

Hidden pathway of the COVID-19 pandemic in children's health and nutrition**Caminho oculto da pandemia de COVID-19 na saúde e nutrição de crianças****El camino oculto de la pandemia de COVID-19 en la salud y la nutrición de niños**

 Jaqueline Laureano de Azevedo¹,  Ana Clara da Cruz Della Torre²,  Eric Batista Ferreira³
 Flávia Della Lucia¹,  Daniela Braga Lima¹

Received: 20/03/2022 Accepted: 02/01/2023 Published: 18/03/2023

Objective: to characterize the eating routine of children during a pandemic. **Methods:** cross-sectional study, with guardians of students from a Children's Educational Center in a municipality in the state of Minas Gerais, Brazil, using a questionnaire regarding food, knowledge about functional foods and food labeling, available via social networks, between 2020 and 2021. A chi-square test was used with a significance level of 5%. **Results:** there was a high intake of ultra-processed foods by children, high screen time during meals, low knowledge about functional foods and food label analysis by parents or guardians. **Conclusion:** organization and discipline are essential for children. There is a need to create food and nutrition education interventions in the context with the possibility to help with small impacts on child health, notably due to the pandemic influence.

Descriptors: Child; Diet; COVID-19; Food and nutrition education; Child, Preschool.

Objetivo: caracterizar a rotina alimentar de crianças em tempo de pandemia. **Método:** estudo transversal, com responsáveis de alunos de Centro Educacional Infantil de um município de Minas Gerais, com o uso de questionário referente à alimentação, conhecimento sobre alimentos funcionais e rotulagem de alimentos, meio das redes sociais, entre 2020 e 2021. Utilizou teste de qui-quadrado com nível de significância de 5%. **Resultados:** verificou-se alta ingestão de alimentos ultraprocessados pelas crianças, tempo elevado de tela durante as refeições, baixo conhecimento sobre os alimentos funcionais e análise dos rótulos pelos pais ou responsáveis. **Conclusão:** a organização e disciplina são essenciais às crianças. Observa-se a necessidade da criação de intervenções de educação alimentar e nutricional no contexto em que se configuram as possibilidades para auxiliar em menores impactos na saúde infantil, notadamente pela influência pandêmica.

Descritores: Criança; Dieta; COVID-19; Educação alimentar e nutricional; Pré-escolar.

Objetivo: caracterizar la rutina alimentaria de niños en tiempos de pandemia. **Método:** estudio transversal, con respuestas de alumnos de un Centro Educativo Infantil de un municipio de Minas Gerais, Brasil, con el uso de cuestionarios sobre alimentación, conocimientos sobre alimentos funcionales y etiquetas de alimentos, a través de las redes sociales, entre 2020 y 2021. Se utilizó la prueba chi-cuadrado con un nivel de significación del 5%. **Resultados:** se verificó una alta ingesta de alimentos ultraprocesados por parte de los niños, un elevado tiempo de tela durante las comidas, un bajo conocimiento sobre los alimentos funcionales y el análisis de las etiquetas por parte de los padres o tutores. **Conclusión:** la organización y la disciplina son esenciales para los niños. Se observa la necesidad de la creación de intervenciones de educación alimentaria y nutricional en un contexto en el que se configuran las posibilidades de ayudar a menores impactos en la salud infantil, sobre todo por la influencia pandémica.

Descriptores: Niños; Dieta; COVID-19; Educación alimentaria y nutricional; Preescolar.

Corresponding Author: Daniela Braga Lima – danibraga@unifal-mg.edu.br

1. School of Nutrition, Universidade Federal de Alfenas (UNIFAL), Alfenas/MG, Brazil.

2. Postgraduate Program of Nutrition and Health, Universidade Federal de Lavras (UFLA), Lavras/MG, Brazil.

3. Department of Statistics, UNIFAL, Alfenas/MG, Brazil.

INTRODUCTION

Eating habits are formed during childhood, as well as other healthy attitudes that will be perpetuated into adult life, so feeding children requires special care¹⁻². The food must be adequate to their nutritional standards, consisting of all food groups and including different nutrients in balanced portions³.

Eating habits are a set of actions that begin in early childhood, in which the individual decides which food to consume depending on availability and food consumption, but the lack of quality information or the food context in which they are inserted reflects in the choice of food⁴⁻⁵. The habits of eating correctly and following a balanced diet can be built and stimulated even in childhood, making use of the curiosity present in children, mainly to encourage them to discover new flavors and foods, helping them to choose the most nutritious and healthy ones⁶.

The school environment, when combined with the practice of nutritional food education (NFE), is capable of becoming a helpful place for healthy coexistence, providing a gateway to interactive learning with food. The goal of the NFE developed in school is to inform children about the general principles of food and nutrition, guiding specific behaviors so that they become able to make conscious choices throughout their lives^{2-3,7}.

During the COVID-19 pandemic, socializing and touching were limited due to the high transmissibility of the virus. Social containment due to the lack of effective treatments, social distancing and isolation have become key strategies for preventing and containing the virus⁸.

As a result, numerous activities that generated crowds of people, including face-to-face educational system, were suspended as a preventive measure, transferring and adapting these activities to a domestic online model and restricting the interaction of families to the home environment⁹.

As a result, there have been several changes in family routine and physical mobility, changing access to food and the pattern of food choices, which could lead to increased food and nutritional insecurity, malnutrition and overweight in childhood¹⁰⁻¹². Within this context, the present study aimed to characterize the eating routine of children in times of a pandemic.

METHODS

This is a study with a quantitative and analytical approach carried out with parents and/or guardians of children enrolled in the Centro Educacional Infantil in a municipality in the south of the state of Minas Gerais - Brazil, from June 2020 to January 2021. Participant recruitment (parents and/or guardians) took place through social networks, via WhatsApp™ application. An illustrative invitation to parents was also used, as shown in Figure 1.

