



ORIGINAL ARTICLE

## Calcium intake by adolescents: a population-based health survey<sup>☆</sup>



Daniela de Assumpção<sup>a</sup>, Marcia Regina Messaggi Gomes Dias<sup>b</sup>,  
Marilisa Berti de Azevedo Barros<sup>a</sup>, Regina Mara Fisberg<sup>c</sup>,  
Antonio de Azevedo Barros Filho<sup>b,\*</sup>

<sup>a</sup> Department of Collective Health, Faculdade de Ciências Médicas, Universidade Estadual de Campinas (UNICAMP), Campinas, SP, Brazil

<sup>b</sup> Department of Pediatrics, Faculdade de Ciências Médicas, Universidade Estadual de Campinas (UNICAMP), Campinas, SP, Brazil

<sup>c</sup> Department of Nutrition, Faculdade de Saúde Pública, Universidade de São Paulo (USP), São Paulo, SP, Brazil

Received 17 April 2015; accepted 22 September 2015

Available online 28 December 2015

### KEYWORDS

Adolescent;  
Calcium dietary;  
Food consumption;  
Health surveys

### Abstract

**Objective:** To analyze calcium intake in adolescents according to sociodemographic variables, health-related behaviors, morbidities, and body mass index.

**Methods:** This was a cross-sectional population-based study, with a two-stage cluster sampling that used data from a survey conducted in Campinas, São Paulo, Brazil, between 2008 and 2009. Food intake was assessed using a 24-hour dietary recall. The study included 913 adolescents aged 10–19 years.

**Results:** Average nutrient intake was significantly lower in the segment with lower education of the head of the family and lower *per capita* family income, in individuals from other cities or states, those who consumed fruit less than four times a week, those who did not drink milk daily, those who were smokers, and those who reported the occurrence of headaches and dizziness. Higher mean calcium intake was found in individuals that slept less than seven hours a day. The prevalence of calcium intake below the recommendation was 88.6% (95% CI: 85.4–91.2).

**Conclusion:** The results alert to an insufficient calcium intake and suggest that certain subgroups of adolescents need specific strategies to increase the intake of this nutrient.

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<sup>☆</sup> Please cite this article as: de Assumpção D, Dias MR, de Azevedo Barros MB, Fisberg RM, de Azevedo Barros Filho A. Calcium intake by adolescents: a population-based health survey. J Pediatr (Rio J). 2016;92:251–9.

\* Corresponding author.

E-mail: [abarros@fcm.unicamp.br](mailto:abarros@fcm.unicamp.br) (A. de Azevedo Barros Filho).

**PALAVRAS-CHAVE**

Adolescente;  
Cálcio na dieta;  
Consumo de  
alimentos;  
Inquérito de saúde

**Ingestão de cálcio por adolescentes: inquérito de saúde de base populacional****Resumo**

**Objetivos:** Analisar a ingestão de cálcio em adolescentes segundo variáveis sociodemográficas, de comportamentos relacionados à saúde, morbidades e índice de massa corporal.

**Métodos:** Trata-se de estudo transversal de base populacional, com amostra por conglomerados, tomada em dois estágios e que utilizou dados de inquérito realizado em Campinas, São Paulo, Brasil, em 2008/09. O consumo alimentar foi estimado pelo Recordatório de 24 horas. Foram analisados 913 adolescentes de 10 a 19 anos.

**Resultados:** Médias significativamente inferiores de ingestão do nutriente foram verificadas nos segmentos de menor escolaridade do chefe da família, de menor renda familiar *per capita*, nos naturais de outros municípios ou Estados, nos que consomem frutas menos que quatro vezes na semana, nos que não bebem leite diariamente, nos fumantes e nos que referiram presença de dor de cabeça e tontura. Média superior de ingestão de cálcio foi encontrada nos indivíduos que dormem menos de sete horas por dia. A prevalência de ingestão de cálcio inferior ao recomendado foi de 88,6% (IC95%: 85,4-91,2).

**Conclusões:** Os resultados deste estudo alertam para o consumo insuficiente de cálcio e sugerem que determinados subgrupos de adolescentes necessitam de estratégias mais específicas para aumentar a ingestão deste nutriente.

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**Introduction**

Calcium is an essential nutrient for maintaining bone health, as it contributes to bone mineralization and rigidity, thus preventing problems such as osteoporosis and fractures in adulthood and old age.<sup>1,2</sup> It also participates in fibrin formation during the blood coagulation process and regulation of muscle contraction, since the protein troponin, a regulator of actin and myosin contractility, depends on calcium.<sup>3</sup>

Adequate calcium intake is essential for the development and maintenance of bone mass peak during adolescence.<sup>1,2</sup> From birth to adulthood, bone mass increases 40 times, and the peak is reached at the end of the second decade of life.<sup>2</sup> Between 40% and 60% of bone mass increase occurs during adolescence.<sup>2</sup>

The nutritional recommendation of calcium intake for children and adolescents aged 9–18 years is of 1100 mg/day, according to the estimated average requirements (EAR), which should not exceed the tolerable upper intake level of 3000 mg/day.<sup>4</sup> According to the 2008–2009 Household Budget Survey (Pesquisa de Orçamentos Familiares [POF]), the highest mean values of calcium intake were 565.7 mg in boys aged 14–18 years and 521.7 mg in girls aged 10–13 years.<sup>5</sup>

Dairy products, dark green vegetables, certain types of fish, and nuts are important dietary sources of this mineral.<sup>6</sup> Brazilian research has shown that the dietary patterns of adolescents is characterized by low consumption of certain foods, such as milk and other dairy products, fruit, and vegetables, and by the increased intake of high-calorie foods, saturated fats, sugars, and sodium, such as sugary drinks, sweets, and cookies.<sup>7–10</sup> This dietary pattern may be harming the consumption of calcium-rich foods.

Considering the importance of the nutrient intake for good health and the results of studies that evidence a severely inadequate calcium intake by adolescents, this

study aimed to evaluate the epidemiological profile of calcium intake in adolescents in the city of Campinas, state of São Paulo, Brazil, and to identify which segments are more susceptible to calcium intake deficiency, according to demographic and socioeconomic variables, health-related behaviors, morbidities, and body mass index (BMI).

**Methods**

This was a cross-sectional population-based study that included 929 non-institutionalized adolescents aged 10–19 years, living in the urban area of the city of Campinas. The study data were obtained from the Campinas Health Survey (Inquérito de Saúde no município de Campinas – ISACamp 2008/09), carried out between February of 2008 and March of 2009.

The study sample was determined by probabilistic sampling procedures by clusters, and in two stages: census sectors and households. In the first stage, 50 census sectors were selected by drawing lots, with probability proportional to size (number of households). In the second stage, the households were selected by drawing lots.

The sample size was calculated considering the estimated prevalence of 50% (corresponding to the maximum variability), with a confidence level of 95%, sampling error between 4% and 5%, and a second design effect, totaling 1000 adolescents (10–19 years). Expecting 20% of non-response, the sample size was corrected to 1250. To achieve this number of individuals, 2150 households were randomly selected for interviews with the adolescents.

Information was collected through a questionnaire structured in thematic blocks that were tested in a pilot study and applied by trained and supervised interviewers. Dietary intake was estimated using the 24-hour food recall (24HR).

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