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Consensus of the Brazilian Association of Nutrology on Milky Feeding of Children Aged 1–5 Years Old

Consenso da Associação Brasileira de Nutrologia sobre a alimentação láctea da criança com idades entre 1 e 5 anos

Carlos Alberto Nogueira-de-Almeida[1] Mario Cicero Falcão[2] Durval Ribas-Filho[3] Renato Augusto Zorzo[1] Tulio Konstantyner[4] Raquel Ricci[5] Nathalia Gioia[5] Mauro Fisberg[5]

[1] Department of Medicine, Universidade Federal de São Carlos, Ribeirao Preto, SP, Brazil
[2] Department of Pediatrics, Faculdade de Medicina da Universidade de São Paulo, São Paulo, SP, Brazil
[3] Department of Nutrology, Universidade Fundação Padre Albino, Brazil
[4] Department of Pediatrics, Universidade Federal de São Paulo, São Paulo, SP, Brazil
[5] Centro de Dificuldades Alimentares do Instituto de Pesquisa em Saúde Infantil (PENSI), Rio de Janeiro, RJ, Brazil

Address for correspondence Carlos Alberto Nogueira-de-Almeida, MD, MSc, PhD, Departamento de Medicina, Universidade Federal de São Carlos - UFSCAR, Rua Eugenio Ferrante, 170, Ribeirao Preto, SP, 14027-150, Brazil (e-mail: dr.nogueira@ufscar.br).

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Abstract

Objective To publish a consensus on the milky feeding of children aged between 1 and 5 years old, in the face of the nonuniformity of indication and the lack of standardization, in Brazil, on the nomenclature and classification of milky products produced for this stage.

Methods Literature review and members discussion.

Results The review showed the nutrition deficiencies among Brazilian children and the position of different medical societies.

Conclusions Recommendations of milky feeding are proposed for government area, industry and health care professionals.

Keywords
- consensus
- child
- diet
- milk

Resumo

Objetivo Publicar um consenso sobre a alimentação láctea de crianças com idades entre 1 a 5 anos, diante da não uniformidade da indicação e da falta de padronização, no Brasil, sobre a nomenclatura e classificação dos produtos lácteos produzidos para esta etapa.

Métodos Revisão de literatura e discussão entre os autores.

Resultados A revisão mostrou as deficiências nutricionais em crianças brasileiras e a posição de diferentes sociedades médicas.

Conclusões Recomendações de alimentação láctea são propostas para as áreas governamental, da indústria e dos profissionais de saúde.

Palavras-chave
- consenso
- crianças
- dieta
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Introduction

During the first years of life, children need relatively larger amounts of macro and micronutrients to process the rapid growth and development of organs, including the brain. There is the global recommendation, endorsed by the World Health Organization (WHO), of exclusive breastfeeding up to 6 months of age, and breast milk and adequate complementary feeding up to 2 years old or more.[1] After the 1st year of life, children show significant progress in their development, a fact that is also reflected in eating behavior. As the growth rate decreases during childhood, appetite and food intake also decrease.[2]

The main goal of child nutrition is, since an early age, to ensure the current and future health of the child, through the development of healthy eating habits. The period between 12 and 60 months of life is critical, as it comprises the transition from breastfeeding and complementary feeding to the family diet. In this period, family habits that will influence the health of the individual will be established, especially from the metabolic point of view.[3]

Eating patterns in early childhood are characterized by independence in physical ability, as well as in language acquisition, allowing their verbal expression in food preferences, so much so that at 15 months old they are already able to eat and drink with little help. Between the 1st and 2nd years of life, children evolve from basic motor activities to thinner motor ones also in their diet, that is, of holding the spoon to sticking the spoon into the plate, putting food and taking it to the mouth. These interactions are part of children's learning about patterns of cultural and family behavior.[4] Thus, it is considered that the environment at mealtime should be free from distractions such as television, music, computer, etc. These bad practices can lead to future eating disorders.

In early childhood, some concerns regarding food are common: limited variety of food ingested, waste of mealtime, distraction, limited consumption of legumes, vegetables, fruits and meats and the desire for sweets and other goodies. Helping parents focus on children's positive eating behaviors, rather than refusals, keeps mealtime pleasant and productive. An early orientation for parents is fundamental for the prevention of eating problems, thus avoiding the deficit of macronutrients.[5] The preference for sweet taste is common in this age group. This creates some problems, as these foods, in addition to having high caloric density, are usually poor in micronutrients. The acceptance of foods with other flavors is usually not immediate, and some children only begin to accept them after eight to ten exposures in a noncoercive manner. Touching, smelling, playing, putting in the mouth and spitting new foods are normal exploratory behaviors that precede the acceptance of this new food.[4] These facts should be informed to the family, emphasizing that the failure of children to accept new foods is part of a development stage and, although frustrating, especially for the mother, should be experienced with knowledge, consistency and patience.

Thus, children in the first years of life may have inadequate intake, both for more and less, of various nutrients, which will negatively influence their growth, neuropsychomotor development, immunity, in addition to metabolic imprinting.[6–8]

In summary, it can be observed that the feeding of children in the first years of life has three topics that deserve special attention:[5,7,8]

- Imbalance (for more or for less) of energy and protein supply;
- Intake of various micronutrients below the recommendations: vitamins A, D, B12, C and folic acid; iodine; iron and zinc;
- Low intake of omega 3 chain fatty acids, mainly Docosahexaenoic acid (DHA), with important consequences, not only for childhood, but throughout life, affecting growth, neurodevelopment, immunity and metabolic imprinting.

Based on the three topics described above, special foods have been designed for this pediatric age group. These products have existed in many countries for about 2 decades and have been called Growing Up Milk (GUM), Young Child Formula (YCF) and "growth formula." Adopting the term "milk" is not appropriate, since in some compounds the protein source is vegetable and not cow's milk protein. In Brazil, this food is called a milky compound, which causes remarkable confusion, since this category encompasses many products with quite different profiles.

The current legislation[9] defines milky compound as:

> *"powdered product resulting from the mixture of milk and milky or non-milky product(s) or food substances(s), or both, added or not of milky or non-milky product(s) or food substances(s) or both permitted in this Regulation, suitable for human feeding, by means of technologically appropriate process. Milky ingredients must represent at least 51% (fifty-one percent) mass/mass (m/m) of the total ingredients (mandatory or raw material) of the product"*

Given the difficulty of naming and the fact that "milky compound" does not exactly characterize the type of product that this consensus addresses, only for the purpose of standardization, in the present document, this type of formulation will be called by the name currently more accepted in English: *Young Child Formula*.

In a 2011 publication, the Nutrition Committee of the French Pediatric Society recommended the use of YCF for all children of this age group, instead of cow's milk, based on a cross-sectional nutritional survey conducted with 3-day food recalls.[10,11] In this survey, children who did not consume YCF, but only cow's milk or other milky products (at least 250 ml/day) had 3 to 4 times more protein intake than recommended and the intake of essential fatty acids (linoleic and linolenic acids), iron, zinc, vitamins C, D and E below daily recommendations. In contrast, children who consumed at least 250 ml/day of YCF had intake within the recommendation, except for vitamin D.[10,11]

In 2013, the European Food Safety Authority (EFSA) considered that YCFs are one of the ways to modulate critical nutrient intake in early childhood, but should not be the only one to reverse nutrient excess or shortages.