All parents and/or guardians who were able to answer the questions and voluntarily agreed to participate were eligible to answer the questionnaire, given the full explanation of the essence of the study, objectives, methods and procedures used in data collection, as well as the benefits obtained from this work, in order to obtain voluntary participation of their children in the study after reading and electronically confirming the Free and Informed Consent Form.

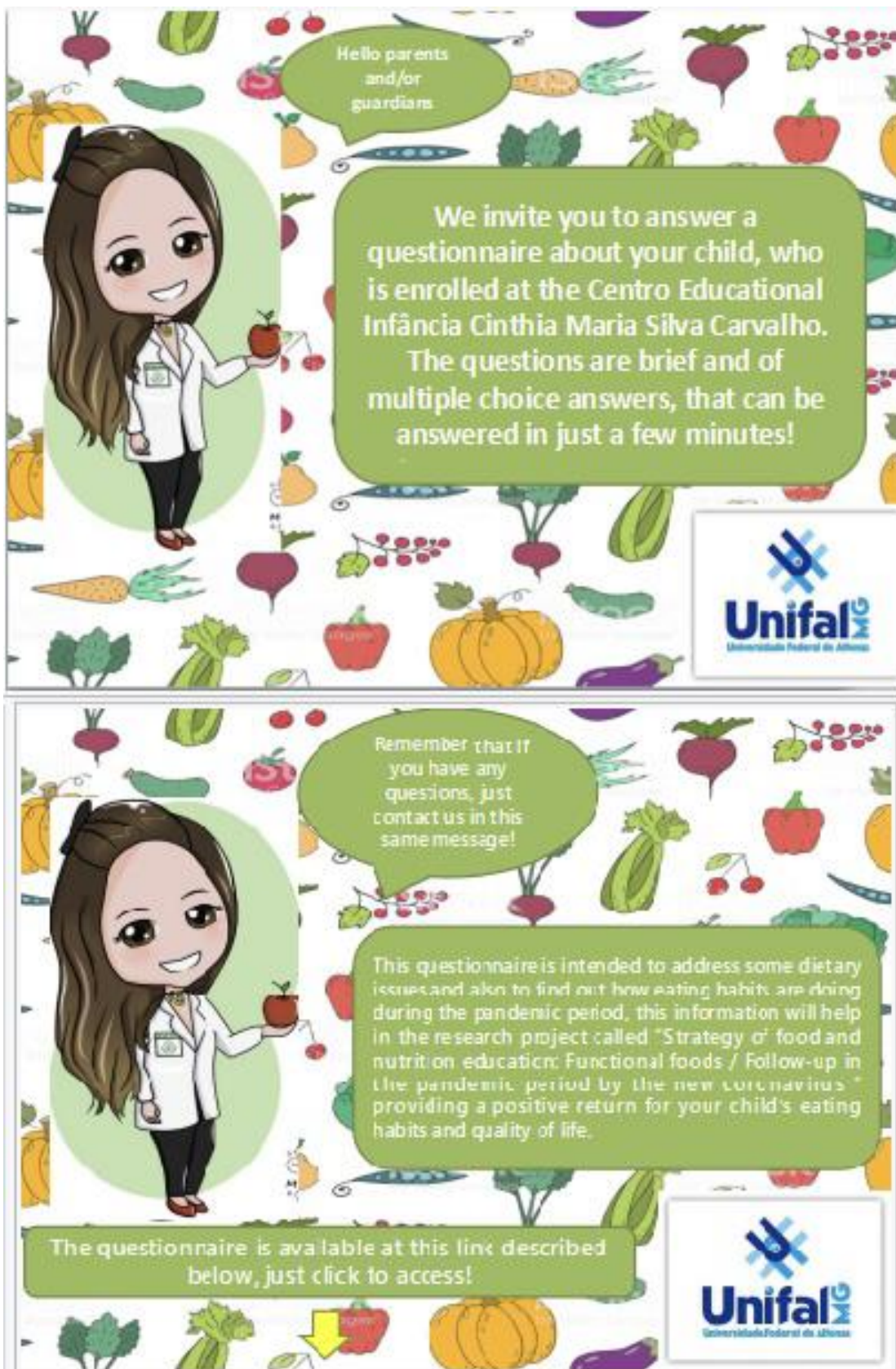
In view of the attempts to recruit participants for the research, four contact attempts were made, three via WhatsApp™ application and by phone call in the year 2020 (Figure 1), and another search via WhatsApp™ application in the year 2021, offering the possibility of sending the form in person at home as an alternative.

Data collection was carried out through the application of an online questionnaire, prepared by the researchers themselves using the Google Forms platform, taking as a reference for its construction the Food Guide for Brazilian Children under two years of age and the Food Consumption Markers questionnaire, proposed by the Brazilian Food and Nutrition Surveillance System (*Sistema de Vigilância Alimentar e Nutricional*)¹³⁻¹⁴. The data collection tool contained multiple choice questions, addressing issues related to healthy eating, dietary patterns and routine in pandemic times for preschoolers, and the knowledge of parents/guardians of these children about functional foods and food labeling.

Data were entered into the Excel™ program. For the application of statistical tests, the free statistical software R, version 3.6.1, was used. Continuous variables were described using measures of central tendency and dispersion, and qualitative variables using absolute and relative frequencies. Pearson's chi-square test was used to assess associations between categorical variables. For all tests used, a significance level of 5% was adopted.

The research was prepared in accordance with Resolution No 466/12 of the Brazilian Health Council/Ministry of Health and approved by the Research Ethics Committee of the Universidade Federal de Alfenas – UNIFAL-MG (CAEE: 26565419.1.0000.5142, Approval No 3.904.528 /2020).

