Research, Society and Development, v. 11, n. 4, e15211427129, 2022
(CC BY 4.0) | ISSN 2525-3409 | DOI: http://dx.doi.org/10.33448/rsd-v11i4.27129

Children's nutritional status - the impacts of the pandemic and their perspectives for prevention

Estado Nutricional infantil – os impactos da pandemia e suas perspectivas para a prevenção

Estado nutricional infantil – los impactos de la pandemia y sus perspectivas de prevención

Received: 02/17/2022 | Reviewed: 02/26/2022 | Accept: 03/07/2022 | Published: 03/14/2022

Larissa Andréia Ribeiro
ORCID: https://orcid.org/0000-0002-1766-9785
Centro Universitário FUNVIC, Brazil
E-mail: larissa.01010532.pinda@unifunvic.edu.br
Matheus Diniz Gonçalves Coêlho
ORCID: https://orcid.org/0000-0002-7903-1429
Centro Universitário FUNVIC, Brazil
E-mail: profmatheuscoelho@gmail.com
Sabrina Fernandes Rosa
ORCID: https://orcid.org/0000-0002-4809-3950
Centro Universitário FUNVIC, Brazil
E-mail: sabrina.01010474.pinda@unifunvic.edu.br
Miryan Marcondes Leite de Oliveira
ORCID: https://orcid.org/0000-0003-3155-0104
Centro Universitário FUNVIC, Brazil
E-mail: miryan.01010748.pinda@unifunvic.edu.br
João Vitor Gonçalves Lourenço
ORCID: https://orcid.org/0000-0003-2669-9211
Centro Universitário FUNVIC, Brazil
E-mail: joao.01010982.pinda@unifunvic.edu.br

Abstract
Brazil currently lives in a new scenario of serious nutritional problems in childhood. In addition to malnutrition in several regions of the country, another nutritional disorder is raised: excessive weight. In addition to this context, in 2020, COVID-19 appears, making this scenario even more problematic. Thus, this study aimed to evaluate the effects of the pandemic on the nutritional health of children aged 0 to 10 years, in relation to their overweight, in the national territory. A cross-sectional, retrospective and quantitative approach was developed. Data for research were taken from official government websites, namely: SISVAN - Web (Food and Nutrition Surveillance), DATASUS and e-SUS Web, in which sociodemographic data from Brazil were analyzed and in its five socio-political regions. The variables analyzed were: gender, age group and zone of occurrence. The profile showed no statistically significant differences in the prevalence of children's overweight in Brazil, regardless of age group, in the period between 2017 and 2021. However, there was a clear trend, although not significant, of increased prevalence of children with overweight, except in the age groups from 0 to 6 months and from 6 months to two years, which showed a stationary trend. In relation to the socio-political regions, it was possible to identify a trend of increasing weight gain for age, in all regions, being lower in the North and higher to the Southeast region. It should be noted that this trend of increasing weight gain was only significant in the southern region, where the prevalence of overweight was significantly higher (G Test; $p<0.0001$) in 2021. There is no statistically significant difference between gender groups, despite the greater number of cases being male. Thus, it can be concluded that child weight gain is closely related to multifactorial causes, among which we can highlight the socioeconomic region, culture, social isolation in the pandemic and purchasing power. In this way, the importance of the nutritionist professional in the health units is reinforced, as the main propagator of actions aimed to promote, treat and rehabilitate children's health, especially through the pandemic.
Keywords: Nutritional status; Epidemiological survey; Brazil.

Resumo
O Brasil vive atualmente em um novo cenário de sérios problemas nutricionais na infância. Além da desnutrição em diversas regiões do país, é levantado mais um distúrbio nutricional: o peso excessivo. Além desse contexto, surge ainda, no ano de 2020 a COVID-19 tornando esse cenário ainda mais problemático. Desse modo, este trabalho teve por objetivo avaliar os efeitos da pandemia na saúde nutricional de crianças de 0 a 10 anos, em relação ao peso elevado das mesmas, no território nacional. Foi desenvolvido um transversal, retrospectivo e com abordagem quantitativa, os dados para pesquisa foram retirados de sites oficiais do governo à saber: SISVAN - Web (Vigilância Alimentar e Nutricional), DATASUS e e-SUS Web, no qual foram analisados dados sociodemográficos do Brasil e nas suas cinco regiões sócio-políticas. As variáveis analisadas foram: gênero, faixa etária e zona de ocorrência. O perfil evidenciou não haver diferenças estatisticamente significativas na prevalência de crianças com peso elevado no Brasil, independente da faixa

etária, no período compreendido entre os anos 2017 a 2021. No entanto, houve uma clara tendência, apesar de não significativa, de aumento da prevalência de crianças com peso elevado, no ano de 2021, em detrimento as faixas etárias de 0 a 6 meses e de 6 meses a dois anos, que apresentaram uma tendência estacionária. Em relação as regiões sócio-políticas foi possível identificar uma tendência de ampliação do aumento de peso elevado para a idade, em todas as regiões, sendo esta, menor no Norte e mais elevada até a região Sudeste, ainda de forma não significativa, até chegar na região Sul, na qual observa-se uma prevalência de casos significativamente maior (Teste G; p<0,0001) no ano de 2021. No que tange a prevalência de peso elevado por gênero, foi possível verificar, que não houve dados significativos estatisticamente, apesar do maior número de casos ser do sexo masculino. Assim, pode-se concluir que o aumento de peso infantil está intimamente relacionado a causas multifatoriais, dentre os quais podemos destacar a região socioeconômica, a cultura, o poder aquisitivo e o gênero. Desse modo, reforça-se a importância do profissional nutricionista nas unidades de saúde, como principal agente de implementações de ações de promoção, tratamento e reabilitação da saúde infantil.
Palavras-chave: Estado nutricional; Inquérito epidemiológico; Brasil.