Not all pediatric nutrition societies recommend replacing cow's milk with YCF for children as of 1 year old. The

Nutrition Committee of the German Society of Pediatrics states that these formulas would not be a need as long as the child's diet is adequate, both in quantity and quality.[12] This committee also considers that YCF based on cow's milk should preserve the beneficial properties of milk in relation to calcium, vitamins B2 and A, and have a reduction in protein and lipid content. Fat quality should be modified, since the deposition of Aracdonic acid (ARA) and DHA within the central nervous system (CNS) continues to be high after the 1st year of life and the addition of these fatty acids, at least DHA, would be interesting, especially in children who do not ingest foods which are sources of omega 3 fatty acids (Eicosapentaenoic acid [EPA] and DHA), such as cold water fish. In addition, micronutrients should be supplemented in these formulas, so that the recommendations are met.[12]

In the face of the nonuniformity of indication of the YCF and the lack of standardization, in Brazil, on the nomenclature and classification of milky products produced for children, the Brazilian Association of Nutrology brought together a group of experts to write a consensus on the milky feeding of children aged between 1 and 5 years old, based on the epidemiology of nutritional deficiencies of the Brazilian child in this age group and on studies published on the use of YCF versus raw cow milk.

The Double Impact of Malnutrition in the Childhood

Nutritional problems have been historically studied and evaluated in two ways separately, considering that they affected distinct populations and with opposite and contrasting risk factors. The first is characterized by chronic malnutrition, food insecurity, extremes of poverty, infections and micronutrient deficiency. The second is defined by overweight, sedentary lifestyle and inadequate energy consumption. However, as a result of social, economic and demographic changes that have occurred globally in the last 3 decades, the two extremes of malnutrition have been related to common triggers and re-contextualized in a single spectrum.[13]

Throughout their lives, a growing proportion of individuals will be exposed to the rapidly expanding obesogenic environment and causes of malnutrition that still persist. Studies with representative samples of the Brazilian population demonstrate the unequal distribution of the magnitude of complications related to nutritional problems in childhood and reveal worrying trends for the future. Although overweight has exceeded the frequency of nutritional deficits, childhood malnutrition remains a public health problem in Brazil.[14]

The gestational period and the first 2 years of life – the "first 1000 days" - constitute a critical and sensitive period to nutritional and metabolic changes. When they occur at this stage, both malnutrition and overweight can cause long-term harmful effects, and the occurrence of one implies a higher risk of occurrence of the other in the future. A relevant point regarding the prevalence of obesity in childhood refers to the earliness with which complications may arise,[15–21] such as chronic noncommunicable diseases (NCDs), in addition to the relationships existing between childhood obesity and its persistence until adulthood.[22] On the other hand, malnutrition jeopardizes the neuropsychomotor development of the child and reduces their chances of reaching the maximum potential in adulthood. In addition, the "first 1000 days" are a crucial period for establishing children's eating habits and behaviors that will influence growth and development at all stages of childhood. Therefore, the evaluation of the diet composition and the consumption profile of infants and preschoolers has become an important point, considering that eating habits and nutritional status in this age group can prevent or predispose to diseases resulting from eating deficiencies or excesses. Similarly, interventions aimed at reducing the double impact of malnutrition in Brazil can contribute to the reduction of the frequency and severity of diseases that, to date, are understood as NCDs.

Encompassing all these aspects, the mapping of the Brazilian child nutritional status allows the understanding of one of the main triggers for changes in nutritional status in the country: nutritional transition. The current nutritional situation in Brazil reflects the fact that the most recent economic, cultural and demographic changes have not affected the population equally, resulting in scenarios where malnutrition and overweight coexist; micronutrient deficiency is present in both conditions.

Nutritional Transition in Developing Countries

The paradox of nutritional status in children < 5 years old in Brazil reflects changes in lifestyle, eating habits, consumption patterns and physical activity practice at global, national and individual levels. This transformation process occurs unevenly throughout the country and is characterized by the inversion of the distribution patterns of the nutritional diseases, called Nutritional Transition. The children most vulnerable to this condition during early childhood are those living in situations of poverty and extreme poverty, such as those from indigenous and quilombola communities or beneficiaries of income concession programs. The inequality that marks the distribution of resources in the country is also imprinted on the evolution of the nutritional status of the Brazilian child.[23,24]

Throughout Latin America, social (urbanization, women's education, greater access to health services, increased workload and importance of women in the labor market) and contextual (increase in per capita income, national income distribution programs) changes have affected the availability, accessibility and demand for certain foods, under the strong influence of advertising and marketing. The nutritional transition results in a diet rich in fat, sugar and low in nutrients, which is associated with increased risk of infections, impaired immune system and growth deficits.[25] Paradoxically, the risk factors that contributed to the reduction of malnutrition from 1996 to 2006 support the increasing incidence of overweight in childhood today.[26]

The Main Risk and Protective Factors for Changes in the Nutritional Status of Children in Brazil

Obesity has been recognized by the WHO as the largest public health epidemic and is associated with chronic noncommunicable diseases of high morbidity and mortality,

which affect children and adolescents earlier and earlier[23]. Regardless of age group and gender, inadequate energy intake and sedentary lifestyle are crucial risk factors for the alarming increase in the prevalence of obesity in developing countries. However, there is little evidence on the importance of these risk factors in children and adolescents living in these regions[27].

A relevant point regarding its presence in the pediatric population refers to the amplification of the predisposition to harmful effects throughout life because changes in the nutritional status before 5 years old increase the risk of evolution to the spectra of malnutrition and overweight in adulthood. The combination of weight deficit and growth in early stages of life, with subsequent progression to overweight, is an example resulting from the nutritional transition that contributes to the increased risk of developing NCD in adulthood. The consequences that high metabolic burden determines on an organism with impaired homeostasis capacity can be explained by the concept of Metabolic Programming,[13] which conspires with genetic factors for the adjustment that affects the body weight and health of the individual throughout life.[28]

Development and growth occur due to a succession of critical periods and great plasticity known as "windows" when the phenotype is particularly sensitive to exposoma stimuli. Physiological mechanisms such as formation, differentiation and organization of tissues, organs and systems, occur in these periods, as well as the constitution of the microbiota and the regulation of hormonal and immunological signaling pathways. These mechanisms respond both to the excess and lack of nutrients in the diet at the beginning of life, programming according to the nutritional context and contributing to long-term and intergenerational effects of both ends of malnutrition. Some of these opportunity windows close at early periods of life and development: preconception, gestational, perinatal, breastfeeding phase or in the first years of life. Thus, the incidence of risk factors for changes in nutritional status in early stages of life may change the functioning of the organism permanently.[13]

Fisberg et al have evaluated the risk factors that determine the establishment of exogenous obesity in childhood: early weaning, introduction of inappropriate complementary foods, inadequate consumption and preparation of milky formulas, eating behavior disorders and misfits of family relationships. The same study has pointed out other contextual risk factors, such as the difficult access to areas for the practice of physical activities and active leisure in urban cities, the universalization of access to industrialized restaurants and foods, the inadequacies of the school infrastructure and the poor quality of school meals.[28]

Population-based studies have also evaluated the independent variables associated with higher risk for overweight before 5 years old in Brazil: residence in the South and Southeast regions, mean socioeconomic class (C1 and C2), maternal education > 6 years, maternal body mass index (BMI) $> 30 Kg/m^2$, being an only child or having up to 1 sibling, birthweight $\geq$ 3,900 Kg, consumption of soft drinks or fried foods or artificial juice $\geq$ 4 days/week. The National Survey Children and Women Demography and Health (PNDS, in the Portuguese acronym) (2006) has associated this condition to the early introduction of complementary feeding, consumption of inadequate food and sedentary lifestyle.[29]

In a recent publication, the WHO has emphasized the importance of food in the beginning of life to avoid excessive weight gain.[30] One of the most studied strategies to achieve this purpose is the reduction of protein burden. In fact, a cohort that has been monitored since birth by an European group of researchers[31] has demonstrated that, at 6 years of age, differences in BMI can be observed that are higher in children who during the first 6 months of life have received protein-content formulas located at the upper limits of the *Codex* as compared with those receiving breast milk or protein-content formulas located at the lower limit. Even after 6 months of life, excessive protein consumption, especially those of animal origin, should be considered a risk factor for future obesity.[32] It has also been observed that this excess is due to adiposity[33] and that it can lead to other health risks.[32,34] This effect is believed to be mediated by the lower circulation of insulin-like growth factor 1 (IGF-1) and by the reduced presence of insulinogenic amino acids observed when protein supply is lower.[35] Rauschert et al[36] state that the high protein intake in childhood is associated with higher blood concentrations of branched chain amino acids (BCAA) (valine, leucine and isoleucine), higher early growth and obesity.

