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Food security of the juvenile population: milk as a component

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Abstract

Breast milk is the first food of the newborn, the only one capable of doubling the weight of the infant in its first months of life and carrying out strong brain development. However, other kinds of milk, such as bovine milk, are usually included in infant nutrition. Thus, as it has been known that the right to grow up with the best possible health is a fundamental right of every child, and provided by the Convention on the Rights of the Child. it is necessary to know the importance of bovine milk for the food security of children and adolescents. Therefore, a literature survey was conducted in SciELO and MEDLINE databases for publications in the last decade. In this review it was observed that dairy products provide about 50% of daily calcium needs worldwide and mainly contribute to the development of healthy bones and healthy growth of children over 2 years old. However, the literature shows the relationship between bovine milk consumption and the occurrence of anemia, food allergies and type 1 diabetes. Thereby, it is observed that feeding practices are determinants of health in childhood and they are subject to the purchasing power of households. So public policies in all regions of the country should be deployed to ensure that all Brazilian children and adolescents are supplied with necessary quantity and quality not only of milk, but all other kinds of food, according to their age, thus ensuring Food and Nutritional Security of the child- juvenile population.

Keywords: Child. Milk. Child Development. Food Security.

Introduction

Proper nutrition is one of the most significant impacting factors on child health, especially because of the decisive influence that the nutritional status has on the risks of morbimortality, growth and development.[1] According to Best et al.,[2] prevalence of malnutrition in Latin American countries is below 10%. In Brazil, data from the Household Budget Survey (HBS) show that the weight deficit in children under five years is of 6%, with emphasis on the first year of life (8.9%). In children aged between five to nine years, the weight deficit affects 4.1% of this population, and the height deficit reaches 6.8%. In 10-19 year old adolescents, the weight deficit corresponds to 3.35%.[3] In addition, prevalence of children with anemia and vitamin A deficiency reaches 20.9% and 17.4% or this population, respectively.[4]

In this context, the Food and Nutrition Security (FNS) concept was developed as a guarantee to continued access to sufficient amount and quality of foods obtained by socially acceptable means, in order to ensure the individual's well-being and health.[1] The FNS concept should include – in addition to access to foods, preservation of biodiversity, promotion of health and nutrition, sanitary and biological quality of foods, and promotion of healthy food practices – the production of knowledge and access to information.[5] Thus, FNS has been assessed and used in population studies, and has been increasingly present in the Brazilian public agenda, because appropriate nutrition is a fundamental right of the human being and indispensable to ensure the rights covered by the Federal Constitution [6], among other reasons.

Recently, the National Household Sample Survey (PNAD) assessed food insecurity of the Brazilian population and found that 42.75% of children and teenagers (under 17 years) were in food insecurity conditions, 7.9% being considered serious food insecurity, according to the Brazilian Food Insecurity Scale.[5]

Breast milk is the first food of newborns, the single one capable of doubling the weight of the infant in the first six months of life and of promoting strong brain development.[7] However, after two years of age, other milks, such as bovine milk, are usually included in the child diet because they are food sources with high concentration of macro and micro nutrients,[8] which makes humans the only mammal that use milk from other species for nutrition.

If, on the one hand, studies have shown that milk has been consumed since the Copper Age, about six thousand years ago,[7] on the other hand it is known that bovine milk can lead to the development of anemia and food allergies among the young population. Thus, knowing that the

right to grow with the best possible health is a fundamental right of every child and is provided in the Convention on the Rights of the Child,[9] it is crucial to understand the importance of breast milk for the food and nutrition security of children and adolescents.

Method

A literature search was conducted in *Scientific Electronic Library On-line* (SciELO) and *Medical Literature Analysis and Retrieval System Online* (MEDLINE) databases, using association between "milk", "food and nutrition security" and "children" descriptors, in Portuguese and English", referring to the past decade. The "milk" and "public policies" descriptors were searched only in ScieLO due to the inclusiveness of Brazilian scientific periodicals.

A total of 86 articles based on the above descriptors were found. The criteria for exclusion were as follows: non-bovine milk, adult population, and public policies not directly related to bovine milk. This resulted in 23 articles that were included in the present work. In addition, two books, one article published before 2002, one thesis, two nutritional guidelines, four laws, and five nationwide surveys, considered relevant to the subject, were cited in the review.

