

NAMS PRACTICE PEARL

Calcium Supplements: Do They Help or Harm?

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Current recommendations for calcium intake call for 1,000 mg per day for women ages 19-50 and 1,200 mg per day for women over age 50 to ensure bone health. Given recent concerns that calcium supplements may raise risk for cardiovascular disease and kidney stones, women should aim to meet this recommendation primarily by eating a calcium-rich diet and taking calcium supplements only if needed to reach the RDA goal (often only ~500 mg per day in supplements is required).

Many clinicians are confused about the benefits and risks of calcium supplementation for women. A recent draft recommendation from the U.S. Preventive Services Task Force (USPSTF) concluded that daily supplementation with 1,000 mg of calcium plus 400 IU of vitamin D is of no benefit for fracture prevention in postmenopausal women,¹ and other reports have suggested that calcium supplementation may increase the risk for kidney stones and cardiovascular disease (CVD). In this Practice Pearl, we provide guidance on the appropriate use of calcium supplements in midlife and older women.

Calcium and vitamin D are important for bone health. Calcium and vitamin D provide important bone health benefits. This was the recent conclusion of the Institute of Medicine (IOM) on the basis of its comprehensive and rigorous review of all available research on the topic, including data from the Women's Health Initiative (WHI),^{2,3} a large randomized clinical trial that evaluated the benefits and risks of daily supplemental calcium (1,000 mg) and vitamin D (400 IU) in 36,282 postmenopausal women ages 50-79. Overall, the trial showed that supplementation was associated with significantly less bone loss at the hip (as measured by dual-energy x-ray absorptiometry [DEXA]) and a 12% reduction in hip fracture.⁴ Yes, the overall reduction in hip fracture was disappointingly small and not statistically significant—and it was this finding that the USPSTF focused on in developing its draft recommendation. However, among women age 60 and over—the age group most likely to sustain an osteoporotic fracture—the intervention was associated with a much larger, statistically significant 21% reduction in hip fracture.⁴ And in analyses restricted to compliant participants (those who took their study pills regularly and were also not already taking supplements), the intervention was associated with a still larger, statistically significant 30% reduction in hip fracture.⁴ The totality of the findings underscores the need for adequate calcium to ensure bone health and prevent fractures, but women who were already consuming at least 1,200 mg per day of calcium at baseline (from diet and/or supplements) had no clear benefits from the additional supplementation, contradicting the adage that “if some is good, more must be better.”

Understanding the recommended dietary allowance (RDA) for calcium. The current RDA for calcium set by the IOM is 1,000 mg per day for women ages 19-50 and 1,200 mg per day for those over age 50. The RDA refers to **total** calcium intake—diet plus supplements (the latter only if needed to reach the intake goal). Women should aim to meet this guideline primarily by eating calcium-rich foods. Good dietary sources of calcium include milk, yogurt, cheese, and other dairy foods; canned oily fish with bones, such as sardines or salmon; tofu; calcium-fortified juice and cereals; and broccoli, collard greens, and kale. A general rule of thumb is that most dairy products and calcium-rich foods provide ~300 mg of calcium per serving. Most women should consider calcium supplements only if their dietary calcium intake falls short of the recommended amount. Too many women are taking calcium supplements at higher doses than they need, especially in view of emerging concerns that such supplements—but not calcium from food—may raise the risk for kidney stones and CVD. Because the median dietary calcium intake of midlife and older women is ~700 mg per day² (equivalent to 2-3 daily servings of the above foods), the majority of women do not need more than 500-800 mg per day in calcium supplements to reach a total calcium intake (diet plus supplements) of 1,000-1,200 mg per day. As a side note, the body cannot absorb more than ~500 mg of calcium (from food or supplements) in any 2-hour period, so women taking daily doses above 500 mg should space their intake accordingly.

