

# Evaluation of the consumption of dairy foods as calcium source by students in the municipality of Agudo-RS

## Avaliação do consumo de alimentos lácteos como fonte de cálcio por escolares no município de Agudo-RS

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### Abstract

*Objective:* Evaluate the consumption frequency of dairy foods as a source of calcium and the behaviors associated with this consumption. *Methodology:* Cross-sectional study conducted in a public school in the municipality of Agudo-RS with teenager students of the 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> years of elementary school. Data collection was performed through a Food Frequency Questionnaire (FFQ) composed by a list of dairy foods. *Results:* Participated 32 students; 31.3% reported not consuming dairy foods every day/regularly, 15.6% eat only a portion and 53.1% two or more portions, without significant statistical differences between genders. Concerning breakfast, 43.7% of the students reported to have it daily, being the higher percentage male individuals. Among the products added to milk, the most cited were chocolate powder (68.8%), followed by coffee (59.4%). The regular consumption of soda was reported by 59.4% of the teenagers, and artificial juice by 53.1%. *Discussion:* Skipping breakfast and high consumption of sugary drinks are factors that can contribute to a lower consumption of dairy products, interfering negatively in calcium intake. *Conclusion:* The consumption of dairy foods as a source of calcium was more prevalent for two or more daily portions, without significant difference in consumption between genders. Having breakfast was more frequent between male teenagers. High consumption of sugary drinks was observed, which can be considered substitutes for dairies in the adolescent routine.

**Keywords:** Calcium. Dairy products. Adolescent. Habits.

## Resumo

*Objetivo:* Avaliar a frequência do consumo de alimentos lácteos como fonte de cálcio e os comportamentos associados a esse consumo. *Metodologia:* Trata-se de estudo transversal realizado em uma escola pública do município de Agudo-RS, com adolescentes estudantes do 4º, 5º e 6º anos do ensino fundamental. A coleta de dados se deu através de um Questionário de Frequência Alimentar (QFA) composto por uma lista de alimentos lácteos. *Resultados:* Participaram 32 escolares. Referiram não consumir nenhuma porção de lácteos por dia 31,3% dos escolares; 15,6% consomem uma porção e 53,1% consomem duas ou mais porções, não havendo diferença estatística significativa entre os sexos. Em relação ao café da manhã, 43,7% dos estudantes referem realizá-lo diariamente, sendo esse percentual maior no sexo masculino. Entre os produtos adicionados ao leite, os mais citados foram achocolatado (68,8%), seguido do café (59,4%). O consumo regular de refrigerantes foi relatado por 59,4% dos adolescentes, e os sucos artificiais por 53,1%. *Discussão:* A omissão do café da manhã e o alto consumo de bebidas açucaradas são fatores que podem contribuir para um menor consumo de laticínios, interferindo negativamente na ingestão de cálcio. *Conclusão:* O consumo de alimentos lácteos como fonte de cálcio mostrou-se mais prevalente para duas ou mais porções/dia, não havendo diferença significativa de consumo entre os sexos. A realização do café da manhã foi mais frequente entre adolescentes do sexo masculino. Observou-se elevado consumo de bebidas açucaradas, que podem ser considerados substitutos dos lácteos na rotina dos adolescentes.

**Palavras-chave:** Cálcio. Laticínios. Adolescente. Hábitos.

## Introduction

Adolescence is the life stage between the ages of 10 and 19 years, a period that is marked by deep psychological, behavioral changes and intense physical growth, constituting a stage of high nutritional demand.<sup>1,2</sup> The food choices and eating habits in adolescence are influenced by diverse factors such as demographic, socioeconomic, cultural, environmental and psychological aspects.<sup>3</sup>

Calcium is the mineral responsible for growth and bones maturation, and the source of this mineral for the human body is diet.<sup>4</sup> In addition to the importance of calcium for the bones maintenance, recent studies have shown an additional role of this nutrient in the prevention of chronic diseases such as high blood pressure and obesity.<sup>5</sup>

An adequate supply of dietary calcium during childhood and adolescence is one of the factors that help maximize bones mass, contributing to preventing risks of development of osteoporosis and fractures during adult life and old age.<sup>6</sup> The best dietary sources of calcium are foods of the group of milks and dairy products, where this nutrient is highly bioavailable. Among nonmilk sources, we have dark leafy greens (collard greens, broccoli, mustard leaves), sardine, shellfish, oyster, and unhulled sesame seeds.<sup>5</sup>