According to the Household Budget Survey (HBS) 2008–-2009, the foods whose consumption were most related to the moderate risk of overweight in childhood were: soft drinks, butter or margarine, fried foods, coffee, pasta and artificial juices. The consumption of sugar-rich foods (milky products, cookies, cakes and pies, sausages, breads and chocolate products) was higher than the daily recommendations and showed a strong association with the risk of overweight in childhood. Considering these results, the child obesity depends not only on income, but also on the eating habits of the family, education level of the parents, availability of caregiver time to prepare meals, among others.[37]

The same risk factors related to the incidence of obesity in childhood increase the risk of incidence of nutritional deficiencies. Currently, malnutrition can be understood by anthropometric parameters (low birthweight, short stature, low weight gain) or by states of depletion of nutrients and micronutrients, which reflect inadequate nutrition.[13] Analyses of socioeconomic profile and family income indicate that the risk of child malnutrition is strongly determined by family income.[24] On the other hand, infants are an important risk group for the double impact of malnutrition because they are susceptible to complementary feeding rich in fat and deficient in micronutrients.[13]

Institutionalization in day care centers can be a protective factor for nutritional status changes in childhood but can also contribute to obesity. Full-time day care centers directly interfere with the nutritional status and growth of children, as they offer almost all meals of the child's day and constitute the ideal environment for the implementation of strategies for health promotion and education.[24] The school can be a facilitator to the quality of food consumption of Brazilian children when well assisted. The National School Feeding Program (PNAE, in the Portuguese acronym) (one of the most

important food policy programs in Brazil, benefiting almost 45 million people), coordinated by the Ministry of Education, establishes that children who stay full time in the teaching institution must receive at least 70% of the daily energy and nutrients recommendation. This determination certainly protects many children from malnutrition, but, on the other hand, causes those in better socioeconomic conditions to end up receiving a large daily caloric amount, when meals at home and in the institution are added and combined with the fact that, in general, there is limited space for the practice of physical activity.[38]

Mapping of The Brazilian Children Nutritional Status up to 5 Years old

The WHO estimates suggest that overweight affects $\sim$ 5 million children $<$ 5 years old worldwide.[39] According to a review of 6 Brazilian studies of population bases conducted between 1974 and 1975 and 2008 and 2009, the following changes in the nutritional status of infants and preschoolers have occurred in the past 35 years[26]:

1. The incidence of malnutrition and short stature in children has decreased significantly, especially in the last decades;
2. The incidence of overweight in children $<$ 5 years old remained constant, while a significant increase occurred in children from 6 to 11 years old.

The 2008–2009 HBS[37] showed an important increase in the number of obese children in Brazil, with a prevalence of 32.8% of overweight and of 16.2% of obesity in children $<$ 5 years old. The increasing trends of overfeeding, overweight and obesity indicate that the prevention of these outcomes is a priority for the prevention of complications and NCDs in adulthood. Currently, $>$ 20% ($\sim$ 42.5 million) of Latin American children aged between 0 and 19 years old are overweight (overweight or obese).[39]

The most recent information on the pediatric age group in different regions of the country is of municipal coverage, small communities and isolated studies conducted in different cities, indicating the prevalence of overweight ranging from 10.8% to 33.8%. The results of the 2008–2009 HBS confirm the positive evolution of the nutritional status of Brazilian children. The prevalence of overweight and obesity among Brazilian preschoolers increased dramatically between 1989 and 2006, mainly between 1996 and 2006.[23]

The secular trends of overweight among Brazilian preschool children $<$ 5 years old were studied in 3 surveys of national population bases conducted between 1989 and 2006 that suggest[29]:

1. Increased obesity prevalence by 9.4% per year: in 1989, the prevalence of overweight in this age group was 3% (95% confidence interval [CI]: 2.2–3.9), remaining at 3.4% in 1996 (95%CI: 2.5–4.3%) and with an increase of 129% (7.8%; 95% CI: 6.3–9.5) in 2006.
2. The Southern region of the country appears in all studies as the one with the highest prevalence of obesity in preschoolers. However, the increase that occurred in the Northeast region exceeds all regions, with a record increase of 20.6% per year from 1989 to 2006.

Associated with the increased prevalence of overweight, there is an increase in the frequency of chronic NCDs and the precocity with which they affect pediatric age groups. The set of diseases called metabolic syndrome involves conditions such as high blood pressure, type 2 diabetes mellitus and dyslipidemia, and is a strong determinant of the risk of NCD, reduced quality of life and increased morbidity and mortality.

At a lower rate, the prevalence of malnutrition decreased by $>$ 60% from 1996 to 2007.[14] In Latin America, low growth (Length/Age $<$ Z score - 2) is the most frequent nutritional deficiency in children $<$ 5 years old. In Brazil, the prevalence of short stature in children $<$ 5 years old was 7.1% (2007). The coexistence of high prevalence of short stature with high prevalence of overweight increases the risk of double impact of malnutrition at the home level, which occurs in the binomial "children with short stature" and "overweight mothers"; whose prevalence in 2006 and 2007 was of 2.7%.[25]

Despite the unquestionable importance of national studies, they do not discriminate specific population groups and variations of prevalence in different epidemiological contexts. In an attempt to encompass the complexity of the distribution of child nutritional problems in the country, a systematic review included 33 articles published from 2006 to 2014, conducted with preschool children and children $<$ 5 years old. As described, despite the reduction in the prevalence of nutritional deficits in children $<$ 5 years old, its prevalence still represents a public health problem associated with social inequality:[24]

1. Samples from day care centers: 9 articles with samples from 189 to 676 children, from 6 months to 7 years old (states of SP, MG, PA, PE, PB). Prevalence of growth deficit: 3.3 to 20.5%; prevalence of overweight/obesity: 2.3 to 7.5%. Mean prevalence of growth deficit by sample size: 9.11%; overweight: 5.37%.
2. Samples of primary care services: 4 articles with samples from 155 to 443 children from 6 months to 7 years old (states of SP and MG). Prevalence of growth deficit: 6.3 to 9.7%; prevalence of overweight/obesity: 5.2 to 17.9%. Mean prevalence of growth deficit by sample size: 7.25%; overweight: 10.97%.
3. Samples in at-risk populations: 5 articles with samples from 99 to 973 children from 6 months to 5 years old incomplete. Prevalence of growth deficit: 11.5 to 45.3%; prevalence of overweight/obesity (weight/height [W/H]): 2.1 to 7.1% (W/H) and 5.9% to 6.4% (BMI/I).
4. Samples in studies by Brazilian cities, regions, and states: 15 articles with samples from 164 to 6,397 children from 6 months to 5 years old. Prevalence of growth deficit: 5 to 16.5%; prevalence of overweight/obesity: 3.2 to 12.5% (W/H) and 6.3 to 11.2% (BMI/I). Mean prevalence of growth deficit by sample size: 10.2%; 10.18% (W/H) and 7.70% (BMI/I).