Resumen
Brasil vive actualmente en un nuevo escenario de graves problemas nutricionales en la infancia. Además de la desnutrición en varias regiones del país, se plantea otro trastorno nutricional: el sobrepeso. Sumado a este contexto, en 2020 aparece el COVID-19, haciendo aún más problemático este escenario. Así, este estudio tuvo como objetivo evaluar los efectos de la pandemia en la salud nutricional de los niños de 0 a 10 años, en relación a su elevado peso, en el territorio nacional. Se desarrolló un abordaje transversal, retrospectivo y cuantitativo, los datos para la investigación fueron tomados de los sitios web oficiales del gobierno, a saber: SISVAN - Web (Vigilancia Alimentaria y Nutricional), DATASUS y e-SUS Web, en los que se analizaron datos sociodemográficos de Brasil y en sus cinco regiones sociopolíticas. Las variables analizadas fueron: sexo, grupo de edad y zona de ocurrencia. El perfil no mostró diferencias estadísticamente significativas en la prevalencia de niños con sobrepeso en Brasil, independientemente del grupo de edad, en el período comprendido entre 2017 y 2021. Sin embargo, hubo una tendencia clara, aunque no significativa, de aumento de la prevalencia de niños con peso elevado, en el año 2021, en detrimento de los grupos de edad de 0 a 6 meses y de 6 meses a dos años, que mostraron una tendencia estacionaria. Con relación a las regiones sociopolíticas, fue posible identificar una tendencia de aumento de la ganancia de peso para la edad, en todas las regiones, siendo esta, menor en la región Norte y mayor hacia la región Sudeste, aún no significativa, hasta alcanzar en la Región Sur, donde se presenta una prevalencia de casos significativamente mayor (Prueba G; p<0,0001) en el año 2021. En cuanto a la prevalencia de peso alto por sexo, se pudo verificar que no hubo datos estadísticamente significativos, a pesar de la mayor número de casos siendo hombres. Así, se puede concluir que la ganancia de peso infantil está estrechamente relacionada con causas multifactoriales, entre las que podemos destacar la región socioeconómica, la cultura, el poder adquisitivo y el género. De esta forma, se refuerza la importancia del profesional nutricionista en las unidades de salud, como principal propagador de implementaciones de acciones de promoción, tratamiento y rehabilitación de la salud infantil.
Palabras clave: Estados nutricionales; Encuesta epidemiológica; Brasil.

1. Introduction

Disorders related to overweight, considered by the World Health Organization - WHO as resulting from the accumulation of fat in the body, derived from an energy imbalance (WHO, 2000), have become, in recent years, one of the greatest health challenges of the contemporary generation, as such health problems affect the whole world exponentially, since from 1980 to 2013, there was a 27.5% increase in overweight in adults (Ng et al., 2014), evidence that also is being identified in the child population, particularly in recent decades and in all countries (Batch & Baur, 2005).

In Brazil, about 40% of the adult population has excessive body weight, which is a disorder identified in all social stratifications (Monteiro et al., 2004), a fact that culminates in a worrying and contrasting evidence, according to which Brazil follows the global trend of a nutritional transition, which occurs when a nation stops having many cases of child malnutrition and starts to present high numbers of children's overweight and obesity (Clemente et al., 2011; Cohen et al., 2013; Batista Filho & Rissin, 2003; Bermudez & Tucker, 2003).

It is possible to exemplify the severity of this problem through data published by the World Health Organization (WHO, 2018), which showed that the number of school-age young people with obesity in the last 40 years raised from 11 to 124 million, representing an increase of approximately 11 times the value detected since the beginning of the world historical series. In Brazil, a survey was published by the Food and Nutrition Surveillance System - SISVAN, in 2019, from which it became evident that

about 10% of the Brazilian population between 5 and 10 years old is overweight for their age, surpassing the same survey carried out in 2009, in which only 3.8% of the population belonging to this same age group was overweight (SISVAN, 2009).

In view of the above, a greater proportion of children may suffer the consequences of overweight, presenting a greater risk of developing cardiovascular problems, resulting from the increase in the amount of body fat (Silva, 2010), and probable future cases of aggravation of these conditions, with an increased probability of developing chronic non-communicable diseases such as hypertension, glucose resistance, dyslipidemia and hyperinsulinemia (Del Río-Navarro et al., 2004). It is also worth noting that among children with obesity, the chance of remaining overweight in adulthood is double higher (Bleich et al., 2018; Balaban & Silva, 2001), which makes weight gain in children a major challenge for Public Health.