The Institute of Medicine (IOM) updated their dietary reference intake (DRI) of calcium according to the individuals' age, based on the beneficial effects of this nutrient in the human body and prevention of deficiencies. Recommended calcium intake for adolescents of both sexes is 1,300mg/day.<sup>7</sup>

In general, adolescents tend to neglect the intake of food sources of calcium, skipping breakfast, drinking milk and eating dairy products in inadequate portions, substituting processed juices or sodas for milk during snacks, thus increasing the intake of sugars and calorie density, and reducing the nutritional quality of the diet.<sup>8</sup>

Dietary inquiries conducted with groups of Brazilian adolescents indicate occurrence of diet inadequacies with a deficient intake of milk products, fruits and vegetables, and excess sugar and fats.<sup>5</sup>

The *Pesquisa de Orçamentos Familiares – POF* (Household Budget Survey – HBS) in 2008-2009 shows that calcium is among the nutrients with the highest percentage of inadequacy among adolescents in all regions studied, and the *per capita* intake of whole milk, milk drinks and yogurt is much lower compared to sodas, artificial and packaged juices.<sup>9</sup> And according to the *Pesquisa Nacional de Saúde do Escolar – PeNSE* (2009) (Household Budget Survey – HBS), which investigated, among other topics, the consumption of healthy food markers, consumption of milk was higher among male students from private schools.<sup>10</sup>

Considering the irrefutable importance of a healthy diet and the great value that calcium has on childhood and adolescence, this study aims to evaluate the frequency of intake of milk foods as source of calcium and associated behaviors.

## Methodology

It is a cross-sectional observational study carried out in a public school in the municipality of Agudo-RS. We used the convenience sampling method, with students enrolled in the 4th, 5th and 6th grades of elementary school. The participants were informed about the objectives and procedures of the study and signed, as well as their parents or guardian, the Free and Informed Consent Form and the Minors Informed Assent. The students who were absent at the day of data collection as well as those who did not submit the forms duly signed were not included in the study.

Data was collected in the classroom during school hours in August 2017, when the children were asked to complete an adapted version of the Food Frequency Questionnaire (FFQ),<sup>11-13</sup> comprised of a list of calcium-rich milk foods and objective questions relating to gender, breakfast eating habits, food intolerance or allergy, products added to milk (coffee, chocolate, cereals, fruits, sugar or honey) and foods that may alter the frequency of intake of dairy products (artificial juices, soft drinks, coffee and teas).<sup>14,15</sup> The FFQ was analyzed descriptively by the percentage of intake frequency of each food and the number of portions per day.

Data was entered in *Microsoft Office Excel 2007* and analyzed statistically by the *Statistical Package for Social Sciences (SPSS)* software program, version 23.0, and using a statistical significance level of 5%. Pearson's chi-square test was used to find out relationships between the categorical variables, milk and dairy products consumption and breakfast habits according to sex; the other results were analyzed descriptively.

The research protocol was approved by the Human Research Ethics Committee from the Universidade de Santa Cruz 0 Sul, with number n° 2.140.382.

## Results and Discussion

Thirty-two schoolchildren with mean age of  $11.1 \pm 1.8$  years, 16 female and 16 male individuals, participated in the study.

By analyzing the number of portions of dairy foods eaten per day, 31.3% said that they did not eat any of this food; 15.6% of the participants eat one portion, and 53.1% eat twice or three times a day. The most consumed foods were fruit yogurt, whole milk and ready-to-drink chocolate milk, with no significant statistical difference between sexes (Table 1).

According to the Brazilian Food Pyramid, the recommended intake of the group of milk and dairy foods is three portions per day.<sup>5</sup> In the present study, it was found that more than half of the schoolchildren eat two or more portions of milk foods per day, which allow us to consider that this intake meets the recommended amounts or at least is close to them.

Silva et al.<sup>16</sup> conducted a qualitative survey on the consumption of calcium-source foods by 30 students with average age of nine years in the municipality of Colina-SP and found that more than half of the children eat two portions of dairy products daily. Whole milk and fruit yogurt were the foods most cited by the children, an intake considered significant for the studied population.

In the study conducted by Coleone et al.<sup>17</sup> with 113 children and adolescents in a school located in Ipiranga do Sul-RS, 46% of the students reported drinking milk more than six times a week, data that were similar to those found by Neutzling et al.<sup>18</sup> and Santos et al.,<sup>19</sup> in which 48.5% and 49% of the adolescents, respectively, drink milk every day.

