



## **Statement on Calcium and Vitamin D for Bone Health in Australian Adult Populations** **Reviewed December 2017.**

### **Recommendations**

**Optimal fracture prevention by diet is considered to require a combination of both calcium and vitamin D.**

**Osteoporosis Australia continues to support the National Health and Medical Research Council Recommended Dietary Intake (RDI) of calcium 1000 mg to 1300 mg of calcium per day in men and women. The RDI is the average daily dietary intake level that is sufficient to meet the nutrient requirements of nearly all (97–98 per cent) healthy individuals in a particular life stage and gender group and differs by age and gender (see Table 1). Ideally this should be achieved by consuming a diet rich in calcium by selecting foods that are naturally high in calcium, and including foods that have had calcium added to them - so called 'calcium-enriched' foods. When the calcium RDI cannot be achieved by individuals through the diet alone, calcium supplements are indicated. In these circumstances Osteoporosis Australia recommends a daily supplement of 500-600mg of calcium.**

**In the general population, ideal blood levels of vitamin D levels (25OHD) for older Australians are above 50 nmol/L at end of winter/early spring. There is some evidence that blood levels over 160 nmol/L may increase fracture risk. In people with a blood levels of 25OHD below 50 nmol/L a daily supplement of 800 to 1,000 IU of vitamin D per day is indicated to achieve serum 25-hydroxyvitamin D levels above 50 nmol/L. Weekly doses of 7000IU can achieve adequate 25OHD levels but have not been studied for efficacy in reducing falls or fractures. Larger intermittent dose supplements should be avoided because of potential for toxicity.**

**It should be noted that these evidence-based recommendations for calcium and vitamin D to reduce falling and fractures apply to older men and women who are at high risk of falling and fracturing and do *not* necessarily apply to younger populations. Individuals at increased risk of falls and fracture should seek advice from a health professional.**

**Adults at lower risk should meet the RDI for calcium and achieve adequate vitamin D status.**

### **Background**

**In recent years concern has been expressed relating to the fact that large numbers of Australians are not meeting guidelines for either calcium intake or vitamin D status. Equally there has been concern expressed as to the health benefit to be derived from testing for vitamin D deficiency using blood tests for 25OHD. As a consequence there has been much discussion of the ideal amount of calcium and vitamin D required to reduce skeletal deterioration as we age. In addition, some investigators have raised concerns about an adverse events in people taking calcium supplements. In 2017 the Scientific Committee of Osteoporosis Australia was asked to update a statement for all Australians on optimal calcium and vitamin D nutrition as part of a healthy lifestyle approach to reducing falls and fractures. Recently important new evidence on ideal calcium and vitamin D dosing has become available as well as new data on the effects of vitamin D on the risk of falling in older women.**

## **Calcium**

Adequate calcium intake helps maintain the optimal level of serum ionized calcium without the need to make up the deficit from bone calcium. Bone calcium is important for bone strength by integration into crystals in the protein matrix thus increasing bone resistance to bending. The NHMRC recommended daily calcium intake is 1,000mg for men aged 50 to 70 years and 1300mg calcium for men over 70 years and women aged over 50 (Table 1) <sup>1,2</sup>. However the last National Nutrition Survey reported that the mean daily food and beverage calcium intake in adults aged over 50 years is about 800 mg/day and that only 10% of older women and 10 -30% of older men, are achieving the optimal intakes from dietary sources alone<sup>3</sup>. In the survey, calcium supplements were consumed by 28% of older women and 15% of older men. In women the median dietary calcium intake was 692mg. In women taking calcium supplements the median intake rose to 1,270mg. For men not taking calcium supplements the median daily intake was 620mg rising to over 1000mg in those taking calcium supplements <sup>4</sup>. The data demonstrated that even with supplements about 60% of older women and 30% of older men are **not** achieving recommended calcium intakes. Unfortunately there are no tests that reliably diagnose a low calcium diet. For example, a normal calcium level in the blood does not mean the dietary calcium intake is also normal. Osteoporosis Australia provides information on the calcium content of various foods on their website that allows you to calculate your calcium intake at <https://www.osteoporosis.org.au/sites/default/files/files/calcium-food-table-web.pdf>