In this worrying contemporary scenario, COVID-19 appears as an aggravating factor, which affects the respiratory system of its victims and, due to its high transmissibility, has spread exponentially worldwide, which resulted in the declaration of a pandemic by the World Health Organization. (WHO) on March 11, 2020 (OPAS, 2020). In Brazil, this disease caused 100,000 deaths, until August 8, 2020 (ECDC, 2020) and due to such circumstances, precautionary measures were taken by Governmental Bodies such as the closing of secondary businesses, cancellation of face-to-face classes and suspension of meetings (Aquino et al., 2020), measures that, although important, can potentially add to an increase in the occurrence of disorders related to the mental and physical condition of individuals and their respective family relationships (Brooks et al., 2020; Lima et al., 2020), which can also have an important impact on children, since such circumstances make them more susceptible to changes in their diet (CFN, 2020), which can affect their nutritional status.

The present study aimed to identify and evaluate sociodemographic and epidemiological aspects related to the increase in child weight and to identify how the pandemic due to COVID-19 may have influenced these indicators.

2. Methodology

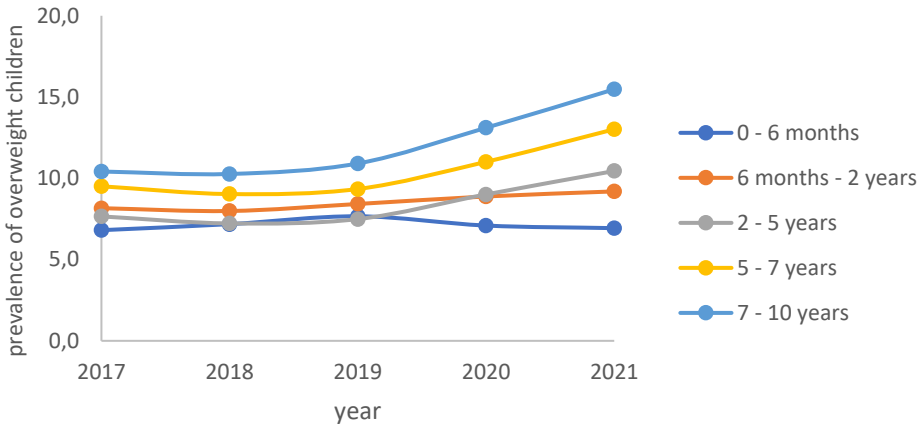
This is a cross-sectional, retrospective study with a quantitative approach, in which sociodemographic data were analyzed in Brazil in general, and in their respective administrative regions (South, Southeast, Midwest, North and Northeast), with regard to the obesity-related morbidity coefficients. Data collection was carried out using official government websites as a source of data, in the last 5 years, namely: SISVAN - Web (Food and Nutrition Surveillance), DATASUS and e-SUS Web, in order to assess the prevalence of overweight for age in children under 10 years of age and associated factors. The variables analyzed were: gender, age group and zone of occurrence. The weight-for-age index was chosen due to the greater coverage of children's age groups.

The results obtained were arranged in Excel spreadsheets and statistically evaluated, using the G test, in order to verify differences between the epidemiological data obtained, and the Bioestat 5.3 software as a support tool.

3. Results

The prevalence rates of overweight in relation to age group, administrative region and gender, during the period from 2017 to 2021, are presented in Figures 1 to 3, respectively.

Figure 1. Behavior of the prevalence of children's overweight in Brazil related to age, in the period between 2017 and 2021.

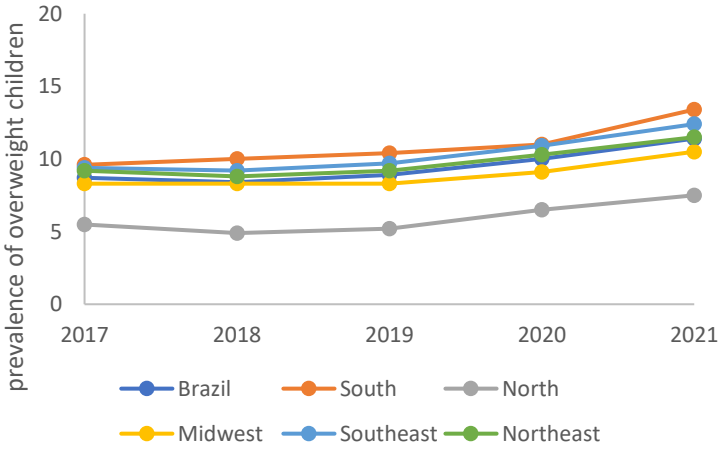


*no significant difference by age group, in the entire period of time evaluated.

	2017	2018	2019	2020	2021
0 - 6 months	6,8	7,2	7,7	7,1	6,9
6 months – 2years	8,2	8,0	8,4	8,9	9,2
2 – 5years	7,7	7,2	7,5	9,0	10,4
5 – 7years	9,5	9,0	9,3	11,0	13,0
7 – 10years	10,4	10,3	10,9	13,1	15,5

Source: Authors.