According to the same survey, the highest growth deficit rates are found in populations living in hazardous conditions

(21.42%); the risk of malnutrition is up to 2.38 times higher in these groups compared with population-based sampling. The risk of malnutrition in children assisted in public primary care services is also 2.37 times higher compared with population-based studies ($p = 0.01$). Samples of children attending day care centers are not at increased risk. On the other hand, obesity and overweight are equally distributed in the population of Brazilian children, with no significant differences between the results of population-based studies and studies with specific groups.[24]

The Consumption Profile of Children Under 5 Years Old in Brazil

One of the key aspects for assessing the child's nutritional status is the knowledge of their eating habit, which, when properly established in the first years, can have a positive impact on the state of health and nutrition throughout life. Because it is an accelerated development and growth phase, with the possibility of preventing metabolic diseases directly related to the quality of food, the knowledge of the consumption profile at early ages reflects a fundamental indicator of health and economy.[40]

In Brazil, introduction of complementary foods before 6 months old and of inadequate foods to children < 2 years old are frequent.[41] Data from 2015 from the Food and Nutrition Surveillance System (SISVAN, in the Portuguese acronym) reflect this reality, in which 41.1% of the children evaluated under 6 months and 98.7% of those aged 6 to 23 months old had inadequate food consumption, based on the recommendations of the "Ten steps towards healthy eating." Among the factors associated with this inadequacy are primiparity, inadequate health care without support to the mother and previous education, maternal age, return to work, child's low weight gain, popular practices and habits such as offering tea in the presence of colic, use of pacifier and low adherence to exclusive breastfeeding.[42] Vieira et al showed a lower incidence of early supply of water, tea, juice, fruit porridge, vegetable porridge and family meal in infants who were breastfed than those not breastfed,[43] where the chance was 8.2 times higher of offering family meal to infants aged ≤ 4 months old and nonbreastfed.

From 6 months, the inclusion of adequate foods is necessary to ensure caloric and protein complement and adequacy of micronutrients important for the development and growth of the child, no longer being sufficiently affected only with breast milk and/or infant formula.[44] The family plays a decisive role in the formation of new habits, in responsiveness to food intake and in the formation of a pattern of eating behavior.

The food introduction of Brazilian children consists of mashed fruit, beaten soup and milky preparations in the form of porridge (addition of cereal or thickener – corn starch), and therefore, the insufficiency of iron, vitamin A and zinc consumption through complementary feeding is frequent. Saldiva et al[40] in a study conducted in 136 municipalities of São Paulo, totaling 24,448 children, have identified a dietary pattern of children with 6 months, of fruit (87%), soup (liquid or pasty meal and salt, 78%), porridge (63%), beans (58%), pot food (solid salty meal that contains whole pieces of food and resembles adult food, 64%) and soup or food with meat, that is, iron source, lower than the other items (36%), and the probability of the child consuming meals based only on milk and porridge was 82%.

The late introduction of beef was also observed in other studies, reinforcing the increased risk for inadequate iron consumption.[45,46] However, as a positive evaluation, the average fruit supply at the time of food introduction is high, evidencing that fruit is the second most consumed food, after milk.[40]

The food profile as of the introduction of food and propagated until 2 years old reflects, primarily, family eating habits, nutritional knowledge of the caregiver, time of maternal study and urbanization with direct access to food.[40,47,48] From 1974 to 2003, the food intake of the Brazilian population was characterized by consumption of fruits and vegetables below the recommendation and surplus sugar and fat. This profile is consistent with evaluations of the dietary pattern of children aged 2 to 5 years old throughout Brazil, as shown in the 2006 National Survey of Demography and Health, in which 53.2% of the children evaluated ($n = 3,086$) had not consumed vegetables in the 7 days prior to the interview, 25.3% had not consumed legumes and 11.5% fruits.[49] On the other hand, foods such as fried foods, soft drinks and cookies were part of the diet of 50.1%, 73.7% and 91.3% of the children in at least 1 day, respectively.

Studies from north to south of the country evaluated their regions separately with similar patterns – inadequate consumption of food sources of fiber and micronutrients and excessive consumption of foods rich in fat, sugar, salt and low fiber, directly corroborating the current anthropometric patterns in the Brazilian infant population. Foods such as breads, cookies, cakes, sweet pies, milky products, chocolate products and sausages are strongly related to overweight. Despite the still significant daily consumption of rice or pasta (77%; 95%CI: 75–79.5), beans or lentils (66.2%; 95%CI: 63.5–68.8), meat (beef or pork), chicken or fish (32.2% 95% CI) and fruit (44.6%; 95%CI 41.5–47.8) in the food repertoire of Brazilian children aged 6 to 59 months old,[49] the high consumption of foods with higher caloric density (fried foods, candies, cookies, snacks and soft drinks), added to the inadequate consumption of vegetables and legumes, have a substantial impact on the prevalence of overweight, in addition to other associated chronic diseases, and nutritional deficiencies due to inadequate consumption of vitamins and minerals.[39,45,47] According to de Carvalho et al, when conducting a review study on food intake and nutritional adequacy in Brazilian children, with data from 2003 to 2013, the authors showed that consumption adjustments have ranged from 0.4% to 65% for iron, 20% to 59.5% for vitamin A, 20% to 99.4% for zinc, 12.6% to 48.9% for calcium and from 9.6% to 96.6% for vitamin C.[45]

Better eating patterns, with consumption of beans, vegetables and legumes, are prevalent among female children, among children living in the urban area and among children with mothers who have ≥ 12 years of education. Inversely proportional are the markers of unhealthy feeding, with higher prevalence of the consumption of fried foods, biscuits or cookies and snacks among children with mothers aged ≤ 20 years old, children whose mothers have 9 to 11 years of

education and whose mothers were between 20 and 29 years old, respectively. Regarding the frequent consumption of sugary drinks (soft drinks and artificial juices), data are associated to children with mothers who have 5 to 8 years of education.[50]

As of the age of 2 years old, school, social relationships outside the family environment and food preferences interfere positively and/or negatively in the repertoire and eating habits in a more marked way.[49,51] Bueno et al[52] in a multi-year study conducted with 85 schools (public [63.5%] and private [36.5%]), covering 3,058 children between 2 and 6 years old from 9 Brazilian cities, evaluated the adequacy of nutrient intake from a qualitative and quantitative analysis of children's feeding for one day, from weighing and diet calculation. The results reinforce the need for constant attention and improvements in the profile of food supply and consumption of Brazilian school-age children, where despite the low prevalence of inadequate intake of vitamins essential to health (B1, B2, B3, B6, folate, phosphorus, magnesium, iron, copper, zinc and selenium), $\sim$ 30% of the sample consumed more saturated fat than recommended, 15 to 29% had inadequate vitamin E, $>$ 90% had inadequate vitamin D intake, 45% of children $>$ 4 years old did not reach the calcium recommendation, and sodium intake was higher than recommended for $>$ 90% of children $<$ 4 years old and for 73% of children $>$ 4 years old.

On the other hand, the school can be an ally in the construction of appropriate eating practices, by promoting the interaction of consumption with other children, planning a nutritionally appropriate menu, according to age, schedule of nutritional education activities and control in the quality of snacks brought by children and those sold in canteens. According to the dietary recommendations of the Manual of Healthy Snack of the Brazilian Society of Pediatrics,[53] for the snack to be considered healthy it should be composed of three food groups: one source of carbohydrate (breads, cakes and whole cookies, corn, popcorn), one source of protein (almost always milk) and a source of vitamins and minerals (fruit or vegetables, avoiding juice). Often, what is observed in studies evaluating the quality of intermediate snacks in preschoolers and schoolchildren is a high presence of industrialized foods, although eventually they follow the recommendation of food groups. Foods such as snacks, cereal, cereal bar, stuffed biscuit, biscuit without filling, artificial juices like nectar, industrialized cake, milk drink, yogurt with added sugar, processed cheese and candies are common in children's snacks,[54] and reflect inadequate practices that reinforce the maintenance of the nutritional status profile of children today.