Figure 1. Invitation sent to parents and/or guardians online. Centro Educacional Infantil Cinthia Maria Silva Carvalho, Alfenas-MG, 2020.



RESULTS

32 children were evaluated, with a predominance of females 59.4% (No=19), with a mean age of 4 (± 1.3) years, mean weight of 18.56 (± 5.25) kg and mean height of 1.03 (± 0.08) meters. It was found that 21 guardians provided information on the child's weight and height, and of these, 33.3% (No=7) were overweight. Table 1 presents data referring to children and their parents.

Most of the children's families did not receive welfare aid, with an average family income of 1540.46 (± 746.46) reais and half of the mothers did not finish high school.

Of the evaluated children, 68.8% (No=20) were exclusive breastfed in the first six months of age, but 69.2% (No=18) were given another type of food before six months. As for follow-up at a health unit, 78.1% (No=25) reported using such assistance.

The presence of fruits and vegetables in the children's diet was verified in 87.3% and 78.1%, respectively, in different amounts. On the other hand, the significant presence of ultra-processed foods in the diet of the analyzed children is noteworthy, such as: sweets (78.1%), instant noodles (65.6%) and sweetened drinks (65.6%). With regard to the use of electronic devices during meals, 59.4% (No=19) declared having the habit of using electronic devices during meals. As for the changes generated in the routine and eating habits of preschoolers during the pandemic, it was shown that with regard to bowel function, 90.6% (No=29) reported a normal bowel function, 62.5% (No= 20) claimed to be maintaining regular meal times.

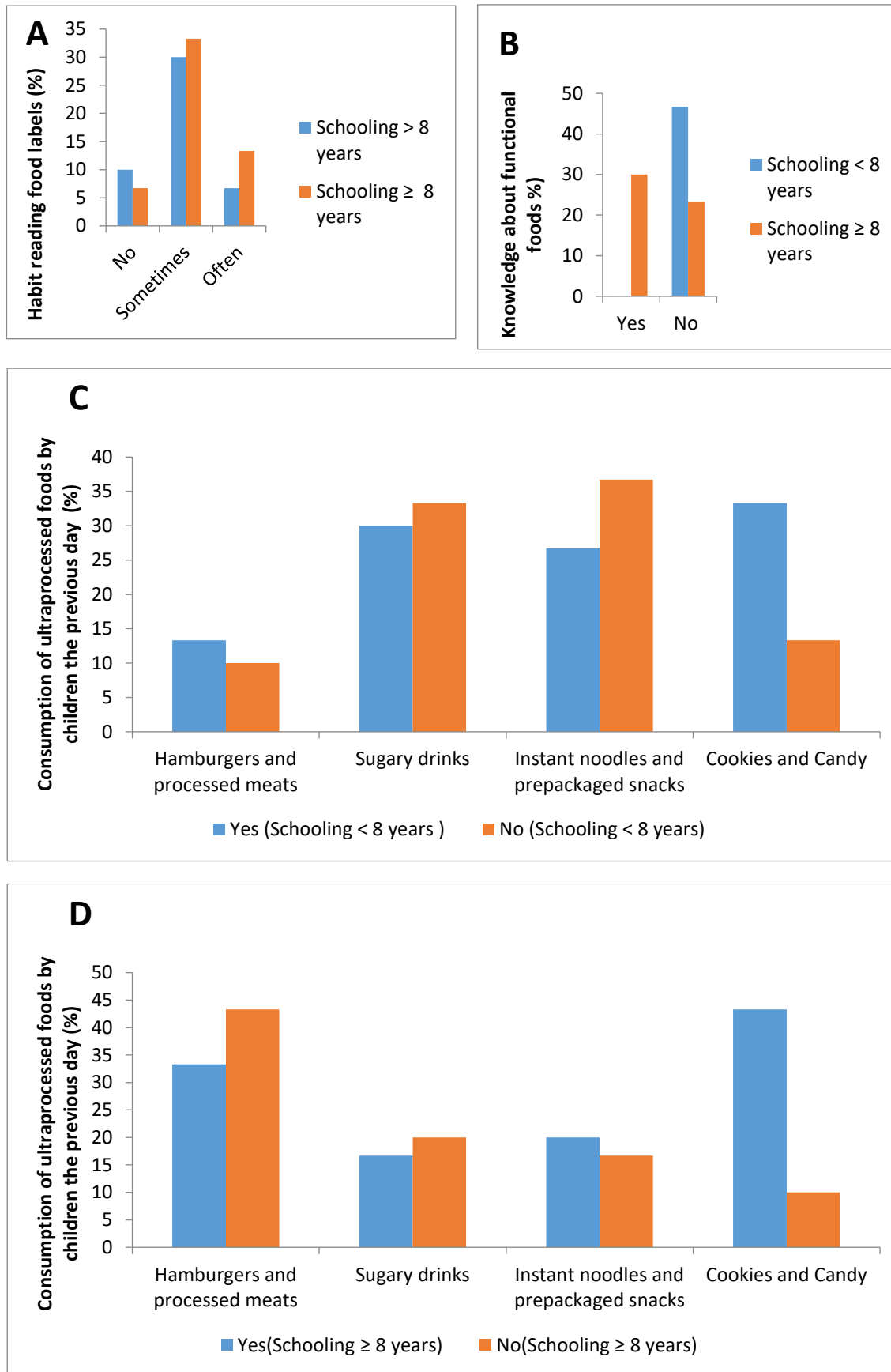
The results showed that only 18.8% (No=6) of parents and/or guardians had the habit of always reading labels before buying food. It was also found that 68.8% (No=22) had no knowledge of what functional foods meant and the most cited foods were avocado, fish and beans in the amount of 23.1% (No=3), respectively. It was found that 90.6% (No=29) think maintaining a healthy diet is very important.