## **Vitamin D**

Vitamin D deficiency has an important role in bone health because this vitamin increases intestinal calcium transport and improves bone remodeling. In addition to effects on bone metabolism there is now good data on the beneficial role of vitamin D on muscle function<sup>5</sup>. Ideal vitamin D status is best defined by serum 25OHD levels >50 nmol/L at the end of winter/early spring, when levels are generally at their lowest<sup>6</sup>. Vitamin D deficiency or insufficiency, a serum 25OHD lower than 50 nmol/L, is found in over one in five Australian adults especially in older women and men in winter and spring<sup>7</sup>. Although testing for blood 25OHD is the recommended method for determining vitamin D deficiency, the inappropriate use of 25OHD screening (excessive testing in younger individuals with no clinical evidence of, or risk factors for, vitamin D deficiency) has resulted in a 2014 Government comprehensive expert report advising restricting testing to patients with evidence of bone and mineral disorders and conditions predisposing to these disorders, a position supported by Osteoporosis Australia<sup>8</sup>.

## **Basis of recommendations**

The recommendations outlined at the beginning of this statement are based on an extensive review of clinical trials of calcium and vitamin D supplementation in older people demonstrating a reduction in fracture risk of about 15 % <sup>9,10</sup>. In a major study that selected women with vitamin D insufficiency and low calcium intake, the fracture risk reduction was 32% with supplementation<sup>11</sup>. Clinical trials where participants who have a low calcium intake and vitamin D insufficiency are recruited demonstrate a more consistent fracture risk reduction with supplementation<sup>12</sup>. For example, a meta-analysis that undertook a sub-analysis of 4 studies recruiting participants with low 25OHD reported a 30% reduction in falls associated with vitamin D supplementation<sup>13</sup>.

In regard to patients receiving pharmaceutical agents to reduce fracture risk it is important to note that in all randomised controlled trials, participants were required to consume calcium and vitamin D to achieve similar intakes to those recommended here, prior to entering the study. Thus to achieve optimal benefit patients should follow the guidelines outlined in this document in addition to the anti-osteoporosis drug prescribed<sup>14,15</sup>.

## Concerns about potential adverse effects of these recommendations

Because large numbers of individuals are at risk of dietary deficiency, the safety of any recommendations that include advice on the use of supplements needs careful consideration.

### Calcium

Calcium supplements can cause intestinal upset especially constipation and abdominal pain in some<sup>16</sup>. A small increase in kidney stones has also been demonstrated in some American studies<sup>17</sup>. One issue that has resulted in much controversy is that calcium supplements in particular increase the risk of heart disease and stroke. Despite intensive consideration international scientific bodies have not supported these concerns when the dosage recommendations of 500 to 600mg per day are followed<sup>18,19</sup>.

### Vitamin D

Some studies of vitamin D effects on falling have utilised data in which high doses of vitamin were used, often in women without evidence of vitamin D insufficiency. Careful consideration of these studies and dose ranging studies indicate that high monthly or yearly vitamin D doses may **increase** falls risk especially in elderly women<sup>20,21</sup><sup>22</sup>. An epidemiological study has also reported an increase risk of fracturing in the 20% of men with the highest blood 25OHD<sup>23</sup>. Hence the new advice that in people with a blood levels of 25OHD below 50 nmol/L a daily supplement of 800 to 1,000 IU of vitamin D per day should be consumed.

## Conclusions

A recent National Health Survey indicates that large numbers of older women and men are **not** achieving recommended calcium intakes; in addition many have vitamin D insufficiency. Evidence from randomised clinical trials is that these Australians will benefit from increased consumption of both calcium and vitamin D, especially if they are at risk of falls and fractures. The importance of these recommendations for public health should be addressed as a matter of urgency.

## References

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**Table 1:**

Age (yrs)	Men	Women
<b>19-30</b>	1,000 mg/day	1,000 mg/day
<b>31-50</b>	1,000 mg/day	1,000 mg/day
<b>51-70</b>	1,000 mg/day	1,300 mg/day
<b>&gt;70</b>	1,300 mg/day	1,300 mg/day

**Table 1** Recommended Dietary Intake for calcium by age and gender for Australians. The RDI is the average daily dietary intake level that is sufficient to meet the nutrient requirements of nearly all healthy individuals.