Calcium and kidney stones. Higher dietary calcium intake appears to **reduce** kidney stone formation, whereas the use of calcium supplements may **increase** kidney stone formation.² A significant 17% increase in risk for kidney stones was found in the WHI,⁴ but the background intake of calcium in this cohort was high, with an average total intake of ~2,100 mg per day in the active treatment group (1,100 mg per day in background intake from diet plus nonstudy supplements + 1,000 mg from randomized treatment). Although calcium citrate may be less likely to cause kidney stones than the calcium carbonate tested in the WHI, the evidence for a difference in risk remains inconclusive. Supplemental calcium taken to meet but not exceed the aforementioned RDA would not be expected to produce this elevation in risk. Why should high intakes of supplemental but not dietary calcium raise kidney stone risk? Most kidney stones (~80%) contain calcium combined with oxalate. Dietary calcium in food may bind to dietary oxalate in the digestive tract, reducing absorption and subsequent urinary excretion of oxalate and thus risk for kidney stones. Other mechanisms may also play a role. Thus, getting sufficient calcium via dietary sources is preferable to taking supplements.

Calcium and cardiovascular disease. There is no evidence to suggest that calcium from food increases the risk for CVD, and some observational studies have even found a **reduced** risk for CVD with higher dietary calcium intake.^{5,6} Overall, dietary calcium has been linked to an inverse or neutral association with risk for CVD, type 2 diabetes, hypertension, and the metabolic syndrome,^{5,6} while concerns have been raised recently about calcium supplements and increased CVD risk by both observational⁶ and randomized studies.^{7,8} It has been proposed that calcium supplements may more quickly increase blood calcium levels than dietary calcium, which could lead to greater deposition of calcium in coronary arteries and an increased risk for coronary heart disease. These relationships, however, remain unproven. In one widely cited study from New Zealand, 1,471 healthy postmenopausal women were randomized to 1 g per day of calcium citrate or placebo and followed for 5 years. Women in the calcium group experienced more CVD events than women in the placebo group,⁷ although the risk elevations were no longer significant when unreported events identified from the national database of hospital admissions were

included. A 2010 meta-analysis of randomized trials of calcium supplements administered without vitamin D, including the New Zealand trial, concluded they raise risk for myocardial infarction (MI) by ~30%.⁸ In the WHI calcium-vitamin D trial, there was no association between randomized treatment and incident MI or stroke in the overall cohort,⁹ although a recent subgroup analysis reported an increased risk for MI (relative risk [RR], 1.22; 95% confidence interval [CI], 1.00-1.50) in participants who first started taking calcium supplements as part of the trial but not in participants already taking calcium supplements at baseline.¹⁰ However, a study among 754 WHI participants who underwent cardiac computed tomography to assess coronary artery calcium (CAC) at the end of the trial found no relationship between calcium-vitamin D supplementation and CAC.¹¹ In a 2012 systematic review of randomized trials, our research group found no significant elevation in CVD risk associated with either calcium alone (RR, 1.14; 95% CI, 0.92-1.41) or calcium plus vitamin D (RR, 0.99; 95% CI, 0.79-1.22) compared with placebo.⁵ In our opinion, whether calcium supplements—particularly when taken without vitamin D—are dangerous for the heart remains an open question, but it would be prudent to try to obtain calcium from food rather than supplements where possible and to ensure adequate concurrent vitamin D intake (RDA for vitamin D, 600-800 IU per day).

Calcium and other health outcomes. The WHI found a borderline significant 9% reduction in all-cause mortality (RR, 0.91; 95% CI, 0.83-1.01) associated with calcium-vitamin D supplementation,¹² as well as a neutral effect on incidence of total cancer (RR, 0.98), colorectal cancer, and breast cancer.¹³

Summary:

- The current RDA for calcium is 1,000 mg per day for women ages 19-50 and 1,200 mg per day for women over age 50. These amounts are necessary to maintain bone health.
- Women should aim to meet the RDA primarily by eating a calcium-rich diet and take calcium supplements only if needed to reach the RDA goal, given recent concerns that such supplements may raise risk for cardiovascular disease and kidney stones. Often only ~500 mg per day in supplements is required.
- In women with a low dietary intake of calcium, supplementation to bring the total intake of calcium to the RDA level—but not exceed it—would be expected to reduce risk for hip fracture while having a neutral effect on risk for heart disease, stroke, kidney stones, and cancer.

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Disclosures

Dr. Manson and Dr. Bassuk report no significant financial relationships.



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