Figure 2A shows the frequency of label reading by parents and/or guardians, which were statistically equal according to education ($p= 0.3699$). In view of the results analyzed, a statistical association was found for the education variable, which was dependent on the frequency of parents and/or guardians who did not have knowledge about functional foods, concentrating mostly on higher education levels ($p=0.007$) (Figure 2B). On the other hand, the findings did not show an association between consumption of ultra-processed foods and the educational level of parents and/or guardians, and the variables were independent ($p= 0.1767$) (Figure 2C; Figure 2D).

Table 1. Food habits and routine in times of pandemic of students enrolled at Centro Educacional Infantil Cinthia Maria Silva Carvalho, Alfenas-MG, 2021.

Variables	No=32 (%)
What is, on average, the amount of fruit (unit/slice/piece) the child consumes at home during the day?	
<i>The child does not eat fruit</i>	4 (12.4)
<i>1 unit/slice/piece</i>	8 (25.0)
<i>2 units/slices/pieces</i>	10 (31.3)
<i>3 or more units/slices/pieces</i>	10 (31.3)
What is, on average, the amount of vegetables (carrots, beets, zucchini, chayote, tomatoes, lettuce, cabbage, etc.) the child consumes at home each day?	
<i>The child does not eat vegetables</i>	7 (21.9)
<i>Up to three tablespoons</i>	16 (50.0)
<i>Four or five tablespoons</i>	5 (15.6)
<i>Six or seven tablespoons</i>	1 (3.1)
<i>Eight or more tablespoons</i>	3 (9.4)
Does the child have the habit of watching TV, using the computer and/or on their mobile phone during meals?	
<i>Yes</i>	21 (59.4)
<i>No</i>	12 (37.5)
The meals the child has throughout the day	
<i>Breakfast</i>	29 (90.62)
<i>Morning snack</i>	13 (40.62)
<i>Lunch</i>	31 (96.87)
<i>Afternoon snack</i>	27 (84.37)
<i>Dinner</i>	24 (75.0)
<i>Supper</i>	5 (15.62)
Is the child having regular meal times during the pandemic?	
<i>Yes</i>	20 (62.5)
<i>No</i>	12 (37.5)
How is the children's intestinal function the pandemic? Are they going to the bathroom regularly?	
<i>Yes</i>	29 (90.6)
<i>No</i>	3 (9.4)
During the night, does the child consume food before going to sleep?	
<i>Yes</i>	25 (78.1)
<i>No</i>	7 (21.9)
Was the child given yesterday:	
<i>Hamburger and/or processed meats (ham, mortadella, salami, sausage, sausage)</i>	
<i>Yes</i>	9 (28.1)
<i>No</i>	23 (71.9)
<i>Sweetened drinks (soda, canned juice, powdered juice, canned coconut water, guaraná/currant syrups, fruit juice with added sugar)</i>	
<i>Yes</i>	21 (65.6)
<i>No</i>	11 (34.4)
<i>Instant noodles, prepackaged snacks, or salty crackers</i>	
<i>Yes</i>	21 (65.6)
<i>No</i>	11 (34.4)
<i>Stuffed biscuit, sweets or candy (candy, lollipop, chewing gum, caramel, gelatin)</i>	
<i>Yes</i>	25 (78.1)
<i>No</i>	7 (21.9)

Figure 2. Frequency of reading the label according to the education of parents and/or guardians (A); Knowledge of parents and/or guardians about functional foods (B); Consumption of ultra-processed foods by children the previous day (C); Consumption of ultra-processed foods by children on the previous day (D). Alfenas-MG, 2021.



A: Pearson's chi-square test indicating a significance level of $p = 0.3699$; B: Pearson's chi-square test indicating significance level $p=0.007$; C and D: Pearson's chi-square test indicating significance level $p = 0.1767$.

DISCUSSION

The data obtained in this study draw attention to the growing prevalence of excess weight in the child population and corroborate the results of overweight and obesity shown by the Family Budget Survey (*Pesquisa de Orçamentos Familiares* - POF-2008-2009) in all income groups and Brazilian regions, starting with at the age of five¹⁵. With the social distancing imposed by the COVID-19 pandemic, there were several changes in the family routine and physical mobility, changing access to food and the pattern of food choices, which led to an increase in food and nutritional insecurity, malnutrition and overweight in childhood¹⁰.

The alarming numbers about the increase in overweight in children are a reflection of the current lifestyle of a large part of the child population, which consists of: excessive consumption of foods with high energy density, saturated fats, sugar and salt; lack of physical exercise and predominance of sedentary activities¹⁴. Thus, the condition of nutritional status in childhood is essential to estimate the evolution of health and quality of life of the population, given that eating practices are formed from the first years of life and can reflect on health conditions in adulthood¹⁶.

There was a high consumption of ultra-processed foods, demonstrating that offering this type of food was part of the children's dietary pattern during the restrictive measures of this period of isolation, likely due to its practicality, variety, shelf life and high palatability, among other conditioning factors. A study carried out in five countries, including Brazil, with children and adolescents, found an increase in the consumption of sweets and fried foods from 14% to 20.7% during the isolation period¹⁷.

Parents have become fully responsible for educating and managing their children's schedules and food, which was previously shared with nannies, day care centers or schools, increasing the time they spend together. In addition, the restriction of mobility and limitation in the frequency of purchase of food, associated with the excess of tasks, practicality and anxiety generated by isolation, resulted in an increase in the consumption of ultra-processed and canned foods¹⁸. The consumption of this type of food of low nutritional value contributed to the onset or worsening of overweight and obesity in children and adolescents¹⁹.

At the same time, an environment susceptible to nutritional inadequacies in children's diets was created, since school meals offered adequate and balanced meals. Children were exposed to the socioeconomic and conditioning factors of their family members, generating the extremes of lack of food or excess of it²⁰.

