Characteristics and Degree of Processing of Foods Contained in School Children’s Lunch Boxes

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Abstract

Purpose: To describe the foods contained in the school children's lunch boxes and classify them according to their characteristics and degree of processing.

Method: This is a descriptive, cross-sectional study, conducted in private schools located in Santa Maria, Rio Grande do Sul, Brazil. The collection was carried out between 2018 and 2019, having as target public children enrolled in the first grade of Elementary School. Each child arranged their snack on the school desk so that all foods could be identified and photographed. The foods were classified according to their characteristics and divided into subgroups according to extent and purpose of processing.

Results: 895 food items from 380 lunch boxes in the seven participating schools were analyzed. Regarding the characteristics, the food subgroups presented the following frequency: 238 (27%) cookies/cereal bars/filled and/or topped cakes, 159 (16%) artificial juice, 129 (14%) fruits and fresh juice. Regarding the degree of processing, 714 (80%) are ultra-processed, 55 (6%) processed and 126 (14%) natural and minimally processed foods.

Conclusion: It was verified that a big part of the lunchboxes contained ultra-processed foods, of which cakes, cookies and juice cartons were the most frequent, followed by natural and minimally processed foods, particularly fruits; and, a small number of processed foods, more often yoghurt and homemade cakes. However, these data can be modified through the Nutritional and Feeding Education at school.

Keywords: Snack; School eating habits; Industrialized foods; Food quality

Introduction

Eating habits at school started being characterized as truly related to the context of the teaching/learning process, taking on the dimension of a pedagogical practice, an educative action, with the purpose of promoting health and feeding and nutrition safety [1,2]. Children stay in school most of their day and, when the private school does not have any food to offer them, they eat snacks prepared at home or bought in stores. The analysis of these snacks is essential for the planning of strategies aimed at a healthy growth and development, as well as the student’s nutritional state, minimizing the risk of illnesses [3]. The school snack is an integral part of the child’s feeding, which should be ideally composed of six meals, two of them being intermediate snacks. These are as important as the other meals of the day and they must be paid attention to and be well-planned, for the amount consumed must supply the nutritional needs according to each age group, not exceeding 15% of the Total Daily Energy Intake (TDEI) (Brazilian Pediatrics Society [SBP, its Portuguese abbreviation], 2012) [4]. The snacks can contribute to the nutritional adequacy of various nutrients, especially when they include natural and minimally processed foods [5].

Child eating habits, when inadequate, often composed of industrialized foods, can contribute to an increased risk of overweight and obesity [6]. The incidence of child obesity in Brazil is already a reality, as one third of the children from 5 to 9 years old are overweight (Brazilian Institute of Geography and Statistics [IBGE], 2010) [6]. Hence, the Brazilian Population Feeding Guide (GAPB) is an important instrument for the support and incentive of healthy eating practices so chronic Noncommunicable Diseases (NCDs) may be prevented, since it provides recommendations on choosing foods according to the type of processing employed in their production (Brasil, 2014) [7]. Thus, this study is made necessary, as it is perceived in school that the parents do not realize to what point the foods consumed by their children at the intermediate snacks are important and need to be adequate. The practical aspects of industrialized foods offered to the children and the lack of knowledge about them lead children to be exposed to an imminent risk to their health [8]. Consequently, there is an increased responsibility of the school regarding guidance and the development of strategies towards Nutritional and Feeding Education (EAN, Portuguese acronym), having the quality of the children's diet as their goal [9]. Therefore, this study aimed at describing the foods contained in the schoolchildren’s lunchboxes and classifies them according to their characteristics and degree of processing.

Methodology

This is a descriptive study with cross-sectional design, conducted at private schools in the city of Santa Maria, Rio Grande do Sul, Brazil. The data was collected from November to December 2018 and from March to August 2019, and the target public was all the children enrolled on the first grade of Elementary School. The study
was approved by the Research Ethics Committee of the Franciscan University (UFN), under evaluation report number 3.224.399.