Complications Associated with Changes in Nutritional Status in Childhood

Despite the higher availability of food in recent decades, there is still a high prevalence of nutritional deficiencies in the Brazilian population. First, because access to food is not egalitarian to all and, second, because food choices will not necessarily meet physiological nutritional demands according to age, gender, health condition and nutritional status.[51]

This is a reality considering the inadequate profile of food consumption in recent years presented in the previous topic; although it seems that over time children are better fed, due to the reduction of malnutrition throughout Brazil, children may suffer from "hidden hunger," which consists of adequate or even increased caloric intake, but without achieving micronutrient recommendations, to the detriment of inadequate food choices; high caloric density foods, high in sugar and low quality fat, and insufficient consumption of fruits, vegetables, legumes and meat (HBS 2002–2003). The condition of a child's nutritional status is strongly evaluated by the presence or absence of deficiency diseases, the most frequent being iron deficiency anemia, zinc and calcium deficiency, hypovitaminosis A, D, B9 and B12; micronutrients directly related to linear growth and healthy development.

Iron Deficiency Anemia

According to a systematic review conducted in 2014 on the prevalence of anemia in Latin American countries, Brazil has a moderate prevalence of anemia among children aged 6 months to 5 years old, ranging from 20.1% to 37.3%. The most recent Brazilian data on this problem are from the National Health Survey (2006–2007), which indicates that 1 in 4 Brazilian children $<$ 5 years old have anemia (18.6–-24.9%). In the same period, the prevalence of short stature and malnutrition was 7.1% (5.8–8.7%) and 7.3% (6.0–8.6%), respectively. In children $<$ 5 years old, overweight is associated with growth deficit, but there is no association with anemia. There was no association between anemia and other anthropometric markers in children $<$ 5 years old.[55,56]

The highest prevalence of anemia occurs in preschool children (47.4%), followed by pregnant women (41.8%) and women of childbearing potential (30.2%).[57] It is known that, in addition to the determining factors of this serious situation, the most worrying systemic manifestation of iron deficiency anemia and iron deficiency are, however, the impairment in cognitive, behavioral development, and in motor coordination not only due to the smallest level of clinical suspicion but also due to the diagnostic difficulty, severity and late onset.[58]

The clinical trial National Study of Home Fortification of Complementary Feeding (ENFAC, in the Portuguese acronym) was conducted in 4 Brazilian cities (Rio Branco, Olinda, Goiânia and Porto Alegre) to evaluate the impact of micronutrient fortification on the health of children who attended primary health care services. A total of 1,213 children were evaluated between June 2012 and January 2013. One arm of the study aimed to study the prevalence of anemia in the sample studied. A total of 520 children aged between 11 and 15 months old were evaluated. Anemia was defined by hemoglobin concentrations $<$ 110 g/L (WHO) and iron deficiency by plasma ferritin concentration $<$ 12 mcg/L or transferrin saturation $>$ 8.3mg/L. The prevalence of anemia, iron deficiency, and iron deficiency anemia was: 23.1%, 37.4% and 10.3%, respectively. The prevalence of short stature was 5%. The risk factors that were significantly related to the occurrence of anemia in the sample studied were: $>$ 1 child $<$ 5 years old in the house, introduction of fruits and vegetables after 8 months of life, short stature, previous hospitalization, and low serum folate concentrations. The prevalence found in this cohort was lower than the results of a systematic review of studies published between 1996 and

2006, which revealed a prevalence of 55.6 to 65.4% in children < 12 months old and 55.1% and 89.1% in children aged 12 to 24 months old. Other studies in different regions of Brazil indicated a prevalence of 37.2 to 76%, evidencing regional variations and unequal distribution of this condition in the country.[59]

According to a study by Vellozo et al, fortification is widely considered to be the most practical approach and the one with the best cost-effectiveness ratio in the medium and long term. Since 2002, with the approval of the Ministry of Health Technical Regulation, through Resolution RDC no. 344 of the National Health Surveillance Agency (Anvisa, in the Portuguese acronym), the fortification of wheat and corn flours with iron and folic acid has become mandatory. This mandatory measure, since June 2004, establishes that each 100 g of the product must contain at least 4.2 mg of iron, which represents 30% of the adult Dietary Reference Intakes (DRI), and 150 mcg of folic acid, which corresponds to 37% of the adult DRI.[60]

Hypovitaminosis A

Since the introduction of food, there has been a low presence, mainly of vegetables and meat, in the diet of children < 1 year old, a more critical immunologic period. Associated with this, foods low in micronutrients, including vitamin A, such as cookies, breads, cereals, pasta, rice, candies, among others, are inserted more frequently. The survey of the National Demography and Health Survey (PNDS, in the Portuguese acronym) (2006), shows a prevalence of 17.4% of hypovitaminosis A in Brazilian children < 5 years old; classified as a moderate public health problem (prevalence of 10 to 20%).[39,45,47]

Other Nutritional Deficiencies

All other vitamin deficiencies may result from the typical eating pattern of Brazilian children aged 0 to 5 years old (HBS 2002–2003) and reinforce the food inadequacy due to low consumption of the recommended portions, according to Guides and Manuals of the Ministry of Health and of the Brazilian Society of Pediatrics, and frequency of irregular consumption to the point of lacking essential elements for good growth and development.

Sangalli et al[61] showed that there was a low prevalence of micronutrient inadequacy (evaluation by Estimated Average Requirement [EAR]) important for the growth and development of the child (zinc [0%], iron [1.2%], vitamin C [4.7%], vitamin A [5.2%], calcium [11.4%] and folate [15.2%]), due to the high consumption of fortified products in the analyzed infant population (88.1% of the 466 children, contributing between 11.3 and 38.3% in micronutrient intake). Thus, in addition to addressing the quality of food processing, it is currently important to evaluate whether the food consumed, such as milky products, cookies and farinaceous, is fortified or not, because even if there is no consumption of naturally source food, the diet may be adequate in the evaluation of certain micronutrients.

►**Table 1** summarizes the source foods, the prevalence of serum inadequacy and the expected consequences of low consumption of vitamins and minerals, in addition to iron and vitamin A, on the child's health.

Food Difficulties and Nutritional Risk in Childhood

Eating problems such as selectivity, refusal to eat, neophobia or aversion are heterogeneously identified among children and adolescents.[62] During the first years of life, family eating habits and biopsychosocial factors are particularly relevant in the genesis of nutritional problems and malnutrition.[63]

The inclusion of all food groups in the main meals, the variety of the supply of fruits in natura, legumes and vegetables, and the restriction of the consumption of flavor enhancers, sugar and saturated fats, contribute to the establishment of preferences, choices and habits that confer health benefits.[64] The choices and behaviors that go to the family table directly reflect on the quality of the food of the child, who mirrors their parents.

Often, the fragility of the mother-baby dyad bond results in problems with eating and nutritional problems in childhood, which can negatively influence healthy growth and development and, mainly, be a determining risk factor for the worsening of several clinical conditions – in this case overweight and/or obesity – or even some other initial process – such as difficulties and eating disorders. Paradoxically, most inappropriate parental practices result from the concern of the parents about their children's weight.[63] Responsive or authoritative caregivers are those who sufficiently correspond to the child's demands, encouraging the exercise of their autonomy and valuing the signs of hunger and satiety to determine the beginning and end of the meal. On the other hand, authoritarian, indulgent or negligent caregivers, impair the normal development of the diet. In nonresponsive practices, the caregiver or the child has excessive control over the diet and there is no division of responsibilities. Practices of restriction, coercion, bargaining, blackmail or punishment originate obesogenic eating behaviors, characterized by monotonous diets, rich in energy, sugar, fats, and poor in micronutrients. Randomized controlled trials have shown evidence that providing guidance on responsive practices for mothers to recognize signs and adequately respond to their children's hunger and satiety can lead to "normal" weight gain and "normal" nutritional status in children aged 0 to 24 months old, compared with mothers who did not receive guidance. On the other hand, restrictive and coercive practices are associated with excess and weight gain and nutritional deficits and low weight, respectively.[63]

Even in cases of greater severity, the occurrence of eating difficulties in childhood does not determine anthropometric changes in most cases. However, the risk of nutritional problems and micronutrient deficiency results from the consumption of foods of high energy value, rich in fat and sugar, and of low nutritional value. Therefore, evaluation and approach of infants and preschoolers with eating difficulties should precede changes in nutritional status.