Isolation initiated a long period of restricted movement, without any physical activity or outdoor play, making children more susceptible to harmful behaviors, such as a sedentary

lifestyle⁹. Children, while less directly affected by the virus, are paying a heavy price for the indirect effects of the crisis, including low nutritional value diet, impact on mental health, social isolation, dependence on screens and lack of schooling and health care, especially among vulnerable groups¹².

There is a strong relationship between the consumption of ultra-processed foods and overweight in children, due to the presence of trans fat in these foods²¹. The intake of these fats is correlated with an increase in LDL-cholesterol, the risk of diabetes, hypertension and cardiovascular diseases²².

The Brazilian Ministry of Health recommends that, in the first years of life, the consumption of sugar, canned food, sweets and soft drinks should be avoided, as well as the lack of information about food¹⁴. There is a strong association between lack of knowledge about food, influence of the media and low education in the process of acquiring and consuming ultra-processed foods²³.

According to research conducted with parents of Brazilian children under 13 years of age, a 46.1% decrease in physical activity practices was observed during the first month of social distancing, with an increase in screen time. Of the parents interviewed, 38% state that screen time is greater than before the pandemic and 36.9% that it is much greater. More than 60% of children's time is spent on sedentary activities⁹.

In a study carried out with 120 families on the impact of the pandemic on the eating habits of children and adolescents, it was found that 42.5% of parents observed an increase in their children's food consumption; of the interviewees, 67% reported having an organization of their children's eating routine and another 8.5% do not have a defined routine, eating only when they feel hungry. Most parents (57.5%) stated that their children eat fruit every day or a few times a week (34%). Regarding screen time, 63.6% stated that their children spend more than 60 minutes a day and some use it for more than 4 hours (30.2%)²⁴.

Studies on the evaluation of food consumption during the COVID-10 pandemic have indicated an increase in the consumption of soft drinks (9.5%), fast food and ultra-processed foods (38.1%), in addition to an increase in the volume of meals (4.8%)²⁵, as well as a low consumption of raw salads and greens and/or vegetables, 35% and 23.7%, respectively, of 517 children²⁶. Thus, the child age group, in addition to suffering the direct effects of the disease and its clinical manifestations, also suffer the indirect effects, such as stress, affecting mental health, increased sedentary lifestyle and obesity, impairments in education, excessive use of electronic devices, increase in hunger and food insecurity²⁰.

On the other hand, a survey conducted with 330 children in Saudi Arabia (198), United Kingdom (62) and Turkey (70). found that most parents were concerned about their children's diet and prepared food at home (96.1%) during isolation. Sixty-three percent of parents indicated that their children did not gain weight. In addition, there were statistically significant differences in children's diet in relation to gender, with better food consumption among boys than girls²⁷.

In another study, conducted with 589 children and 720 adolescents in Brazil, it was found that social isolation affected the eating habits of children and adolescents, so that families in isolation had a lower consumption of healthy foods, especially those from the lower economic class in the Northeastern region of Brazil, in addition to low education of parents and/or guardians¹¹.

Maternal education can directly influence the provision of appropriate care in promoting the child's health, food and nutrition²⁸, in addition to being associated with increased consumption of unhealthy foods in childhood²⁹.

In the study presented here, there was a high consumption of fruits and vegetables by preschoolers, which predispose a factor of good eating habits. According to the World Health Organization (WHO), low consumption of fruits and vegetables is among the top ten risk factors for the total burden of disease worldwide. In this same perspective, fruits and vegetables are essential components of a healthy diet, and their consumption is one of the main protective factors for chronic non-transmissible diseases in the short and long term³⁰.

Referring to the follow-up at a health unit, the study demonstrated a high adherence of parents and/or guardians in the use of primary care. A strong association was evidenced between socioeconomic level and education in the use of basic health services, highlighting that lower-income children may have a greater need to seek primary care services and emergency services than children in better socioeconomic conditions, due to the easy access that this group has to private services and health plans³¹.

With regard to screen time, the findings represented a high rate of frequency of use of electronic devices during meals, which reflects an increase in screen time in general by children. This excess is strongly correlated with the wide availability of computer games and TV programs. There is also a concern on the part of parents with the safety of their children in relation to outdoor activities, a high demand for activities related to the work of parents and/or guardians during the period of confinement, and the lack of recreational spaces for games at home in times of isolation⁹. Studies indicate that with social isolation, screen entertainment time is higher, generating an increase in sedentary time and physical inactivity^{9,12}.

Another study associated the act of eating in front of the TV with the contribution to excess calorie consumption and sedentary lifestyle, in addition to spending more hours exposed to advertisements for unhealthy foods³², unlike the data collected here, which showed high consumption of fruits, vegetables and greens.

Another important variable found in this research and which showed a statistical association was related to the low knowledge of parents and/or guardians about functional foods and the lack of reading labels when buying foods. The most common reasons for not consulting nutritional labels are lack of understanding of the information provided, lack of time for analysis and reading difficulty³³, reinforced by a survey carried out with 17 mothers of children and adolescents assisted in a university extension project, which found that 31.6% of mothers used to read food labels, 36.8% did not understand the labeling and 10.5% trusted the information on the labels when reading³⁴.

Nutritional labeling is a very important tool for making healthier food choices, as it is the form of communication among consumers, and it is from a correct and complete reading of the label that the consumer has full knowledge of the food and of its composition. Thus, the lack of understanding of this information can contribute to the purchase of unhealthy foods for the children, which for the most part are processed and ultra-processed foods³⁴⁻³⁵. The data from this research also observed the purchase and consumption of ultra-processed foods by children on the day before data collection, which was possibly related to reading and knowledge about food labeling.