Figure 2. Behavior of the prevalence of overweight children in Brazil and in their respective administrative regions, in the period between 2017 and 2021.

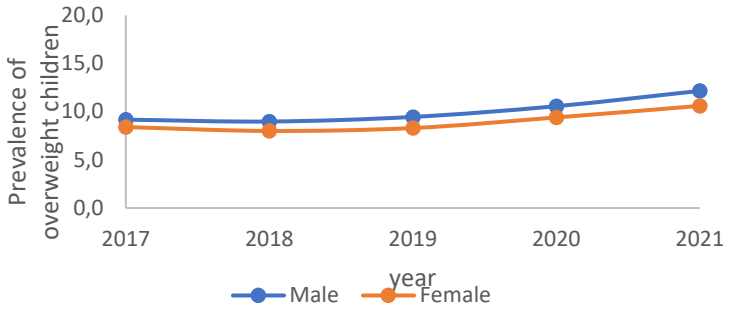


* significant difference (G test / p<0.0001) in relation to the same region in the years 2017 and 2018.

	2017	2018	2019	2020	2021
Brazil	8,7	8,4	8,9	10,0	11,4
South	9,6	10,0	10,4	11,0	13,4*
North	5,5	4,9	5,2	6,5	7,5
Midwest	8,3	8,3	8,3	9,1	10,5
Southeast	9,4	9,2	9,7	10,9	12,4
Northeast	9,2	8,8	9,2	10,3	11,5

Source: Authors.

Figure 3. Prevalence of overweight children in Brazil, by gender. (2017 to 2021).



* no significant difference by gender, over the entire time period evaluated.

	2017	2018	2019	2020	2021
Male	9,2	9,0	9,5	10,6	12,2
Female	8,4	8,0	8,3	9,4	10,6

Source: Authors.

4. Discussion

After collecting and analyzing data on the weight of children belonging to the age groups addressed in this study, it was observed that there were no statistically significant differences in the prevalence of children with overweight in Brazil, regardless of age group, in the period between the years 2017 to 2021, as shown in Figure 1.

The absence of a statistically significant increase in children with high body weight may be related to the purchasing power of the families to which such children belong (Silva et al., 2018), since the data evaluated in the present work come from a child population probably less privileged families, since the database that served as the basis for the composition of the results, namely the SISVAN, concerns children registered and treated in public health units, which normally do not serve children with high purchasing power, as they usually undergo consultations with nutritionists and pediatricians from the private network.(Ribeiro et al., 2003)

This hypothesis can be reinforced based on the national health survey carried out in 2019 (IBGE, 2020), according to which 64.7% of users of public primary care services had a per capita household income of less than one minimum wage and the next 32.3% were in the range of 1 to 3 minimum wages, reaching a total of 97% of users belonging to families with low purchasing power.

In addition, in the period of the pandemic, the financial crisis that was established may have made it even more difficult to acquire food with higher cost, including ultra-processed and industrialized foods, which are possibly possessing a higher content of calories (ILO, 2020). According to Aquino & Philippi (2002) eating practices are important factors in determining health conditions in childhood, being closely linked to family purchasing power, on which the qualitative and quantitative availability of food consumed depends. Also according to these authors, the consumption of chocolate, yogurt and powdered milk is much more frequent among children belonging to families with higher purchasing power, not occurring frequently in those from poorest families, a factor that can influence a less weight gain, even in the conditions of social isolation that were necessary in the pandemic, and which led to a greater sedentary lifestyle in children, which theoretically should have resulted in a greater number of individuals with excessive body weight.

It is worth noting that, despite the fact that they are children from families with lower purchasing power, in the age groups of two to five years, from five to seven years and from seven to ten years, there was a clear trend, although not significant, of an increase in the prevalence of children with overweight, which culminated in the year 2021, the same not occurring in the age groups from 0 to 6 months and from 6 months to two years, which showed a stationary trend, demonstrating that the occurrence

of weight in excess in children is probably linked to advancing age, so that as they grow and move away from the birth period, the diet is modified, with the introduction of new foods, many of which are ultra-processed and hypercaloric, as cited by Matos et al. (2011).

Such trends may be related to the typical food profile of each age group, since in those with a stationary trend, the predominant food is breast milk, and its consumption is intensely stimulated, healthy, safe and necessary. In fact, according to the food guide for children under 2 years of age, the WHO recommends that breastfeeding be the only source of food for children up to 6 months of age, and, if possible, should be continued at least until the second year of life (Brazil, 2002).

However, in age groups above the age of 2 years, there is a tendency to increase adherence to unbalanced diets in terms of calories, which maximizes the possibility of weight gain, beyond what is acceptable, and which can worsen during the pandemic and of the consequent social distancing, where a sedentary lifestyle prevails over activities that allow energy expenditure, such as the practice of sports and access to public leisure places (Black & Hurley, 2007; Garcia & Duarte, 2020). According to De Sousa et al. (2020) the social distancing imposed by the COVID-19 pandemic makes it difficult to carry out prevention strategies and encourages practices that can trigger or worsen overweight, being an aggravating factor for the obesity epidemic, which will only bring greater impacts later.