Macronutrients and calcium recommendations for children and adolescents

For proper child growth and development, nutrition should have a balance of the macronutrients distribution. Calorie sources should be 55% to 60% from carbohydrates, and 25% to 30% from lipids. Protein requirements per kg of weight in children are higher than in adults, requiring a larger amount of essential amino acids. Values vary according to the individual's age and sex, in the range of 0.85g/kg/day to 1.52g/kg/day.[10]

Recommended calcium amount in the first six months of life is 210 mg, and from 7 to 12 months is 270 mg.[11] These values are based on the amount contained in the breast milk, which is the main food source in the first year of life.[12] For children aged 1-4 years and 4-8 years, recommended daily amounts (RDA) of calcium are 700 and 1000 mg, respectively,[11] which are easily provided by daily intake of three to four servings of dairy products. In adolescents, according to the recommendations of the Food and Nutrition Board of the Institute of Medicine (1997-2001), RDA of calcium is 1,300 mg, distributed in four daily servings of foods of the dairy group.[11]

Dairy products account for 47% of the calcium intake by the American population. [13] In the Netherlands, 73% of calcium intake by children is provided by dairy products. [14] Other important factor relating to the amount of calcium present in food servings is bioavailability. Table 1 indicates the food sources of calcium according to its absorption level.[12]

Table 1. Calcium food sources according to its absorption rate

Food source	Serving (g)	Calcium content (mg/ portion)	Estimated absorption (%)	Calcium absorbed per serving (mg)	Servings equivalent to 1 cup of milk
Milk	240	290	32.1	93	1.0
Yogurt	240	300	32.1	96.3	1
Cheddar cheese	42	303	32.1	97.2	1
White beans	110	113	21.8	24.7	3.9
Red beans	172	40,5	24.4	9.9	9.7
Broccoli	71	35	61.3	21.5	4.5
Kale	85	61	49.3	30.1	3.2
Spinach	85	115	5.1	5.9	16.3
Whole-wheat bread	28	20	82	16.6	5.8

Source: Adapted from Silva; Mura (2010).

Milk and its effects on health

Although the exact composition varies in response to factors such as the animal nutrition and stage of lactation, bovine milk is composed by approximately 87% of water, 5% of lactose, 3% of protein, 4% of lipids and 0.7% of mineral salts.[15] Amongst the minerals, milk contains a great amount of phosphorous, potassium, magnesium and calcium, and a small amount of vitamin D.[7,16] Few foods contain natural vitamin D, which plays a key role in the bones growth, along with calcium,[17-20] and is also of interest in the prevention of rickets, osteomalacia,[21] cardiomyopathies, and possibly in the prevention of diabetes, high blood pressure, dyslipidemia, asthma,[22] infectious diseases and even some types of cancer.[23] Vitamin D deficiency is becoming a world epidemics. [22]

Calcium is the most abundant mineral found in the human body and is the nutrient responsible for the formation, maintenance and mineralization.[24]

The high bioavailability of calcium in dairy products relates to the content of Vitamin D and the presence of lactose, which increase intestinal calcium absorption.[25] Recent studies show that the high bioavailability of this element is also due to bioactive peptides that are released during milk gastrointestinal digestion, especially the casein phosphopeptides, which present binding sites with divalent minerals (Ca, Mg and Fe) and oligoelements (Zn, Ba, Cr, Ni, Co and Se).[26] In addition, bioactive peptides provide antimicrobial, antithrombotic, immunomodulatory, cytomodulatory activities, influence blood pressure and mood, and also modulate the intestinal microbiota, having a key role in the defense against infections and in the development of allergies in formula-fed children.[15]

Bovine milk has numerous health benefits. Vilela[27] reports that milk increases retinol and calcium absorption, modulates the immunological response, and improves the antioxidant and antimicrobial function. Moreover, during gastrointestinal digestion, peptides are released from milk proteins and have regulatory effects on various body functions, such as anti-hypertension, antioxidant, antithrombotic, hypocholesterolemic actions, minerals absorption, decreased appetite, increased intestinal transit, with anti-diarrheal, immunomodulatory, cytomodulatory and antimicrobial activity.[15, 26] Bovine milk is also a source of energy and indispensable in the synthesis of sphingolipids, crucial for the development and functioning of brain neurons.[7]

On the other hand, studies have reported that bovine milk intake is a consistent risk factor for the occurrence of anemia in children, because it can obstruct the absorption of iron provided by other foods. Several studies show that the occurrence of anemia associated with bovine milk intake is caused by non-exclusive breastfeeding until the sixth month of the infant's life, failure in introducing complementary foods as recommended by the Ministry of Health, and also the use of bovine milk as the single food source for the child in case of lack of breast milk, of access to or information on milk formulas.[28-30] Thus, it is necessary to develop and maintain educational programs that make the population aware of the importance of exclusive breastfeeding until six months of age and the introduction of complementary foods. In addition, it is necessary to monitor the daily milk intake so that it does not exceed the recommended daily amounts, and make sure that milk does not replace the main meals (lunch and dinner).[31] Corroborating these data, the Institute of Medicine emphasized that high calcium levels have not shown greater benefits; actually, they have been associated with other health problems.[11]