In this same perspective, knowledge about functional foods is also a valuable tool for preventing injuries and promoting health for children, since functional foods have several beneficial effects on health and, in addition to the basic functions related to nutritional value and to their chemical composition, they also play an important role in modulating metabolic and physiological processes, resulting in the reduction and prevention of disease risks, such as cancer and diabetes and chronic degenerative diseases in the short and long term³⁶⁻³⁷. An investigation on the consumption of functional foods carried out with 68% of respondents with university education, 58% reported knowledge of what functional foods are and of these 87% had already consumed this type of food³⁶. In the same study, a strong correlation was observed between knowledge about functional foods and education³⁶. To assist in the sedimentation and acquisition of new eating habits by children, it is essential for parents and/or guardians to know about these topics, even more so in this pandemic period when food and eating routine are under the full responsibility of families.

CONCLUSION

The findings revealed that children, during the COVID-19 pandemic, have a high consumption of ultra-processed foods, longer screen time when consuming their meals, low knowledge about functional foods and almost no practice of analyzing labels when purchasing food by parents and/or guardians. When considering that eating habits are formed in childhood, as well as other healthy attitudes that will continue into adulthood, in the context of isolation, children's food and eating routine require special care. However, the results must be interpreted considering some limitations inherent to the research, such as the application of the questionnaire online, which makes face-to-face contact with the participants impossible and a more detailed explanation of the questions exposed and the collection of anthropometric data, which took place in a self-reported manner, which may lead to possible mistakes in the nutritional assessment. Despite these limitations, there are potentialities, the data from this work are relevant to the current scenario of child food health in a pandemic period, being essential for a future context, in order to assist in the creation of new dietary strategies.

In view of this, there is a need to broaden the focus of food and nutrition education actions so that parents and/or guardians can participate, as well as improve their knowledge about topics relevant to childhood, such as transmission of knowledge about functional foods and food labeling.

REFERENCES

1. Lopes FM, Nunes T. Inclusão de hábitos alimentares saudáveis na educação infantil com alunos de 4 e 5 anos. Cadernos da FUCAMP [Internet]. 2016 [cited in 11 Dec 2021]; 15(24):105-26. Available from: <http://www.fucamp.edu.br/editora/index.php/cadernos/article/view/932/677>
2. Teodoro MA, Santos LMPG, Lima DB, Ferreira EB, Della Lucia F. Estratégia de educação alimentar e nutricional na prevenção de distúrbios nutricionais em pré-escolares. Extensio: Revista Eletrônica de Extensão [Internet]. 2018 [cited in 11 Dec 2021]; 15(31):15-30. DOI: <http://doi.org/10.5007/1807-0221.2018v15n31p15>
3. Donadoni P, Costa JAS, Netto MP. Nutrindo o saber: relato de experiência em práticas de educação alimentar e nutricional com pré-escolares. Rev APS [Internet]. 2020 [cited in 11 Dec 2021]; 22(1):203-14. DOI: <http://doi.org/10.34019/1809-8363.2019.v22.16634>
4. Marinho AI. Percepção dos pais de uma comunidade em vulnerabilidade social sobre práticas alimentares: além da obesidade e da desnutrição infantil [Internet]. [dissertação] [Mestrado em Saúde Coletiva]. Santos, SP: Universidade Católica de Santos; 2020 [cited in 11 Dec 2021]. Available from: <https://tede.unisantos.br/handle/tede/6581>
5. Perin L, Zanardo VPS. A importância dos alimentos funcionais para crianças. Vivências: Revista Eletrônica de Extensão da URI [Internet]. 2013 [cited in 11 Dec 2021]; 9(16):29-35. Available from: http://www2.reitoria.uri.br/~vivencias/Numero_016/artigos/pdf/Artigo_03.pdf
6. Silva GAP, Costa KAO, Giugliani ERJ. Alimentação infantil: além dos aspectos nutricionais. J Pediatr (Rio J.) [Internet]. 2016 [cited in 11 Dec 2021]; 92(3 Suppl 1):S2-7. DOI: <http://dx.doi.org/10.1016/j.jped.2016.02.006>