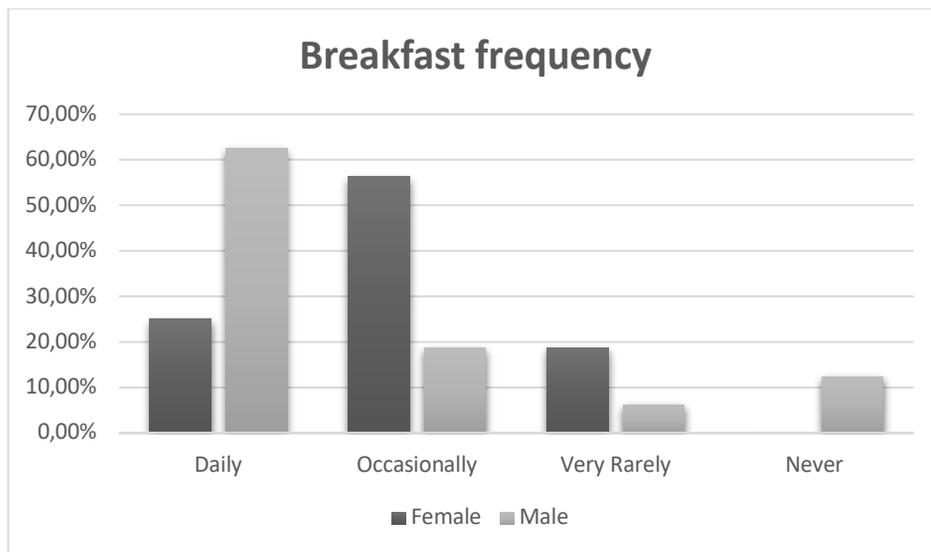
**Table 1.** Frequency of consumption of milk and dairy products as a source of calcium, according to the sex of the schoolchildren studied (n=32). Agudo-RS, 2017.

Food	Serving size	Never/rarely	Once a week	2-4 times a week	Once a day	Two or more times a day	Never/rarely	Once a week	2-4 times a week	Once a day	2-4 times a day	p-value*
		FEMALE (n = 16)					MALE (n = 16)					
Whole milk	1 glass (200 ml) of milk	7 43.8%	4 25.0%	1 6.3%	2 12.5%	2 12.5%	6 37.5%	1 6.3%	2 12.5%	4 25.0%	3 18.8%	0.545
Low-fat milk	1 glass (200ml) of milk	16 100%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	16 100%	0 0.0%	0 0.0%	0 (0.0%)	0 0.0%	-
Fat-free milk	1 glass (200ml) of milk	16 100%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	15 93.8%	0 0.0%	0 0.0%	1 6.3%	0 0.0%	0.310
Soy milk	1 glass (200 ml) of milk	16 100%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	16 100%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	-
Lactose-free milk	1 glass (200 ml) of milk	16 100%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	16 100%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	-
Natural yogurt	1 pot	14 87.5%	1 6.3%	1 6.3%	0 0.0%	0 0.0%	16 100%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0.344
Fruit yogurt	1 pot	5 31.3%	3 18.8%	3 18.8%	3 18.8%	2 12.5%	7 43.8%	1 6.3%	0 0.0%	4 25.0%	4 25.0%	0.273
Chocolate milk (ready-to-drink)	1 carton (200ml) 200ml	4 25.0%	5 31.3%	2 12.5%	0 0.0%	5 31.3%	7 43.8%	2 12.5%	1 6.3%	1 6.3%	5 31.3%	0.487
Ricotta cheese	1 slice	15 93.8%	0 0.0%	1 6.3%	0 0.0%	0 0.0%	16 100%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0.310
Danbo cheese	1 slice	14 87,5%	1 6,3%	1 6,3%	0 0,0%	0 0,0%	13 81,3%	0 0,0%	1 6,3%	0 0,0%	2 12,5%	0,386
Mozzarella cheese	1 slice	12 75,0%	1 6,3%	0 0,0%	1 6,3%	2 12,5%	12 75,0%	2 12,5%	0 0,0%	2 12,5%	0 0,0%	0,446
Curd cheese	1 tablespoon	14 87,5%	1 6,3%	0 0,0%	0 0,0%	1 6,3%	15 93,8%	0 0,0%	0 0,0%	1 6,3%	0 0,0%	0,386
Milk skim	1 tablespoon	10 62.5%	2 12.5%	0 0.0%	2 12.5%	2 12.5%	8 50.0%	2 12.5%	1 6.3%	3 18.8%	2 12.5%	0.840
Cream cheese	1 tablespoon	15 93.8%	1 6.3%	0 0.0%	0 0.0%	0 0.0%	16 100%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0.310

