

Impact of Calcium Supplementation on Cholesterol Levels in Women Dieting to Lose Weight

Major GC, Alarie F, Doré J, et al. Supplementation with calcium + vitamin D enhances the beneficial effect of weight loss on plasma lipid and lipoprotein concentrations. *Am J Clin Nutr* 2007;85:54–9.

Study Overview

Objective. To determine the impact of calcium and vitamin D supplementation on metabolic parameters during a weight-reduction intervention.

Design. Randomized, double-blind, placebo-controlled trial.

Setting and participants. Women were recruited from the general population of Quebec City, Canada. Participants were included if they were premenopausal; did not use calcium supplements, tobacco, or drugs that might impact weight; had a daily dietary calcium intake < 800 mg/day, a body mass index (BMI) between 27 and 40 kg/m² and no recent change in BMI, normal blood pressure, cholesterol levels not requiring pharmacologic treatment, normal thyroid hormone levels; and consumed ≤ 5 cups of coffee daily.

Intervention. Participants were randomized to calcium plus vitamin D supplementation (total of 600 mg elemental calcium and 200 IU vitamin D twice daily) or matching placebo. All participants met with a nutritionist who described the weight loss intervention, which consisted of a 700 kcal/day reduction in total caloric intake. Every 2 weeks, participants met with the nutritionist, who assessed compliance with caloric restriction and offered additional advice. The study duration was 15 weeks.

Main outcome measures. The primary outcome measures were changes from baseline in levels of very-low-density lipoprotein, high-density lipoprotein (HDL), low-density lipoprotein (LDL), triglycerides, blood pressure, and glucose (as measured by an oral glucose tolerance test).

Main results. 84 participants were initially randomized; 19 dropped out and 2 were excluded due to noncompliance, resulting in 63 participants who completed the study. Baseline characteristics were similar between intervention and placebo groups. In both groups, there was a significant decrease in BMI, waist circumference, and fat mass from baseline; however, there were no significant differences in these

parameters between the 2 groups. At 15 weeks, the intervention group demonstrated significantly greater decreases in total:HDL cholesterol (mean change, -0.38 ± 0.63 versus 0.08 ± 0.62 ; $P < 0.01$), LDL:HDL cholesterol (mean change, -0.32 ± 0.54 versus 0.008 ± 0.45 ; $P < 0.01$), and LDL cholesterol (mean change, -0.41 ± 0.39 versus -0.18 ± 0.43 ; $P < 0.05$) compared with the placebo group. After adjusting for fat mass and waist circumference, differences in total:HDL and LDL:HDL remained significant. Subsequent analyses revealed a statistically significant positive correlation between baseline calcium intake and HDL cholesterol even after adjusting for fat mass and waist circumference ($r = 0.36$; $P < 0.01$).

Conclusion. In overweight or obese women with low daily calcium intake, supplementation with calcium and vitamin D enhanced the beneficial effect of weight loss on plasma total:HDL cholesterol and LDL:HDL cholesterol.

Commentary

Although calcium supplementation has a well-established role in osteoporosis prevention, several other potential health benefits have been described [1]. Observational studies and clinical trials have suggested that calcium supplementation may have advantages in hypertension, colorectal adenoma prevention, and colorectal cancer prevention [2,3]. Although differences may be related to study design, evidence is conflicting with regard to the impact of calcium on serum lipid profiles [4,5]. There are plausible biologic mechanisms that suggest a beneficial effect, including reductions in fatty acid absorption and binding to bile acids. Major et al attempted to address some these uncertainties.

This study confirmed previous findings, which suggest that dietary calcium intake may be related to HDL cholesterol levels, and also found that in women who enrolled in a weight-reduction program that primarily consisted of caloric restriction, supplementation with calcium and vitamin D resulted in significantly decreased total:HDL and LDL:HDL. However, there are some limitations to this study. Most importantly, the analysis was not intention-to-treat. Patients who dropped out of the study were not included in the analysis, which may have biased the results. Additionally,

as the intervention combined calcium and vitamin D, it is uncertain if the beneficial effects are attributable to calcium, vitamin D, or both. Nevertheless, the study lends support to the value of calcium supplementation, an intervention with little known risks.

Applications for Clinical Practice

In women who are initiating a weight-reduction program through calorie reduction, the addition of calcium and vitamin D supplements may augment the beneficial effects of weight loss on lipid parameters.

—Review by Harvey J. Murff, MD, MPH

References

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