Studies on the Use of Young Child Formula and its Results in Different Populations

A recent study, published by Eldridge et al[65] has evaluated the patterns of milk and dairy products consumption in Australia, Russia and the United States, using nationwide data. The authors verified that milk and dairy products

Table 1 Source foods, the prevalence of serum inadequacy and the expected consequences of low consumption of vitamins and minerals, in addition to iron and vitamin A, on the child's health

	Food Sources (I)	Daily consumption recommendation (I)	Prevalence of serum inadequacy in children under 5 years of age	Symptoms of vitamin deficiency	Consequences of severe disability
VITAMIN D	D2 (ergocalciferol), obtained by ultraviolet irradiation of vegetable ergosterol (vegetables, fungi, yeasts) and in commercial products. D3 (cholecalciferol), result of the non-enzymatic transformation of the precursor 7-dehydrocholesterol existing in the skin of mammals, by the action of ultraviolet rays. 7-dehydrocholesterol is also found in cod liver oil, tuna, dogfish, sardines, egg yolk, butter and fatty fish (herring).	400 IU - 0 to 12 months 600 IU - 1 to 3 years 600 IU - 4 to 8 years	68.2% (2019) - 468 children aged 11 to 15 months old (II)	Fatigue Muscle weakness Pain in joints, muscles and bones	Growth retardation Autoimmune diseases Cancers Fractures Development of osteoporosis in adulthood
FOLATE - B9	Beans, viscera, dark green leaves (broccoli, spinach), potatoes, wheat and yeasts and, to a lesser extent, milk, eggs and fruits.	65 µg - 0 to 6 months 80 µg - 7 to 12 months 150 µg - 1 to 3 years 200 µg- 4 to 8 years	0.8% - 460 children from 11 to 15 months (IV)	Diarrhea Weakness Vertigo Dyspnea	Anemia
CYANOCOBALAMIN - B12	Animal tissues, beef, pork, poultry and fish, viscera, mainly liver, kidneys and heart, egg yolk, seafood and beer yeast and, to a lesser extent, milk and dairy products.	0.4 µg - 0 to 6 months 0.5 µg - 7 to 12 months 0.9 µg - 1 to 3 years 1.2 µg- 4 to 8 years	15% - 460 children from 11 to 15 months (IV)	Fatigue, shortness of breath, numbness, lack of balance and memory problems.	Pernicious anemia Neuropathy
CALCIUM	Milk and derivatives, fruits, fish, meats, greenery, beans.	210 mg/day - 0 to 6 months 270 mg/day - 7 to 12 months 500 mg/day - 1 to 2 years 800 mg/day - 3 to 8 years	50% and 93% - children from 1 to 3 years ($N = 45$) and 4 years ($N = 19$), respectively (study 2019) (V)	Cramps, muscle weakness or muscle spasms, fatigue, irritability or tingling sensation	Growth delay Fractures Cardiovascular diseases Development of osteoporosis in adulthood
ZINC	Beef, chicken, fish, legumes, whole grains, nuts.	2 mg/day - 0 to 6 months 3 mg/day - 7 to 12 months 3 mg/day - 1 to 2 years 5 mg/day - 3 to 8 years	13.8% and 16.2% (2016 review study, children attending day care centers) (III)	Drop of immunity	Short stature Loss of taste

References of ►**Table 1**: (I),[23] (II),[95] (III),[51] (IV),[96] (V).[97]

determine an important contribution to adequate nutrient intake in children, so that this practice should be encouraged. Within this reality, the use of YCFs in children has been the object of study in different populations, seeking to understand whether such segment would fit as essential, optional or expendable. Basically, these studies were designed to compare the adequacy of consumption and nutritional status before and after interventions.

Evaluating the studies of the last 5 years related to this consensus (2016–2020) indexed on the PubMed and Scielo platforms, some relevant data can be highlighted, as described below.

Two studies used data from the UK Diet and Nutrition Survey of Infants and Young Children to assess the adequacy of various micronutrient consumption in > 1,000 children aged between 12 and 18 months old. A group of children who often consumed an YCF was compared with a group that did not. Verger et al observed better scores of consumption of short-chain fatty acids, long-chain polyunsaturated fatty acids (LC-PUFAs), vitamin D, zinc, iron and copper in the group that consumed an YCF. The study does not mention the amount of YCF consumed by the children and characterized as "routine use" any consumption other than zero.[66] Vieux et al[67] have observed that the group using YCF and/or nutritional supplement has reached with greater proportion the nutritional adjustments proposed by the EFSA. The nutrients with improved consumption related to the use of YCF were carbohydrates, fiber, LC-PUFAs, thiamine, niacin, biotin, folate, vitamin D, vitamin E, retinol, sodium, potassium, calcium and phosphorus. There was no anthropometric difference between the groups resulting from the intervention.

Several other studies on the impact of YCFs consumption on the nutritional adequacy of micronutrients have been conducted in several populations, all of which have reached

very similar observations. Li et al,[68] for example, in a Chinese study conducted in five large cities, have shown that YCFs can contribute to reducing the risk of insufficient intake of several key micronutrients. The design of the studies below was also quite similar: the comparison of a group using one YCF with another using cow's milk.

Lovell et al[69] conducted a study in two sites: Auckland (New Zealand) and Brisbane (Australia). A total of 160 children have been evaluated and monitored from 12 to 24 months old, divided into 2 groups: 1 in consumption of at least 300mL/day of YCF and the other in consumption of a similar amount of cow's milk. The children in the intervention group had lower protein intake and higher intake of iron, vitamin D, vitamin C and zinc. At the end of the 12 months of intervention, the children in the study group showed improvement in serum levels of vitamin D, hemoglobin and ferritin when compared with baseline, with statistical significance when compared with the control group under control consumption.[70] Another interesting outcome was the difference in body composition in favor of the study group, which presented lower mean body fat percentage in the 12th month of intervention.[71]

In Germany, Hower et al showed that the daily intake of 350mL of YCF enriched with 2.85 mcg/100mL of vitamin D protected children aged between 2 and 6 years old against hypovitaminosis D in the winter period of that country.[72]

Ghisolfi et al, in 2013,[11] compared the consumption of various micronutrients in French children aged between 1 and 2 years old in consumption of YCF or cow's milk, and concluded that the control group did not reach the recommended amounts of vitamin D, vitamin C, iron, α-linolenic acid and linoleic acid, unlike the study group that reached them without difficulties.

Chouraqui et al, 2019,[73] conducted a controlled multicenter study with almost 1,000 children aged between 1 and 3 years old. Children $<$ 2 years old using YCF consumed lower amounts of protein and sodium than those who consumed cow's milk. For all ages, the consumption of 240mL/day of YCF was shown to be a sufficient strategy for the adequacy of vitamin A, vitamin C, vitamin D, vitamin E, B complex (except vitamin B12), iron and LC-PUFAs, with statistical significance.

In the United Kingdom, a group of $>$ 500 children aged between 12 and 18 months old were compared by Eussen et al[74] regarding the adequacy of vitamin D, iron and lipid intake. Children who received YCF had lower consumption of saturated fats and higher intake of LC-PUFAs, vitamin D and iron, which was interpreted by the authors as a better nutritional adequacy.

Akkermans et al[75] showed that children aged between 1 and 3 years old from three European sites who received YCF daily for 20 weeks improved their serum levels of ferritin, hemoglobin and vitamin D, unlike the group that received cow's milk in the same period.