\* Pearson's chi-square test

Matuk et al.<sup>20</sup> carried out a study to assess qualitatively the composition of the lunchboxes of 501 students aged between 7 and 13 years from private schools in the city of São Paulo-SP, and found that milk and dairy products were the most common foods found in the lunchboxes of 65% of the children.

With respect to breakfast, 43.7% of the students reported having it every day, 62.5% being male students and only 25.0% female (p=0.036) (Fig. 1).



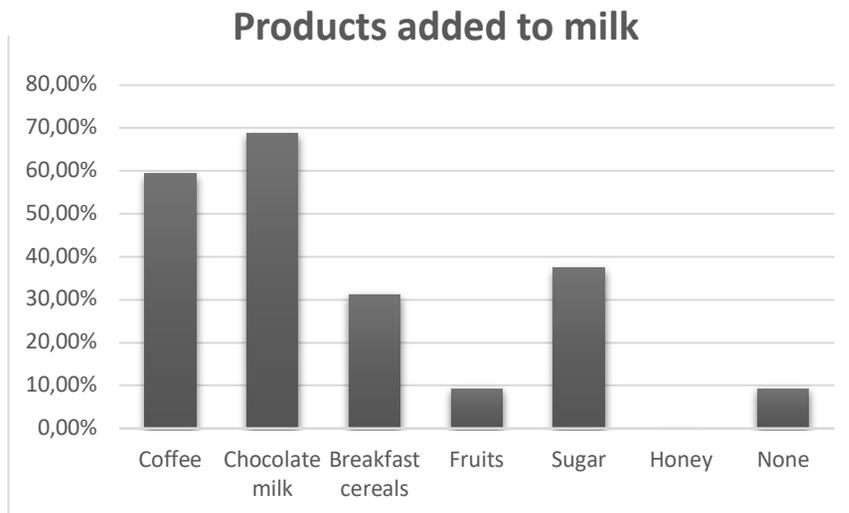
**Fig. 1.** Breakfast consumption frequency according to the students' gender (n= 32). Agudo-RS, 2017.

In a study conducted in a public school in Ilhabela-SP with 228 students,<sup>21</sup> it was found that 21% of the teenagers skipped breakfast, a percentage that was higher for girls (29%) than boys (13%). Likewise, in a study conducted in the city of São Paulo-SP with 795 adolescents,<sup>22</sup> the prevalence of breakfast skipping was 38%, statistically higher for female teenagers. According to the authors, breakfast skipping contributed to the difficulty of not attaining the nutritional recommendations, mainly calcium.

Pereira et al.<sup>23</sup> evaluated the prevalence of consumption and the breakfast nutritional content among adolescents aged between 10 and 19 years who were assessed in the 2008-2009 National Food Inquiry. The results indicated that 93% of the adolescents had breakfast regularly and occasionally, and this percentage was higher for male individuals. However, daily mean intake of calcium was lower among adolescents who had breakfast regularly, probably due to a larger portion of milk foods (especially whole milk) in intermediate meals, such as snacks.

Breakfast skipping is a common phenomenon among teenagers, especially girls, and among the reasons for this finding is the irregular food intake that is common at this life stage and body image concerns, situations that usually lead people to follow restrictive diets without medical guidance and to skip meals. This behavior is associated with higher BMI, less concentration, lower school performance, and increased risks of inadequate intake of nutrients, especially calcium and dietary fibers.<sup>24,25</sup>

Out of the products added to milk, the most cited were chocolate milk (68.8%), followed by coffee (59.4%). Milk addition with honey or fruits had the lowest percentages (Fig. 2).



**Fig. 2.** Products added to milk by the interviewed students (n=32). Agudo-RS, 2017.

In the study of Silva et al.,<sup>16</sup> all respondents mentioned that they usually add some ingredient to milk, chocolate and coffee being the most cited by 83% and 13% of the students, respectively.