With regard to the nutritional status of children in Brazil as a whole, it is possible to verify that there was no significant increase, but there was a trend towards an enhancement in the number of cases of overweight children within the period of time evaluated. This fact is closely related to the development of a nutritional transition in the country, in which, over the years, the number of malnourished children has decreased and cases of body weight gain have increased, due to various circumstances arising from socioeconomic factors which have changed until the contemporary moment, as an example, the improvement in the living condition, the insertion of women in the labor market, urbanization and the fast-paced lifestyle that leaves parents absent from their children's meals, as well as the greater workload in schools and meals away from home, factors that have a negative impact on families, who start to prefer meals that are easier to prepare and eat (Batista Filho & Rissin, 2003; Kac & Velásquez-Meléndez, 2003; Mendonça & Anjos, 2004; Killien, 2001; Ferreira & Magalhães, 2006).

It is worth noting that the trend was not statistically significant, and this evidence may be linked to the fact that the analysis of the study was carried out on children registered in the public health system, as mentioned above, and because the country is still in development, since overweight is more common in developed countries, being, over the years, detected more frequently and initially in higher social classes in developing countries, such as Brazil, modifying this scenario only recently (Zeferino et al. , 2003; Costa et al., 2006; Wang et al.,2002).

This statement can be proven by Aquino and Philippi (2002), who claim that a country's income is proportionally associated with the degree of refinement and industrialization of the food consumed. In the United States, for example, approximately 46% of household food expenditures are on meals away from home, of which 34% are on fast foods (Nicklas et al., 2001), negatively impacting the health of the population, since approximately 18.5% of North American children and adolescents are obese (Hales et al., 2017), while in Brazil, this number drops to 13.2% (Brasil, 2021).

It is still worth noting that, in developed countries, most cases of excess weight are from lower social classes due to the greater ease of contact with high-calorie foods, while in underdeveloped or developing countries, cases of increased body weight are more prevalent in high-income children, given the greater difficulty in accessing these foods (Sobal et al., 2003; Monteiro et al., 2004). In a cross-sectional study produced by Rech et al. (2010), in Serrana-RS, overweight and obese children were evaluated according to their families' income. In this study, it was found that overweight children represented 30.3% among those with high and intermediate income, in contrast to only 17.6% among low-income children, which demonstrates that children with better economic conditions may have approximately twice the chance of developing overweight concomitant with obesity.

The same scenario can be observed in studies carried out before the aforementioned one, such as the study carried out by Siqueira and Monteiro (2007) and by Fagundes et al. (2008), in which overweight and obese children were analyzed, both carried out with children aged between six and fourteen years, but in groups with different economic conditions, namely, low and high socioeconomic status. In their results, a prevalence of 26% was found for overweight children from high-income families and 14.7% for low-income children. Finally, it is worth mentioning that although low-income children have a lower prevalence of comorbidity, it has increased over the years, as already reported in the literature (Ferreira et al., 2010; Pimenta et al., 2015).

Regarding the regions of Brazil, there is a divergence between the respective prevalences, which may be related to the diversified development of each region of the country, and its popular culture, which is related to immigration influences, miscegenation, the regional climate and the food disposal (Abreu et al., 2001; Ferreira & Magalhães, 2006; Pinheiro, 2001). When contemplating figure 2, it is possible to identify a trend of increasing weight gain for age, in all regions, being lower in the North and higher up to the Southeast region, still not significantly, until reaching the South region, in which there is a significantly higher prevalence of cases (G Test; $p<0.0001$) in the 2021 year, compared to the initial years of the evaluated period, namely the years 2017 and 2018.

The highlight for the South region may be linked to the fact that the region has greater economic power than other regions, as according to the Ministry of Health and the PNDS (National Demographic and Health Survey of Children and Women) in 2009, this is a region recognized as one of the most developed in Brazil, which leads to greater purchasing power on the part of this population. According to them, the South Region, with the Southeast and Center-West regions, has a higher average family income than the North and Northeast regions. These still aggregate the largest number of cities with a high percentage of critical food insecurity (Gubert et al., 2010).

Thus, the greater purchasing power of the South region triggers a peculiar food profile, as evidenced by Bortolini et al (2012), who, based on their analysis, highlighted that the greater daily consumption of sweets and soft drinks was observed primarily in the such region, and then in the Southeast region. Also, according to the Ministry of Health, of the five regions of Brazil, the South region has the most serious percentage of overweight in adults, approximately 40%, corresponding to about five million individuals and this can extend to children quickly, as they need an adult to feed themselves, and can be strongly influenced by their inappropriate eating habits (CFN, 2020).