The 13 private schools in the city of Santa Maria, RS, were invited to participate in the study, seven of which agreed to participate in the research; there were 27 first-grade classes in them, totaling 427 students. The first grade of the Elementary School was chosen because they have their snack inside the classroom, before recess. The children who bought their snack at the school cafeteria were included in the study, for they return to the classroom to have their snack and so the collection could be performed. All the lunch boxes of the children from both genders, properly enrolled in the first grade of the private Elementary Schools, who signed the Assent Form read to them in the classroom before collection began, were included in the research. In accordance with the exclusion criteria, the children who signed the Assent Form and did not agree to participate in the research, the children who presented dietary restrictions, and those who were absent from school on the day of the collection were excluded. The collection was performed on a randomly chosen weekday, except in the case of some special school activity and excluding Fridays, as the snack is usually different or freely chosen on these days (these situations were previously seen with the schools' coordinators). Two schools had to be returned to on another day to finish the collection, as it had been impossible to collect from all the classes on a single day. This impossibility took place at the schools that had many first-grade classes, the collection teams being insufficient to conduct it simultaneously on the same day, since they all happened at the same time. Pictures were taken only once in each class. Each child was invited and instructed to arrange their snack on the school desk so all foods and packaging could be visually identified. After the foods and drinks were thus organized on the desk, each snack was individually photographed with a cell phone, and the pictures were sent to a file in the computer, being automatically numbered. At no moment the child appeared on the picture or was otherwise identified. In addition to the pictures, the foods were listed on a spreadsheet with the description of the lunchbox, containing the food, the brand and the amount; as for the snacks with no packaging, the children were asked about its origin (homemade or bought at a store). By viewing the pictures and the spreadsheet, the foods contained in the lunchboxes were classified according to their characteristics and degree of processing. The characteristics of the foods were defined in accordance with the parameters by Matuk [10], and the foods were put together in the following subgroups: fruits and natural juice, sweets, potato chips and similar snacks, yogurt, milk and dairy products, cookies/cereal bars/filled and/or topped cakes, artificial juice, sandwich bread, soft drinks, homemade cake, salty and fried pastries. The classification of foods regarding the extension and purpose of their processing was carried out according to the NOVA, which classifies foods as: natural and minimally processed (i.e., obtained directly from plants or animals, without undergoing any alterations after being taken from nature; the minimally processed are the natural ones which are submitted to a process of cleaning, removing nonedible or undesirable parts, fractionating, grinding, drying, etc.), processed (foods industrialized with salt or other substances of culinary use added; these are products directly derived from foods and are recognized as versions of original foods), and ultra-processed (industrialized formulations made entirely of substances extracted from foods, derived from food components as hydrogenated fats, modified starch, or substances synthesized in a laboratory based on organic materials as petroleum and coal) [11,12]. The information collected was stored in Excel databases and underwent descriptive statistical treatment in the Statistical Package for the Social Sciences (SPSS) software, version 18.0.

Results

There were 427 students at first; however, after excluding the lunchbox of 26 (6.8%) children who did not sign the Assent Form, six (1.6%) children with dietary restrictions and 15 (3.9%) children who were absent from school on the days of collection, the total of lunchboxes photographed was of 380 of the students who had signed the Assent Form. The foods were classified according to the extension and purpose of processing [13], as seen in Graph 1.

It was identified that, in average, the children presented in their lunchboxes 2.39±0.97 food items, and that the average of foods belonging to the group of minimally processed, processed and ultra-processed was of 1.10±0.30; 1.06±0.32; and 2.06±0.83, respectively (Graph 2). The 380 lunchboxes contained 895 food items, and, regarding their characteristics, the subgroups presented the following frequency: 238 (27%) cookies/cereal bars/filled and/or topped cakes, 159 (18%) artificial juice, 129 (14%) fruits and natural juice, 90 (10%), 77 (9%) sandwich bread, 66 (7%) salty and fried pastries, 51 (6%) sweets, 37 (4%) yogurt, 18 (2%) potato chips and similar snacks, 18 (2%) homemade cake e 12 (1%) soft drinks. Among the most frequent food subgroups, it was noted that the most present fruit was banana: 54 (42%); that of natural juice was orange: 14 (56%); nectar artificial juice (10% of fruit juice); among the sweets, the candies and bubble gums: 8 (15%); and, among the salty and fried pastries, sausage rolls: 13 (19%) was the most usual.

![Graph 1](image1.png)

**Graph 1**: Frequency of foods present in lunchboxes regarding extension and purpose of processing, in accordance with the NOVA classification.