7. Silva SU, Monego ET, Sousa LM, Almeida GM. Food and nutrition education actions and the nutritionist within the scope of the National School Food Program. *Ciênc Saúde Colet*. [Internet]. 2018 [cited in 11 Dec 2021]; 23(8):2671-81. DOI: <http://doi.org/10.1590/1413-81232018238.19642016>
8. Sousa GC, Lopes CSD, Miranda MC, Silva VAA, Guimarães PR. A pandemia de COVID-19 e suas repercussões na epidemia da obesidade de crianças e adolescentes. *Revista Eletrônica Acervo Saúde* [Internet]. 2020 [cited in 11 Dec 2021]; 12(12):e4743. DOI: <https://doi.org/10.25248/reas.e4743.2020>
9. Sá CDSC, Pombo A, Luz C, Rodrigues LP, Cordovil R. Covid-19 social isolation in Brazil: effects on the physical activity routine of families with children. *Rev Paul Pediatr*. [Internet]. 2020 [cited in 11 Dec 2021]; 39: e2020159. DOI: <https://doi.org/10.1590/1984-0462/2021/39/2020159>
10. Assunção DGF, Oliveira AF, Fully TMCS, Rodrigues KDSR. Como promover alimentação saudável para crianças em tempos de Covid-19? Um relato do grupo de assistência nutricional materno infantil (AMInutri). *Revista Extensão & Sociedade* [Internet]. 2020 [cited in 11 Dec 2021]; 12(1):285-92. DOI: <https://doi.org/10.21680/2178-6054.2020v12n1ID20894>
11. Teixeira MT, Vitorino RS, Silva JH, Raposo LM, Aquino LA, Ribas SA. Eating habits of children and adolescents during the COVID-19 pandemic: the impact of social isolation. *J Hum Nutr Diet*. [Internet]. 2021 Aug [cited in 11 Dec 2021]; 34(4):670-8. DOI: <http://doi.org/10.1111/jhn.12901>
12. Zemrani B, Gehri M, Masserey E, Knob C, Pellaton R. A hidden side of the COVID-19 pandemic in children: the double burden of undernutrition and overnutrition. *Int J Equity Health* [Internet]. 2021 [cited in 11 Dec 2021]; 20(1):1-4. DOI: <https://doi.org/10.1186/s12939-021-01390>
13. Ministério da Saúde (Brasil). Orientações para avaliação de marcadores de consumo alimentar na atenção básica [Internet]. Brasília, DF: Ministério da Saúde; 2015 [cited in 11 Dec 2021]. 33 p. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/marcadores_consumo_alimentar_atencao_basica.pdf
14. Ministério da Saúde (Brasil). Guia alimentar para crianças brasileiras menores de 2 anos [Internet]. Brasília, DF: Ministério da Saúde; 2019. 265 p. Available from: http://189.28.128.100/dab/docs/portaldab/publicacoes/guia_da_crianca_2019.pdf
15. Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares 2008-2009: análise do consumo alimentar pessoal no Brasil [Internet]. Rio de Janeiro: IBGE; 2011 [cited in 11 Dec 2021]. 150 p. Available from: <https://biblioteca.ibge.gov.br/visualizacao/livros/liv50063.pdf>
16. Santos LMPG, Teodoro MA, Carramaschi T, Porto C, Monteiro E, Azeredo C, et al. Ações de educação alimentar e nutricional na prevenção da anemia: saúde do pré-escolar. *Revista Ciência em Extensão* [Internet]. 2019 [cited in 11 Dec 2021]; 15(4):30-46. Available from: https://ojs.unesp.br/index.php/revista_proex/article/view/1949/2329
17. Raphaelli CO, Figueiredo MF, Pereira ES, Granada GG. A pandemia de COVID-19 no Brasil favoreceu o consumo de alimentos ultraprocessados? *Brazilian Applied Science Review* [Internet]. 2021 [cited in 11 Dec 2021]; 5(3):1297-313. DOI: <https://ojs.brazilianjournals.com.br/ojs/index.php/BASR/article/view/29333>
18. Murad N, Spineli T, Almeida B. Alimentação infantil em tempos de pandemia. *Laboro: ensino de excelência* [Internet]. 2020 [cited in 11 Dec 2021]; 4-6. Available from: <http://localhost/jspui/handle/123456789/156>
19. Sociedade Brasileira de Pediatria. Departamento Científico de Endocrinologia. Obesidade em crianças e adolescentes e COVID-19. Nota de Alerta SBP [Internet]. Rio de Janeiro: SBP; 2020 [cited in 11 Dec 2021]. 7 p. Available from:

https://www.sbp.com.br/fileadmin/user_upload/22443c-NA_-_Obesid_em_Crianc_Adolesc_e_COVID-19_.pdf

20. Valverde RF, Romanello TB, Balseiro EM, Balseiro LM, Giacometti RA. Panorama da relação epidemiológica entre obesidade infantil associada ao Covid-19. *Revista Artigos.Com* [Internet]. 2021 [cited in 11 Dec 2021]; 27:e7123. Available from: <https://acervomais.com.br/index.php/artigos/article/view/7123/4605>
21. Sparrenberger K, Friedrich RR, Schiffner MD, Schuch I, Wagner MB. Ultra-processed food consumption in children from a Basic Health Unit. *J Pediatr (Rio J.)* [Internet]. 2015 [cited in 11 Dec 2021]; 91(6):535-42. DOI: <http://dx.doi.org/10.1016/j.jped.2015.01.007>
22. Lopes WC, Pinho L, Caldeira AP, Lessa AC. Consumption of ultra-processed foods by children under 24 months of age and associated factors. *Rev Paul Pediatr.* [Internet]. 2020 [cited in 11 Dec 2021]; 38:e2018277. DOI: <http://dx.doi.org/10.1590/1984-0462/2020/38/2018277>
23. Bielemann RM, Motta JVS, Minten GC, Horta BL, Gigante DP. Consumption of ultra-processed foods and their impact on the diet of young adults. *Rev Saude Pública* [Internet]. 2015 [cited in 11 Dec 2021]; 49(28):1-10. DOI: <http://doi.org/10.1590/S0034-8910.2015049005572>
24. Debastiani C, Fernandes JK, Leal VR. Relação da alimentação e a saúde durante o período pandemia do Covid – 19 dos alunos da Escola Terra do Saber, do Município de Palotina – PR. *Revista ConSensu IV* [Internet]. 2020 [cited in 11 Dec 2021]; 1-14. Available from: <http://consensu.uespar.edu.br/artigo-cientifico/revista-consensu-iv-c-583>
25. Bicalho E, Vieira B. Avaliação do consumo alimentar durante o Covid-19. *Jornal de Investigação Médica* [Internet]. 2020 [cited in 11 Dec 2021]; 1(2):29-41. DOI: <http://doi.org/10.29073/jim.v1i2.291>
26. Sant C, Menezes A, Sacramento JT, Dall' M, Brandão A, Broilo MC, et al. Habilidades culinárias parentais e consumo infantil de alimentos in natura ou minimamente durante a pandemia COVID-19. *DEMETRA (Rio J.)* [Internet]. 2022 [cited in 11 Dec 2021]; 17:e63174. Available from: <https://www.e-publicacoes.uerj.br/index.php/demetra/article/view/63174>
27. Bahatheg RO. Young children's nutrition during the covid-19 pandemic lockdown: a comparative study. *Early Child Educ J* [Internet]. 2021 [cited in 11 Dec 2021]; 49(5):915-23. DOI: <https://doi.org/10.1007/s10643-021-01192-3>
28. Neves RO, Bernardi JR, Silva CH, Goldani MZ, Bosa VL. Can parity influence infant feeding in the first six months of life? *Ciênc Saúde Colet.* [Internet]. 2020 [cited in 11 Dec 2021]; 25(11):4593-600. DOI: <https://doi.org/10.1590/1413-812320202511.01432019>
29. Relvas GRB, Buccini GS, Venancio SI. Ultra-processed food consumption among infants in primary health care in a city of the metropolitan region of São Paulo, Brazil. *J Pediatr (Rio J.)* [Internet]. 2019 [cited in 11 Dec 2021]; 95(5):584-92. DOI: <https://doi.org/10.1016/j.jped.2018.05.004>
30. Damiani TF, Pereira LP, Ferreira MG. Consumo de frutas, legumes e verduras na Região Centro-Oeste do Brasil: Prevalência e fatores associados. *Ciênc Saúde Colet.* [Internet]. 2017 [cited in 11 Dec 2021]; 22(2):369-82. DOI: <http://doi.org/10.1590/1413-81232017222.12202015>
31. Tomasi E, Nunes BP, Müller RM, Thumé E, Silveira DS, Siqueira FV, et al. Perfil de utilização de serviços de saúde por crianças de zona urbana no Brasil: estudo transversal de base nacional. *Rev Bras Saúde Mater Infant.* [Internet]. 2015 [cited in 11 Dec 2021]; 15(1):81-90. DOI: <https://doi.org/10.1590/S1519-38292015000100007>
32. Oliveira JS, Barufaldi LA, Abreu GA, Leal VS, Brunken GS, Vasconcelos SML, et al. ERICA: Use of screens and consumption of meals and snacks by Brazilian adolescents. *Rev Saúde Pública* [Internet]. 2016 [cited in 11 Dec 2021]; 50(Suppl 1):1s-9. DOI: <http://doi.org/10.1590/S01518-8787.2016050006680>