It is important to emphasize that the peak in the number of cases of overweight in Brazil and its regions was precisely between 2020 and 2021, as shown in Figure 1, with 2020 being the first year impacted by the pandemic in the country, as well as the introduction of the respective prevention measures (Croda & Garcia, 2020; Rodriguez-Morales et al., 2020; Pires, 2020), thus making the increase in the prevalence of overweight linked to social isolation and the suspension of public events and which can cause psychological disorders arising from fear, stress, loneliness (McElroy et al., 2020; Brooks et al., 2020; Deighton et al., 2019; Loades et al., 2020), causing a greater preference for high-calorie foods by children (Abbas et al., 2020; Ruíz-Roso et al., 2020; Pietrobelli et al., 2020) and sedentary lifestyle, from the longer time spent in the virtual world, and lower frequency of physical activities (Lourenço et al., 2019).

Regarding the prevalence of overweight for the gender, it is possible to verify, according to figure 3, that there was no significant difference, but with a greater tendency to increase body weight among men, to the detriment of women. This tendency may be related to children's eating habits by sex. According to Souza e Enes (2013), female children are more susceptible to a healthier diet rich in vegetables and fruits, while male children opt for more fatty foods, which demonstrates the greater difficulty of boys to adapt to a healthier lifestyle. Likewise, regarding sociocultural arguments, the strong impact of beauty standards imposed by society can be highlighted, which affect females more intensely, even if at an early stage, making parents more attentive to the weight of girls than boys (Huang et al., 2007; He & Evans, 2007) and causing them to seek a thin body and

develop an aversion to gaining weight more often than males (Gonçalves et al., 2013). It is emphasized, however, that although there was a tendency for boys to be overweight than girls, this difference was not significant, and this fact is probably related to the strong impacts of isolation resulting from the pandemic, which brought, as previously mentioned, anxiety, predilection for hypercaloric foods and greater involvement with activities in the so-called "virtual environment", which together ended up affecting, in a practically equitable way, both girls and boys.

5. Conclusion

It is concluded, therefore, that child weight gain is closely related to multifactorial causes, with this condition being the most prevalent health condition in the age groups of two to five years, five to seven years and seven to ten years, probably due to change in food profile, linked to social isolation resulting from restrictive measures related to the COVID-19 pandemic, since there was a clear trend, although not significant, of an increase in the prevalence of children with overweight, in the year 2021, compared to the age groups from 0 to 6 months and from 6 months to two years, which showed a stationary trend, demonstrating that the occurrence of excess weight in children is also closely related to growing up, since a tendency to practice of inadequate eating habits is developed, with a decrease in the consumption of foods composed exclusively of breast milk.

Thus, the importance of the professional nutritionist in health units is reinforced, as the main propagator of actions to promote, treat and rehabilitate children's health. Since nutritional monitoring will act in the development of eating habits in childhood, with the aim of promoting healthy eating in the quality of life promotion.

Finally, for the design of future research, it is suggested to direct efforts aimed at assessing whether there is excessive weight gain in families with greater economic power, as well as studies aimed at verifying whether the epidemiological behavior highlighted in the present work will be maintained or will set back with the return of economic activities in Brazil.

References

Abbas, A. M., Fathy, S. K., Fawzy, A. T., Salem, A. S., & Shawky, M. S. (2020). The mutual effects of COVID-19 and obesity. *Obesitymedicine*, 19, 100-250.

Abreu, E. S. D., Viana, I. C., Moreno, R. B., & Torres, E. A. F. D. S. (2001). Alimentação mundial: uma reflexão sobre a história. *Saúde e sociedade*, *10*, 3-14.

Aquino, E. M., Silveira, I. H., Pescarini, J. M., Aquino, R., Souza-Filho, J. A. D., Rocha, A. D. S., & Lima, R. T. D. R. S. (2020). Social distancing measures to control the COVID-19 pandemic: potential impacts and challenges in Brazil. *Ciencia & saude coletiva*, *25*, 2423-2446.

Aquino, R. C. & Philippi, S. T. (2002). Consumo infantil de alimentos industrializados e renda familiar na cidade de São Paulo. *Revista de Saúde Pública*, 36(6), 655-60.

Balaban, G. & Silva, G. A. P. (2001). Prevalência de sobrepeso e obesidade em crianças e adolescentes de uma escola da rede privada do Recife. *Jornal de Pediatria*, 77(2), 96-100.

Batch, J. A. & Baur, L. A. (2005). Management and prevention of obesity and its complications in children and adolescents. *Medical Journal of Austrália*, 182(3), 130-35.

Batista-Filho, M. & Rissin, A. (2003). A transição nutricional no Brasil: tendências regionais e temporais. *Caderno de Saúde Pública*, 19(1), 181-191.

Bermudez, O. I. & Tucker, K. L. (2003). Trends in dietary patterns of Latin American populations. *Caderno de Saúde Pública*, 19(1), 87-99.

Black, M. M. & Hurley, K. M. (2007). Helping children develop healthy eating habits. *Encyclopedia on Early Childhood Development*, 1-10.

Bleich, S. N., Vercammen, K. A., Zatz, L. Y., Frelier, J. M., Ebbeling, C. B., & Peeters, A. (2018). Interventions to prevent global childhood overweight and obesity: a systematic review. *The Lancet Diabetes & Endocrinology*, *6*(4), 332-346.

