



## EDITORIAL

# Optimizing bone health in Brazilian teens: using a population-based survey to guide targeted interventions to increase dietary calcium intake<sup>☆,☆☆</sup>



Otimizando a saúde óssea em adolescentes brasileiros: utilização de um levantamento de base populacional para orientar intervenções direcionadas para aumentar a ingestão alimentar de cálcio

Neville H. Golden

*School of Medicine, Stanford University, Palo Alto, United States*

Calcium is necessary for bone health, cardiovascular function, nerve conduction, muscle contraction, and hemostasis. Calcium is the most abundant mineral found in the body and 99% of total body calcium is found in the skeleton, where it provides strength to the underlying collagen matrix. During the adolescent growth spurt, demand for calcium is high, both for longitudinal growth as well as for accretion of bone mass.<sup>1,2</sup> Peak bone mass is achieved toward the end of the second decade of life and is an important predictor of future fracture risk. The adolescent years therefore provide a window of opportunity for interventions to optimize peak bone mass acquisition.

In this issue of the Journal, de Assumpção et al. examined calcium intake in adolescents in relation to a range of socioeconomic variables and health-related behaviors.<sup>3</sup> In a carefully conducted, cross-sectional, population-based study of 913 adolescents living in Campinas, Sao Paulo,

Brazil, using 24-hour dietary recall, the investigators found that 88.6% of adolescents had a daily dietary calcium intake below the estimated average requirement (EAR) for adolescents aged 9–18 years. Consumption was lower in girls, in those from lower socio-economic backgrounds, and in those where the head of the family had a lower level of education. Low calcium intake was also associated with reduced dairy intake as well as low intake of fruits and vegetables.

In its 2011 report, the Institute of Medicine (IOM) set the EAR, the recommended dietary allowance (RDA), and the tolerable upper intake Levels (UL) as 1100 mg/day, 1300 mg/day, and 3000 mg/day, respectively, for adolescent boys and girls between the ages of 9 and 18 years.<sup>4</sup> These recommendations were based on metabolic calcium balance studies as well as studies of bone mineral accrual using dual energy X-ray absorptiometry and similar techniques.<sup>5</sup> The EAR is the average daily nutrient intake that is estimated to meet the needs of half the individuals within that age group. The EAR actually reflects the estimated median requirement and as such, by definition, the EAR is less than the needs of half of the population. In contrast, the RDA represents the daily calcium intake that meets the requirements of 97.5% of the population. According to the 2011 Institute of Medicine report, the RDA for calcium for adolescents aged 8–19 years is 1300 mg/day.<sup>4</sup> Using the RDA instead of the

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E-mail: [ngolden@stanford.edu](mailto:ngolden@stanford.edu)

EAR, the prevalence of low calcium intake would be even higher.

The major dietary sources of calcium are dairy products, dark green leafy vegetables, legumes, nuts, and certain types of fish such as sardines and salmon. In the United States, approximately 70% of dietary calcium comes from dairy products and vegetables only contribute approximately 7%.<sup>6</sup> Each 8 oz. (240 mL) serving of milk or cup of yogurt and 1.5 oz. serving of natural cheese contains approximately 300 mg of calcium. Both in Brazil and in the United States, calcium is also available in certain calcium-fortified drinks and cereals. The bioavailability of calcium in green leafy vegetables is generally high, but the quantity of vegetables needed to be consumed in order to meet requirements is large. Based on the IOM's recommendations, adolescents require four servings of dairy products or calcium-enriched foods per day, and the American Academy of Pediatrics recommends that pediatricians periodically assess calcium intake during the growing years and encourage increased intake, either by increasing the amount of dairy products or by incorporating calcium-enriched foods into the diet.<sup>7</sup>

Although some studies have demonstrated that calcium supplementation in children and adolescents increases bone mineral density,<sup>8,9</sup> a recent meta-analysis of randomized controlled trials found that routine calcium supplementation only resulted in a marginal increase in bone mineral density and concluded that this small increase would not likely result in a clinically significant reduction in fracture risk.<sup>10</sup> Routine calcium supplementation is therefore not recommended, but increased dietary consumption of foods rich in calcium is recommended to achieve recommended intake levels.<sup>7</sup>

As de Assumpção et al. have demonstrated, it is not easy to meet recommended dietary calcium intake. The findings of the Brazilian study are similar to those from the United States that generally show lower calcium intake in girls and reduced dairy consumption in all teens, but especially in girls.<sup>11,12</sup> Not reported in this study, both in the United States and in Brazil consumption of soft drinks and sweetened beverages by teens has increased while milk consumption has declined, suggesting that soft drinks have replaced milk products in this age group.<sup>11-13</sup> Some adolescent girls, conscious of body image concerns, incorrectly perceive dairy products to be fattening and tend to avoid them. One 8 oz. glass of skim milk contains no fat and 80 kcal, and is a good source of protein and vitamin D. In contrast, a can of soft drink contains approximately 140 kcal and is devoid of other nutrients. Pediatricians can play an important role by educating their patients and dispelling the notion that dairy products are fattening.

In the de Assumpção study, the findings of the impact of socioeconomic class and parental education offer additional insights into the complexity of the situation. Dairy products may be more expensive than high-calorie "fast foods" preferred by many teens, and calcium-enriched foods may cost more than food not enriched with calcium, placing additional burden on those from lower socioeconomic groups who may have food insecurity. The de Assumpção study provides rich data offering opportunities for targeted intervention. Unquestionably, improvement in socioeconomic conditions is important, but this is not always easily

achieved if resources are limited. However, nutrition education interventions can play a major role in improving calcium consumption by teens. These interventions can be in the form of public health campaigns about the importance of drinking milk and dairy products, ensuring the availability of milk and dairy products, and limiting ease of access of soft drinks and sweetened beverages in school lunches, as well as by conducting classroom-based nutrition education interventions in schools. The latter have been found to be effective in increasing dietary calcium intake in adolescents living in a variety of different countries.<sup>14-17</sup>

Findings from the de Assumpção study demonstrate that inadequate calcium intake in teens is associated with other high-risk behaviors, such as smoking and inadequate intake of other healthy foods such as fruits and vegetables. Lessons learned from the de Assumpção study can guide targeted interventions aimed at those at greatest risk and indicate that the interventions should address multiple health risk behaviors.

## Conflicts of interest

The author declares no conflicts of interest.

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