33. Lopes MPM, Barros DF, Costa ADSM, Gouvea TMDOA. Interpretações acerca da influência das informações nutricionais na escolha de alimentos infantis. *Gestão e Sociedade* [Internet]. 2013 [cited in 11 Dec 2021]; 7(16):4. DOI: <http://doi.org/10.21171/ges.v7i16.1528>
34. Jungblut SB, Campagnolo PDB. Relação entre conhecimento materno sobre rotulagem de alimentos e consumo de ultraprocessados em crianças e adolescentes atendidos em um projeto de extensão universitária. *Extensio: Revista Eletrônica de Extensão* [Internet]. 2020 [cited in 11 Dec 2021]; 17(37):2-17. DOI: <http://doi.org/10.5007/1807-0221.2020v17n37p2>
35. Veras GSS, Castro KR, Oliveira GS, Resende FBS, Garcia LRS. Compreensão dos pais/responsáveis sobre informação nutricional e alimentação infantil. *CARPE DIEM: Revista Cultural e Científica do UNIFACEX* [Internet]. 2014 [cited in 11 Dec 2021]; 15(1):50-68. Available from: <https://periodicos.unifacex.com.br/Revista/article/view/868/pdf>
36. Instituto Nacional de Saúde Doutor Ricardo Jorge. Silva MA, Alves RC, Oliveira MBPP, Alves RC, Costa HS. Percepção e hábitos de consumo relativamente a alimentos funcionais. *Boletim Epidemiológico* [Internet]. 2020 [cited in 11 Dec 2021]; (6):27-32. Available from: https://repositorio.insa.pt/bitstream/10400.18/7083/1/Boletim_Epidemiologico_Observacoes_N26_2020_artigo6.pdf
37. Vidal AM, Dias DO, Martins ESM, Oliveira RS, Nascimento RMS, Correia MGS. A ingestão de alimentos funcionais e sua contribuição para a diminuição da incidência de doenças. *Cadernos de Graduação - Ciências Biológicas e da Saúde* [Internet]. 2012 out [cited in 11 Dec 2021]; 1(15):43-52. Available from: <https://periodicos.set.edu.br/cadernobiologicas/article/view/284/112>

Associated Publisher: Rafael Gomes Ditterich.

Conflict of Interests: the authors declared there is no conflict of interests.

Financing: none.

CONTRIBUTIONS

Jaqueline Laureano de Azevedo and **Daniela Braga Lima** contributed to the conception, collection and analysis, writing and revision. **Ana Clara da Cruz Della Torre** and **Flavia Della Lucia** participated in the writing and revision. **Eric Batista Ferreira** participated in data collection and analysis.

How to cite this article (Vancouver)

Azevedo JL, Della Torre ACC, Ferreira EB, Della Lucia F, Lima DB. Hidden pathway of the COVID-19 pandemic in children's health and nutrition. *Rev Fam, Ciclos Vida Saúde Contexto Soc.* [Internet]. 2023 [cited in *insert day, month and year of access*]; 11(1):e6111. Available from: *insert access link*. DOI: *insert DOI link*.

How to cite this article (ABNT)

AZEVEDO, J. L.; DELLA TORRE, F.; FERREIRA, E. B.; DELLA LUCIA, F.; LIMA, D. B. Hidden pathway of the COVID-19 pandemic in children's health and nutrition. **Rev. Fam., Ciclos Vida Saúde Contexto Soc.**, Uberaba, MG, v. 11, n. 1, p. e6111, 2023. DOI: *insert DOI link*. Available from: *insert access link*. Access in: *insert day, month and year of access*.

How to cite this article (APA)

Azevedo, J.L., Della Torre, F., Ferreira, E.B., Della Lucia, F., & Lima, D.B. (2023). Hidden pathway of the COVID-19 pandemic in children's health and nutrition. *Rev. Fam., Ciclos Vida Saúde Contexto Soc.*, 11(1). Retrieved in *insert day, month and year of access* from *insert access link*. DOI: *insert DOI link*.



This is an open access article distributed under the terms of the Creative Commons License