Other bovine milk-related issue is the occurrence of food allergies.[32] Overuse of bovine milk in replacement of human milk has led to incidence of sensitivity to the its components.[33] It is known that early exposure to bovine milk is associated with the risk of developing type 1 *diabetes mellitus* and atopic diseases such as asthma and other allergies, whose effects seem to last until the first decade of the child's life.[28] Currently, about 20% of food allergies are claimed to be consequence of milk intake, [28] and such incidence is the range of 1.9 and 7.5%.[33] Therefore, bovine milk is not recommended before the child's first year of life.[28]

Food and nutrition security for children and adolescents

FNS imposes a comprehensive understanding on the concept of appropriate diet. Diets should supply the individuals' energy requirements, be nutritionally diversified, respect the age, the physiological conditions, physical activity and, ultimately, everyone's cultural habits. [6]

In Brazil, there is no doubt that the main cause of non-access to foods, as well as child malnutrition, is low income. Regular and proper access to foods for the families of lower classes is unaffordable, because it consumes a significant share of the household earnings and may compromise the access to other goods and services that are essential to living a life with quality.[34]

It is known that in the first stage of access to foods, in terms of purchasing power, diets are limited to cheaper nutritional sources, such as grains, sugar and basic products. Then, more

complex, processed foods are gradually incorporated to the diet, such as milk and other dairy products, poultry meats, source of animal proteins, replacing part of the basic goods. In the next economic stage, individuals include other sources of animal protein, such as swine and bovine meats, as well as vegetables and fruits to the diet.[35]

In Brazil, according to the HBS 2008-2009, dietary consumption of milk is proportional to the household income. Average monthly household expenditures correspond to 33% of the income. If we compare the highest and lowest income level, consumption of milk and dairies by Brazilians is three times higher in families with higher income.[36]

It is suggested that people with high educational background make best food choices for consumption. However, the illiteracy rate is still high in Brazil, if we consider the rate of 11.4% compared to only 1% in the United States, UK and Germany.[35] This shows the inability of part of the population to make appropriate food choices.

In Brazil, there are two public policy experiences that contribute to FNS in terms of milk consumption by the children. The modality of incentive to Milk Production and Consumption, the "PAA Milk", was created to stimulate consumption of bovine or goat milk by families that are in food insecurity conditions and to encourage production by family farmers. The families that would be eligible to the benefit should be in the maximum *per capita* income limit, i.e., up to half minimum wage, and have among the family members children aged between two to seven years, breastfeeding mothers up to six months after birth, pregnant women, and elderly people aged 60 and over. The PAA Milk acts within the scope of the Northeast Development Superintendence (SUDENE), and all states comprising the northeast region and north of Minas Gerais are covered by the program.[37]

The second experience is the Milk Program for Children (PLC), which was implemented in the state of Paraná by State Law no.16475/2010,[38] as a right to children aged between 6 to 36 months, pregnant women and breastfeeding mothers, with *per capita* income of up to half regional minimum wage. PLC consists of the free and daily distribution of one liter of pasteurized milk enriched with chelated iron and vitamins A and D. The aim of the program is to contribute to the reduction of nutritional deficiencies of children in the state of Paraná and the development and organization of the milk production chain, with emphasis on income generation and jobs creation. The ultimate goal is to stimulate the permanence of the population in the rural areas, as well the socialization of information and procedures for social inclusion of low-income families.[38]

Thus, public policies materialized in the abovementioned programs represent an effective contribution to the FNS and DHAA (Human Right to Appropriate Nutrition) goals by promoting access and availability of nutrients to help supply the children's nutritional needs. However, other similar programs should be implemented throughout the country in order to ensure that all Brazilian children and adolescents are provided with quantity and quality not only of milk, but also of all other foods, irrespective of the family's purchasing power. Public policies should be implemented, especially those specifically designed to children aged 6-12 months, in order to prevent alterations in the gastrointestinal and immunological system, in the child's growth and development, thus assuring the food and nutrition security of children and adolescents.

Final considerations

Diets that are milk-free and/or have insufficient amounts of milk may contribute to malnutrition, delayed growth and may even cause other adverse reactions. Inappropriate nutrition in childhood may have adverse lasting effects in health, even in the adult age. Such effects may be reduced by FNS-oriented strategies, providing numerous benefits to the overall health of people, adding quality of life.

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