Nogueira and Canniatti-Brazaca<sup>26</sup> assessed calcium bioavailability in milk mixed with fruits, powder chocolate and coffee and found that the whole milk and skimmed milk samples, both mixed with banana or papaya, exhibited the best results for calcium bioavailability. Skimmed milk combined with banana achieved the best results, probably due to the fruit composition, which has many compounds derived from free amino acids, which may act as a calcium-complexing agent, forming chelates. The lowest percentage of calcium bioavailability was found in the sample containing skimmed milk and coffee. The samples comprising a mixture of whole or skimmed milk with powder chocolate exhibited higher contents of calcium, dialyzed calcium and available calcium in a 200-ml sample than the other samples studied, probably due to the powder chocolate formulation.

According to Cozzolino,<sup>27</sup> caffeine may have an adverse impact on calcium absorption and has been associated with an increased risk of hip fractures. However, this association has been restricted to women in menopause and with low calcium intake, and there is not sufficient evidence to change the diets of individuals who have the habit of consuming high amounts of caffeine. Excess consumption of sugar and chocolate milk during adolescence has been associated with a poor-quality diet. During this stage, excess intake of soft drinks, sugars and fast foods are common. This dietary pattern is of concern since it can lead to overweight and greater likelihood of developing chronic noncommunicable diseases (NCDs) such as diabetes, high blood pressure and dyslipidemias in adult life.<sup>21,28</sup>

Habitual consumption of sugary beverages, which can be considered substitutes for milk and dairy foods in the routine of many teenagers, was also found in the present study. The habit of drinking soft drinks more than three times a week was reported by 59.4% of the adolescents, and artificial juices by 53.1%.

In the study conducted by Santos et al.<sup>19</sup> with 59 adolescents aged 10-19 years, enrolled in a Youth Center in the city of Anápolis-GO, daily consumption of artificial juices reached 45%, while the intake of sodas was reported by 28% of the adolescents. Saraiva et al.<sup>29</sup> observed a considerable consumption of sodas by the adolescents of the study, in which 41.30% of them mentioned that they usually drink this kind of beverage more than twice a week.

Levy-Costa et al.<sup>30</sup> analyzed the evolution of family purchases of foods and beverages in metropolitan areas in the country, comparing the HBSs carried out from 1974 to 2003. In these areas, consumption of milk and dairy foods increased by 36%, whereas soft drinks had an increase of up to 400%. However, the increased consumption of milks and dairy products occurred mainly between 1974 and 1988, and after this period it had not changed at all. In contrast, a progressive growth in household purchases of soft drinks was observed.<sup>30,31</sup>

The 2008-2009 HBS<sup>10</sup> showed that the highest averages of daily intake of beverages *per capita* by teenagers were found for juices, powder juices (167.8 g/day) and sodas (123.7 g/day).

The high consumption of sodas, packaged juice and other sugary beverages by adolescents contributes to a low calcium intake, because it replaces milk products. These beverages not only contribute to increasing total calories in the diet without adding nutrients but are also associated with a decreased intake of important nutrients required for growth and development in adolescence and more weight gains and propensity to obesity.<sup>14,25</sup>

The increasing number of meals eaten outside the home is another factor that influences the consumption of calcium-rich foods, because in foodservice establishments such as restaurant and fast food chains, the availability of other beverages such as sodas and artificial juices are greater, thus contributing to meals with low calcium intake.<sup>32</sup>

In the present study, food allergy or intolerance was also questioned since it could prevent the intake of milks and dairy foods; however, lactose intolerance was reported by only one male student. Lactose intolerants have increased risks for calcium deficiency since they usually avoid milk products; however, sometimes this is not necessary because some studies revealed that many intolerants can consume low doses, e.g. one glass of milk.<sup>27</sup>

We consider a limitation of the study the small sample size obtained.

## Conclusion

This study showed that the intake of milk foods as source of calcium was more prevalent for two or more portions/day (53.1%); 31.3% of school adolescents do not consume any portion, with no significant difference between genders. Having breakfast was more frequent among male adolescents. It was observed a high intake of sugary beverages like sodas and artificial juices that are usually substituted for milk products in the adolescents' routine.

## Contributors

Poll FA and Wasielewski M participated in all stages of the study, being responsible for the conception and conduction of the research as well as for its analysis, results interpretation and writing the manuscript. Poll FA was also responsible for the revision of the final version of the manuscript.

Conflict of interests: The authors declare that there is no conflict of interests.

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