![Graph 2](image2.png)

**Graph 2**: Foods categorized into subgroups, in accordance with classification criterion.
Discussion

When analyzing the foods regarding extension and purpose of processing, 80% was identified as ultra-processed, 14% as natural and minimally processed, and 6% as processed. Studies investigating eating habits of children in a public school and in a hospital revealed that schoolchildren consume ultra-processed food in greater quantity than natural ones [14,15]. Another one, comparing and analyzing the consumption of natural/minimally processed and ultra-processed foods among schoolchildren from public and private schools, presented high consumption of ultra-processed foods among private school students, whereas those of public schools consumed more natural/minimally processed [16]. The high presence of ultra-processed in the lunchboxes, observed in this study, can collaborate to the increase in chronic NCDs as hypertension, diabetes, obesity, cardiovascular diseases and some types of cancer [17,18], since these foods contain high levels of fats, sodium and sugars [19,20]. Filgueiras [21] verified that the sandwich cookies and the processed meats were associated with eating dependency, which can be a likely explanation for the frequent consumption of the ultra-processed. Eating dependency is the exaggerated consumption of distinct foods similarly to any other addiction [22]. The ingestion of hyperpalatable foods stimulates the sensation of pleasure and the need to ingest a greater amount of these products [23]. Another explanation for the association between ultra-processed foods and the chronic NCDs is their nutritional profile. A study in New Zealand analyzed the level of industrial processing and nutrient profile of foods in the supermarket and verified that 83% of the packaged items are ultra-processed and have the worst nutritional profile (poor in dietary fibers) [24]. The foods present in the lunchboxes in this study are mostly ultra-processed; in average, two of these items in each lunchbox. According to Luiten et al. [25] these foods present an unsatisfactory nutritional profile, and the schoolchildren are not benefited by nutrients necessary to their growth and development when consuming them.