Bortolini, G. A, Gubert, M. B. & Santos, L. M. P. (2012). Consumo alimentar entre crianças brasileiras com idade de 6 a 59 meses. *Caderno de Saúde Pública*, 28(9), 1759-1771.

Brasil. Ministério da Saúde — Área Técnica de Alimentação e Nutrição. Brasília, 2002.

Brasil. Ministério da Saúde. Guia alimentar para crianças menores de 2 anos. 2002.

BRASIL. Ministério da Saúde. Obesidade infantil afeta 3,1 milhões de crianças menores de 10 anos no Brasil. Brasília, 2021

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *The lancet*, *395*(10227), 912-920.

ECDC, E. (2020). COVID-19 situation update worldwide.

CFN. Conselho Federal de Nutricionistas. Nota Oficial: Orientações à população e para os nutricionistas sobre o novo coronavírus. 2020.

Clemente, A. P. G., Santos, C. D. D. L., Martins, V. J., Benedito-Silva, A. A., Albuquerque, M. P., & Sawaya, A. L. (2011). Mild stunting is associated with higher body fat: study of a low-income population. *Jornal de pediatria*, *87*, 138-144.

Cohen, E., Boetsch, G., Palstra, F. P., & Pasquet, P. (2013). Social valorisation of stoutness as a determinant of obesity in the context of nutritional transition in Cameroon: The Bamiléké case. *Social Science & Medicine*, *96*, 24-32.

Costa, R. F. D., Cintra, I. D. P., & Fisberg, M. (2006). Prevalência de sobrepeso e obesidade em escolares da cidade de Santos, SP. *Arquivos Brasileiros de Endocrinologia & Metabologia*, *50*, 60-67.

Croda, J. H. R. & Garcia, L. P. (2002). Immediate Health Surveillance Response to COVID-19 Epidemic. *Epidemiologia e Serviços de Saúde*, 29.

Deighton, J. et al. (2004). Prevalence of mental health problems in schools: poverty and other risk factors among 28 000 adolescents in England. *The British Journal of Psychiatry*, 215, 565-567.

Del Río‐Navarro, B. E. et al (2004). The high prevalence of overweight and obesity in Mexican children. *Obesity Research & Clinical Practice*, *12*(2), 215-223.

de Sousa, G. C., Lopes, C. S. D., Miranda, M. C., da Silva, V. A. A., & Guimarães, P. R. (2020). A Pandemia de COVID-19 e suas repercussões na epidemia da obesidade de crianças e adolescentes. *Revista Eletrônica Acervo Saúde*, *12*(12), e4743-e4743.

Fagundes, A. L. N., Ribeiro, D. C., Naspitz, L., Garbelini, L. E. B., Vieira, J. K. P., Silva, A. P. D., & Juliano, Y. (2008). Prevalência de sobrepeso e obesidade em escolares da região de Parelheiros do município de São Paulo. *Revista Paulista de Pediatria*, *26*, 212-217.

Ferreira, V. A. & Magalhães, R. (2006). Obesidade no Brasil: tendências atuais. *Revista portuguesa de saúde pública*, 24(2), 71-81.

Ferreira, V. A., Silva, A. E., Rodrigues, C. A. A., Nunes, N. L. A., Vigato, T. C., & Magalhães, R. (2010). Inequality, poverty and obesity. *Ciência & Saúde Coletiva*, *15*, 1423-1432.

Garcia, L. P. & Duarte, E. (2020). Intervenções não farmacológicas para o enfrentamento à epidemia da COVID-19 no Brasil. *Epidemiologia e Serviços de Saúde*, 29.

Gonçalves, J. D. A., Moreira, E. A. M., Trindade, E. B. S. D. M., & Fiates, G. M. R. (2013). Transtornos alimentares na infância e na adolescência. *Revista paulista de pediatria*, *31*, 96-103.

Gubert, M. B., Benicio, M. H. & Santos, L. M. (2010). Estimativas de insegurança alimentar grave nos municípios brasileiros. *Caderno de Saúde Pública*, 26, 1595-1605.

Hales, C. M., Carroll, M. D., Fryar, C. D., & Ogden, C. L. (2017). Prevalence of obesity among adults and youth: United States, 2015–2016.

He, M. & Evans, A. (2007). Are parents aware that their children are overweight or obese? Do they care? *Canadian Family Physician*, 53,1493-1499.

Huang, J. S., Becerra, K., Oda, T., Walker, E., Xu, R., Donohue, M., & Breslow, A. (2007). Parental ability to discriminate the weight status of children: results of a survey. *Pediatrics*, *120*(1), e112-e119.

Instituto Brasileiro de Geografia e Estatística - IBGE. Pesquisa nacional de saúde: 2019: informações sobre domicílios, acesso e utilização dos serviços de saúde: Brasil, grandes regiões e unidades da federação / IBGE, Coordenação deTrabalho e Rendimento. - Rio de Janeiro: 2020.

Kac, G. & Velásquez-Meléndez, G. (2003). A transição nutricional e a epidemiologia da obesidade na América Latina. Caderno de Saúde Pública, 19(1), S4-S5.

Killien, M. G. (2001). Women and employment: a decade review. *Annual Review of Nursing Research*, 19(1), 87-123.