In Ireland, two studies have also shown advantages in the use of YCF. In one of them, Walton et al[76] observed that children aged between 1 and 3 years old who received 300mL/day of an YCF had consumption of lower amounts of protein, saturated fat and vitamin B12 and higher of carbohydrates, fiber, zinc, iron, vitamin C and vitamin D. In another study, by Kehoe et al,[77] a four-day recall was used with parents of 500 children aged between 1 and 3 years old, and concluded that the intake of 1 YCF enriched with 3.1mcg/100mL of vitamin D and 1.2mg/100mL of iron had an important impact on the adequacy of daily intake of these 2 micronutrients. In the case of vitamin D, the intake of the group receiving YCF was higher when compared with another group that received supplementation alone of this nutrient. It was observed in the groups that the 2 main nutritional sources of iron were YCF and red meat (12 and 11% of the iron consumed, respectively), and this strategy proved to be more effective than the fortification of cow's milk with iron salts.

Two studies had as object the impact of the association of prebiotics in YCFs. Chatchatee et al[78] followed 2 groups of children aged between 11 and 29 months old. The study group received between 400–750mL/day from 1 YCF enriched with 1.2 g/100mL of galactooligosaccharide (GOS) mixture with fructo-oligosaccharides (FOS), in the ratio of 9:1, plus 19.2mg/100mL of mixture of EPA with DHA in the proportion of 4:6. The control group received the same YCF but without galactooligosaccharides (GOS), Fructooligosaccharides (FOS) and omega-3. The authors observed a 6% reduction in the risk of viral infections in the period of 52 weeks of observation, a result that, although apparently small, presented statistical significance by the 95%CI. Also, the effect of adding pre- and probiotics on the intestinal microbiota was tested by Kosuwon et al,[79] using a group of 129 Thai children between 1 and 3 years old. The proposed intervention was the consumption of 500–650mL/day for 12 weeks of one YCF enriched with a mixture of 1.2 g/100mL of GOS and FOS in the ratio 9:1, in addition to the probiotic *Bifidobacterium breve* M-16V. The results observed in the intervention group were increased proportion of intestinal microbiota components belonging to the gender *Bifidobacterium,* reduction of fecal pH by an average of 7.05 to 6.79 and presence of softer feces.

Another Consensus on the Subject

The European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN)[80] defines YCF as milky compounds or vegetable drinks designed to partially meet the nutritional needs of children aged between 1 and 3 years old. The understanding of this society is that there is insufficient evidence for the drink to be indicated as a routine in children of the aforementioned age, although it can be used as a strategy to improve the nutritional intake of iron, vitamin D and LC-PUFAs and to reduce excessive protein intake. It is also highlighted that infant continuation formulas could be used for this same purpose.

The EFSA[81] defines YCF as a formula designed specifically for young children (1 to 3 years old). The document mentions that there is no specific legislation that serves as a guideline for the composition of this drink and raises nutritional requirements for children up to 36 months old. The positioning of the society, similar to that of ESPGHAN, is that the use of GUM should not be indicated as a routine for

children > 1 year old, because a balanced diet would be able to provide the necessary nutrients for adequate physiological growth. However, it can be a useful tool for the adequacy of vitamin D, iron, iodine and LC-PUFAs consumption.

Positioning of other Countries and other Societies

There is a Belgian consensus on the indication of YCFs for children aged between 1 and 3 years old, published by Vandenplas et al. According to this document, and in a way very similar to the previous positions, YCF is not an indispensable product for the child's diet to be balanced, but can be used as a tool to improve the consumption of nutrients such as vitamin D, fiber and LC-PUFAs in children with inadequate eating habits.[82]

In 2019, a document published by a panel of American experts[83] with participation of The American Academy of Pediatrics (AAP) stated that milky products specific to children between 1 and 5 years old are not recommended because nutritional needs must be met primarily through nutritionally appropriate dietary patterns. According to this panel, although there is no evidence to indicate that YCF is harmful, these products do not offer an unique nutritional value, beyond that that could be achieved through a healthy diet; in addition, they could contribute to sugars added to the diet, as well as being more expensive than an equivalent volume of cow's milk. The recommendation endorsed by the AAP is for children > 1 year old to use unmodified cow's milk.

Przyrembel et al[84] published a position on the theme, also against the above: although YCF is not a necessity in children aged between 1 and 3 years old, it can be used as a tool for nutritional adequacy of some essential nutrients and prevent excessive protein intake. Turck[85] has also published positioning similar to that of Przyrembel et al.[84]

Tounian,[86] on behalf of "The multidisciplinary working group of the French Pediatric Society on iron", expressly recommends that between 1 and 6 years old, children should drink at least 300 ml per day of YCF until they can consume 100 to 150 g per day of meat products.

Discussion on Literature Data and the Brazilian Reality

While the use of new technologies in the production of healthy foods is often a cause for concern, the potential for and an innovative food technology that allows to produce a wide variety of foods with enhanced flavor and texture and confers various benefits to consumer health is promising. Thus, the use of modified foods and products in all age groups has been increasingly proposed and studied in scientific investigations.[87]

Specifically, YCFs, which are drinks or infant formulas based on milk or vegetable proteins, specially developed to partially meet the nutritional requirements of children > 1 year old, have aroused the interest of the food industry and researchers in the child health field.[80]

Since there is no single international definition or composition criteria for YCF[80] and its composition is not fully regulated, the industry has launched and made available different milk-based products with varying nutritional composition on the market in recent years. In addition, it has performed aggressive marketing of "baby milks" (sugary milk-based drinks for babies), declaring health benefits of the product, often with a focused and not comprehensive look.[82] These products often have unclear labeling information, which creates confusion with infant formulas.[88]

Consequently, YCF has been increasingly introduced into the diets of young children, leading to increased consumption in the last 2 decades. Market studies estimate associations between marketing (television advertising spending, product price, number of retail views) and sales volume of milks by brand and category. In a recent publication, American researchers analyzed products sold by 8 brands from 2006 to 2015. During this period, advertising spending on "baby milks" increased 4-fold and sales volume increased 2.6 times.[89]

This scenario has raised concerns about the consumption of these food by young children, which has motivated children's health researchers, government agencies and industry to seek scientifically based answers about the contribution of these products to children's health.[90] From the science side, there has been substantial growth in the number of researches related to this topic in recent years. As an example, 236 scientific papers assigned to the terms *growing up milk* or *young child formulas* have been identified in the virtual PubMed database of the National Library of Medicine in February 2020, and more than half of them have been published in the last 7 years (►**Fig. 1**).

Literature reviews point out that although they are not a need for adequate nutrition for the age group for which they are intended, YCFs can be useful and compensate the nutritional deficiencies that may occur in the phase of transition from child nutrition to family nutrition, especially in situations in which the eating pattern of the family is insufficient to meet nutritional requirements.[82,84]

Expert groups have been formed to determine the appropriate nutritional composition of these products aimed at children from 1 to 6 years old, which aim at the development of guidelines with practical implications in their manufacture.[90] Although there are efforts for public-private dialogue, there is still a considerable difference between the strength of marketing and scientific evidence on the health benefits of GUM.

