative risk using the Zhang and Yu method. The risk difference for preventing a fall and the number-needed-to-treat (NNT) were also calculated. Publication bias was investigated using both the Begg and Egger tests.

How were differences between studies investigated?
Heterogeneity was investigated statistically using Q, H, R and I statistics. Subgroup analyses were conducted to investigate the effect of the type of vitamin D used; these analysed studies evaluating cholecalciferol and active analogues separately. Sensitivity analyses were conducted to investigate the effects of RCTs that did not meet the inclusion criteria and abstracts with incomplete results.

**Results of the review**

Ten RCTs in total were included. Of these, 5 RCTs met the inclusion criteria and were included in the main analysis (1,237 participants); the 5 RCTs that did not meet the inclusion criteria were included in the sensitivity analysis. A total of 10,001 participants were included in the secondary analyses.

Of the 5 RCTs included in the main analyses, four reported the method of randomisation and allocation concealment, and the results were analysed on an intention-to-treat basis. Three were blinded to treatment allocation. The reasons for drop-out were balanced between the treatment and control groups, and ranged from 7 to 28% across the trials.

There was a statistically significant decrease of 22% in the risk of having a fall in older people taking vitamin D in comparison with participants receiving calcium or placebo (5 RCTs) The corrected OR was 0.78 (95% CI: 0.64, 0.92), with an associated NNT of 15 (95% CI: 8, 53). The authors reported that there was no statistically significant heterogeneity between these studies.

When the additional 5 studies that did not meet the inclusion criteria were included in the analysis, there was a statistically significant decrease of 13% in the risk of having a fall in older people taking vitamin D in comparison with the control. The corrected OR was 0.87 (95% CI: 0.80, 0.96).

The results of several subgroup analyses were reported in the review. The authors reported that there was no evidence of publication bias.

**Authors’ conclusions**

Vitamin D supplementation appeared to reduce the risk of falls among ambulatory and institutionalised older people with stable health by more than 20%.

**CRD commentary**

The review question and the inclusion criteria were clearly defined in terms of the interventions, participants, outcomes and study designs. The authors searched relevant databases without language restrictions, and also attempted to obtain both published and unpublished studies. The data extraction was carried out in duplicate. The authors did not report whether the study selection process was duplicated to reduce selection bias, although they did perform sensitivity analyses using the excluded studies. The authors used appropriate summary measures and a meta-analysis. This seems a well-conducted review and the conclusions are likely to be reliable.

**Implications of the review for practice and research**

Practice: The authors stated that vitamin D supplementation should be considered in the elderly.
Research: The authors suggested further studies in men and for cholecalciferol are required. The impact of calcium and its dose on fall outcomes needs to be investigated.

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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.