Studies revealed lower fiber ingestion among children who consume the processed and ultra-processed foods [26-30]. The study identified the foods present in the lunchboxes, which compose the schoolchildren's intermediate snack. They were grouped together, in accordance with Matuk [31], in the cookies/cereal bars/filled and/or topped cakes subgroup, the artificial juice subgroup, and the fruits and natural juice subgroup. The snacks of the cookies/cereal bars/ filled and/or topped cakes subgroup correspond to 27% of the foods; when the 2% of the homemade cakes are added, these make up 29% of the foods contained in the lunchboxes. This percentage is lower than those found in studies that analyzed intermediate snacks. One, conducted at private schools in São Paulo, Brazil, identified 51% of filled and/or topped cakes, cookies and cereal bars [32]. Another study described the eating habits related to intermediate snacks of preschoolers in Brazil, aged 4 to 6 years. The most frequent group was cookies in general, analyzed in the morning, 40.65%; and in the afternoon, 79.44% [33]. In the following year, these authors identified, in a nationwide sample of 7- to 11-year-old schoolchildren, frequency of 40.45% in the consumption of cookies in general in the morning, and that of 80.73% in the afternoon. The higher frequency of these foods in lunchboxes can be partly explained by the survey commissioned by the Brazilian Association of Cookies, Pasta and Industrialized Bread & Cakes Industries (ABIMAPI, its Portuguese acronym) (2017) [34], which analyzed in 11,300 Brazilian households the cookie-eating habit. In it, 21% are made of people up to 15 years old, 61% prefer new flavors, and 33% would not give up on the convenience and ease of having a snack to satiate hunger. The second most frequent subgroup in the lunchboxes was that of artificial juice, representing 18%. A study with a similar population presented a consumption of 67% of artificial juice and other beverages (teas, energetic drinks, soy drinks, isotonic and hydrotonic drinks) present in the snacks [35]. In another study, with Brazilian preschoolers from more economically developed regions, the chances were twice as big of sugary drinks being consumed [36]. Industrialized juice is known to present the highest concentration of added sugar, and the continuous consumption of these drinks is related to weight gain, obesity and chronic NCDs [37,38]. Despite the high consumption of sugary drinks in children's and adolescents' eating habits, according to researches that analyzed the consumption and its relation to BMI, no significant data related to weight gain were presented; they also found it difficult to define the drinks, as there is a large variety of these products [39-41]. The third group most frequent in the lunchboxes was that of fruits and natural juice, corresponding to 14%. This percentual was lower than those of other studies, which found from 33% to 58% of presence of fruits in schoolchildren's snacks [42,43]. A study conducted in two public schools, one with and the other without a cafeteria, in the city of Santa Fé, Argentina, identified in both schools the ingestion of fruits below the recommended to children. The World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) recommend the consumption of at least five daily portions of fruits and vegetables, at least five times a week, to prevent the chronic NCDs. Since the children need to have on or more small meals while at school, fruits are a good option for their high nutrient content and great satiating power, besides being practical to carry. It was verified that the most prevalent foods in the schoolchildren's lunchboxes are the industrialized ones, produced with added preservatives, coloring, thickeners, sodium, fats, which are extremely harmful to health, classified by the NOVA as ultra-processed, and which do not make part of the recommendation in the Resolution /CD/FNDE no. 26, nor of the Law 11,947/09, which suggest the use of varied natural foods for an adequate and healthy eating. Regarding the recommendation, attention is called to the frequency of fruits and natural juice (14%), which are capable of diminishing the harm caused by the consumption of ultra-processed foods, as they contain nutrients essential to the maintenance and functioning of the human organism. Among the prohibitions of the Law 11,947/09, there is the acquisition of canned foods, processed meats, sweets, prepared or semi-prepared meals, or concentrated foods, and of beverages with low nutritional value, such as soft drinks and powdered drink mixes. The Interministerial Resolution no. 1010, of May 8, 2006, for both public and private schools, recommends the development of strategies to inform the families, with emphasis on their co-responsibility and on the importance of their participation in the process of stimulating and instructing about the Nutritional and Feeding Education (EAN). Hence, the National School Feeding Program (PNAE, its Portuguese abbreviation) contributes to the biopsychosocial growth and development, learning, school performance, as well as to the establishment of healthy eating habits on the part of the students by means of promoting EAN initiatives and serving meals that meet their nutritional needs during the time the children stay in school, thus promoting healthy eating habits and avoiding ever-earlier health problems. The low cost of ultra-processed foods, their practical aspects and the lack of information about their composition can influence the parents and/or guardians when they are choosing the children's snacks. According to the Pan American Health Organization,
these foods are transformed into highly profitable products (low-cost, long-living and hyperpalatable), with the purpose of surpassing especially the nonprocessed or minimally processed ones (Organización Panamericana de La Salud [OPS], 2019). These products are easily identified by their immense list of additives, substances that would never, or sporadically, be added to foods prepared at home. The research has shown that two out of three food items present in the lunchboxes are ultra-processed. These have an advantage over the natural ones: their relatively lower cost, causing diet consisting of industrialized products to substitute for traditional diets. Furthermore, they make consumption easier if compared with the processed foods regarding purchase, cost and convenience. They have been winning the consumer, as most of them are presented ready for consumption and/or need only to be heated. The processed foods require more attention, more preparation time and even some degree of skill on the part of the consumer; these reasons are probably responsible for the 6%. Lastly, the natural and minimally processed foods, as the ultra-processed, are practical as well, besides being more nutritious. All the aspects mentioned can affect in some way when the schoolchildren’s intermediate snacks are being chosen; therefore, the importance of the EAN at schools is highlighted. It is important to plan what will be consumed in the small meals, especially when away from home, as it is the case in school. In order to avoid, either for lack of option or of time, his consumption of ultra-processed foods, it is important to take along from home fresh or dry fruits, other natural or minimally processed foods, or some favorite culinary preparation. In addition to planning, cost can be another reason for inadequate eating choices. A study carried out in Brazil analyzed the price of the food groups consumed, considering the nature, extension and purpose of their processing, and the results highlight the importance of policies leading to price increase of the ultra-processed foods, further distancing them from the price of the other foods; thus, healthy eating habits can be made easier. Along with the lack of additional information about the family of the schoolchildren who took part in the research, the low adherence of private schools can be a limiting factor to the study. The shortage of studies analyzing the foods contained in the lunchboxes of a similar public makes the comparison of results difficult. Nevertheless, the type of methodology used in the collection furnished trustworthy data to base the study; that, along with its being unprecedented, are considered positive aspects.

Conclusion

It was verified that most of the lunchboxes contained ultra-processed foods, of which the most frequent were the cookies/cereal bars/filled and/or topped cakes, artificial juice, and the natural and minimally processed ones, particularly the fruits. The higher frequency of these contrasting foods is probably due to their convenience when the schoolchildren’s snacks are being chosen. Therefore, strategies for the choosing of foods, such as planned shopping and methodologies to organize them, must be adopted, as the intermediate snacks are an integral part of the children’s routine and, when they are well conducted and adequate, can supply the nutritional needs for such meal. Moreover, they can help improve the quality of intermediate snacks and, consequently, the health of those involved. The need of further studies is highlighted, in order to confirm the damages in the medium and long term.

References

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