A study based on the Delphi method with Portuguese pediatricians specialized in infant nutrition identified that there was no consensus on the nutritional benefits of using YCF in the 2nd year of life, although the panel agrees that these formulas have some advantages over integral cow's milk.[91] Another study concluded that GUM consumption reduced the risk of iron and vitamin D inadequacies, two nutrients often absent in the diets of young children who consume only enriched cow's milk.[76]

Concisely, it seems acceptable to understand that the composition of an YCF potentially contributes to (1) decreasing the overall protein intake, which tends to be higher than the reference values for this age, (2) increase the content of

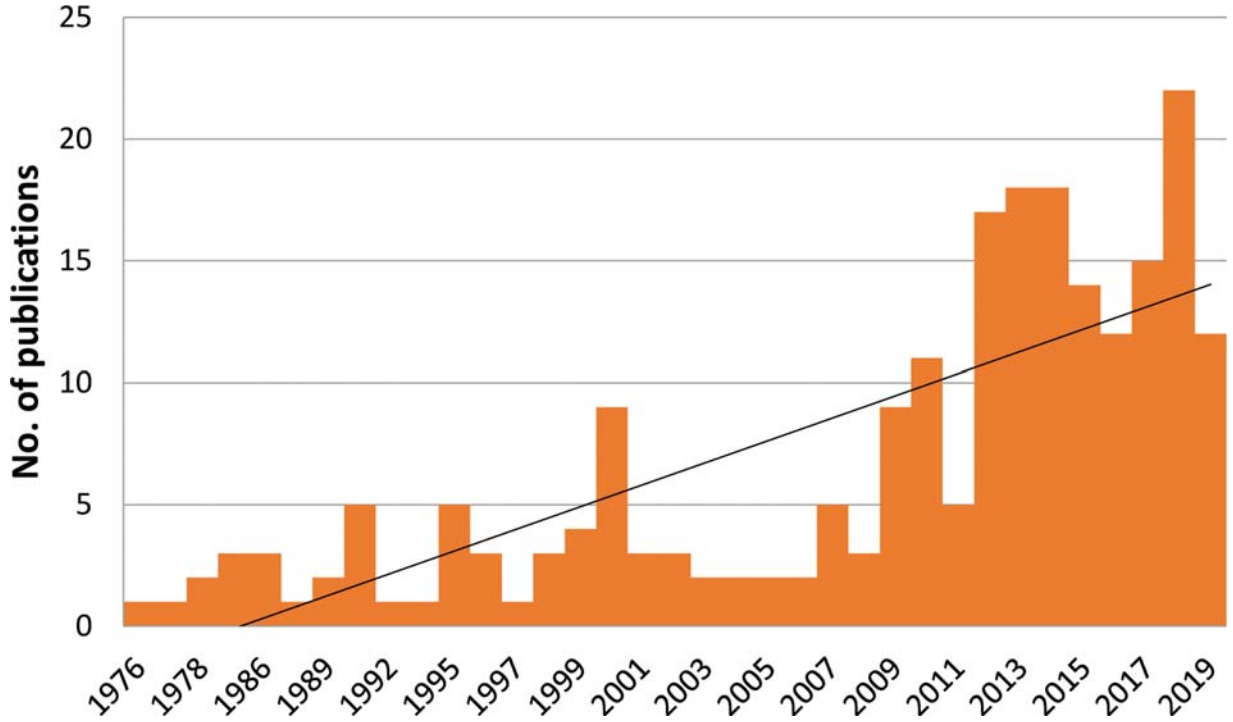

Fig. 1 Number of scientific articles related to the terms "Growing Up Milk" or "Young Child Formulas" that were published in journals indexed in the PubMed database of the National Library of Medicine in February 2020.

essential fatty acids with the addition of long-chain polyunsaturated fatty acids (docosahexaenoic and arachidonic acids) and (3) ensure the supply of some minerals (such as iron, calcium and phosphorus), vitamins (D, B2 and B12) and fibers/prebiotics.[84]

In Brazil, the growth in the consumption of these compounds is recent. The feeding of Brazilian children evaluated in 2 national surveys (1996 and 2006), showed that, among 4 eating patterns, the least present among children in the 2nd year of life, was one that included dietary formulas.[92] Another retrospective study with 164 mothers from 11 Brazilian cities with children aged 13 to 24 months old, conducted in 2009 and 2010, identified that 32.9% of the children consumed breast milk, 98.7% whole cow's milk, and only 10.9% "grow up milk," at the time of the interview.[93]

The Brazilian Society of Pediatrics recognizes the possibility of using YCF to minimize any nutritional deficiencies that may occur due to food selectivity. However, it states that it is recommended that these compounds do not present sucrose and fructose addition and, besides, reduce sodium and saturated fat.[23]

In this context, the results presented here suggest that, in general, the evidence on the health effects of YCF is still limited.[80] In some specific situations of clinical practice, this product presents as an alternative to improve the quantity and quality of ingested nutrients which, once lacking, jeopardize the maintenance of metabolic functions and normal physical growth. However, it seems clear that YCF should not be pointed out as a mandatory nutritional need for young children.[84] Traditional foods in a balanced diet potentially provide all the nutrients necessary to ensure adequate nutritional status, especially when breastfeeding is provided exclusively until the 6th month and continued with complementary feeding until $\geq$ 2 years old.[94]

Conclusions

Considering that:

1. Current Brazilian recommendations suggest the consumption of 3 portions of milky products per day for children aged between 1 and 3 years old and 2 portions for preschoolers and recognize the importance of these foods for nutritional health;
2. There is no specific regulation in Brazil for milky products specifically formulated for children between 1 and 6 years old;
3. The prevalence of obesity is high and increasing in the preschool age group;
4. Excessive protein consumption is one of the obesogenic factors in young children;
5. Different surveys demonstrate the presence of multiple deficiencies of vitamins, minerals and essential fatty acids omega 3 in the feeding of Brazilian children, configuring a high prevalence of hidden hunger;
6. In Brazil, the usual infant diet, as of the introduction of complementary feeding, is generally inadequate, with excessive calories and proteins, contributing to the high prevalence of obesity;
7. There is a need for an institutional positioning based on scientific evidence on YCF that directs the practice of professionals who care for children in this age group.

The Brazilian Association of Nutrology Recommends that:

1. **FOR THE GOVERNMENT AREA**
   (a) Start an evidence-based discussion to create the YCF category, separately from the general category of infant formulas and milky compounds;
   (b) Be created regulations on the composition of YCF so that this product is aligned with the nutritional needs of the age group and the Brazilian reality;
   (c) The marketing of YCF is regulated to avoid misleading advertising and confusion with infant formulas, preserving policies to protect breastfeeding.
2. **FOR THE INDUSTRY**
   (a) Young Child Formula is produced with composition aligned with the nutritional needs of the Brazilian child;
   (b) The YCF should also meet the recommendations of the country's public policies, especially with regard to the levels of calories, sugar, salt and saturated fats;
   (c) Young Child Formula is disseminated in such a way as not to lead to consumer confusion when comparing these products with food aimed at children < 1 year old;
   (d) The YCF have, in the context of their divulgation, the clear information that it is not a product for routine use and, even less, mandatory.
3. **FOR HEALTHCARE PROFESSIONALS**
   (a) Young Child Formula may be prescribed for children > 1 year old, within the recommendation of the intake of milky products, in substitution or in parallel to unmodified cow's milk, especially in case of need to adjust the supply of macro and micronutrients;
   (b) Consider YCF as a strategy to provide the recognized benefits of unmodified cow's milk, with the advantage of having lower protein content and being a food fortification vehicle to ensure adequate intake of essential vitamins, minerals and fatty acids;
   (c) Assess the economic impact that YCF will bring to the family and take these data into consideration in the prescribing decision;
   (d) Make it clear to the family that YCF is not a product for routine use, even less, mandatory, but rather an option with recognized benefits;
   (e) Preferably, children who demonstrate nutritional risk during the clinical evaluation should receive the prescription of the YCF;
   (f) Stimulate the consumption of traditional foods with high nutritional value for the composition of a quantitative and qualitatively balanced diet;
   (g) Promote breastfeeding, which is the most effective way to prevent infant morbidity and mortality worldwide.

Conflicts of Interest
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The authors expressly state that there was no interference by the company Danone Nutricia in the content of the material and all the information contained in the consensus represents exclusively the views of the authors and of the Brazilian Association of Nutrology, based on the bibliographic review used for its execution.

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