Lima, C. K. T., Carvalho, P. M. D. M., Lima, I. D. A. A. S., Nunes, J. V. A. D. O., Saraiva, J. S., Souza, R. I. D., Silva, C. G. L. D. & Rolim-Neto, M. L. (2020). The emotional impact of Coronavirus 2019-nCoV (new Coronavirus disease*). Psychiatry research*, 287(112915), 1-2.

Loades, M. E., Chatburn, E., Higson-Sweeney, N., Reynolds, S., Shafran, R., Brigden, A., Linney, C., McManus, M. N., & Crawley, E. (2020). Rapid systematic review: the impact of social isolation and loneliness on the mental health of children and adolescents in the context of COVID-19. *Journal of the Americam Academy Child Adolescent Psychiatry*, 59, 1218–1239.

Lourenço, C. L. M., de Souza, T. F. & Mendes, E. L. (2019). Relationship between smartphone use and sedentary behavior: a school-based study with adolescents. *Revista Brasileira de Atividade Física & Saúde*, 24, 1-8.

Matos, S. M. A. de. et al. (2011). Velocidade de ganho de peso nos primeiros anos de vida e excesso de peso entre 5-11 anos de idade, Salvador, Bahia, Brasil. Caderno de Saúde Pública, 27(4), 714-722.

McElroy, E., Patalay, P., Moltrecht, B., Shelvin, M., Shum., A., Creswell, C. & Waite, P. (2020). Demographic and health factors associated with pandemic anxiety in the context of COVID-19. *British Journal of Health Psychology*, 25, 934–944.

Mendonça, C. P. & Anjos, L. A. (2004). Aspectos das práticas alimentares e da atividade física como determinantes do crescimento do sobrepeso/obesidade no Brasil. *Caderno de Saúde Pública, 20(3), 698-709.*

Ministério da Saúde/Centro Brasileiro de Análise e Planejamento. Pesquisa nacional de demografia e saúde da criança e da mulher – PNDS 2006: dimensões do processo reprodutivo e da saúde da criança. Brasília: Ministério da Saúde; 2009. (Série G. Estatística e Informação em Saúde).

Monteiro, C. A., Moura, E. C., Conde, W. L. & Popkin, B. M. (2004). Socioeconomic status and obesity in adult populations of developing countries: a review. Bulletin of the world health organization, 82, 940-946.

Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., Mullany, E. C., ... & Gakidou, E. (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. The lancet, 384(9945), 766-781.

Nicklas, T. A., Baranowski, T. & Cullen, K. W. (2001). Berenson G. Eating patterns, dietary quality and obesity. Journal of American Nutrition Associate, 6, 599-608.

Organização Pan-Americana de Saúde (OPAS). Folha informativa – COVID-19 [Internet]. Brasília: OPAS; 2020.

Pietrobelli, A., Pecoraro, L., Ferruzzi, A., Heo, M., Faith, M., Zoller, T., Antoniazzi, F., … & Heymsfield, S. B. (2020). Effects of COVID-19 lockdown on lifestyle behaviors in children with obesity living in Verona, Italy: a longitudinal study. Obesity, 28, 1382–1385.

Pires, R. R. C. Os efeitos sobre grupos sociais e territórios vulnerabilizados das medidas de enfrentamento à crise sanitária da covid-19: propostas para o aperfeiçoamento da ação pública: Nota Técnica. Brasília: IPEA; 2020. [acessado 2022 fev 11]. Disponível em: http://www.ipea.gov.br/portal/index.php?option=com_alphacontent&view=alphacontent&Itemid=357.

Pinheiro, K. (2001). História da Alimentação. Universitas Ciências da saúde, 3, 173-190.

Pimenta, T. A. M., Rocha, R. & Marcondes, N. A. V. (2015). Políticas públicas de intervenção na obesidade infantil no Brasil: uma breve análise da política nacional de alimentação e nutrição e política nacional de promoção da saúde. Health Sciences Journal, 17(2), 15-24.

Rech, R. R., Halpern, R., Constanzi, C. B., Bergmann, M. L. D. A., Alli, L. R., Mattos, A. P. D., Trentin, L., & Brum, L. R. (2010). Prevalência de obesidade em escolares de 7 a 12 anos de uma cidade Serrana do RS, Brasil. Revista Brasileira de Cineantropometria e Desempenho Humano, 12(2), 90-7.

Ribeiro, M. C. S. de A., Barata, R. B., Almeida, M. F. D., & Silva, Z. P. D. (2003). Perfil sociodemográfico e padrão de utilização de serviços de saúde para usuários e não-usuários do SUS – PNAD 2003. Ciência & Saúde Coletiva, 11(4), 1011-1022.

Ruíz-Roso, M. B., Padilha, P. D. C., Matilla-Escalante, D. C., Brun, P., Ulloa, N., Acevedo-Correa, D., Peres, W. A. F., ...& Dávalos, A. (2020). Changes of physical activity and ultra-processed food consumption in adolescents from different countries during Covid-19 pandemic: an observational study. Nutrients, 12(2289), 1-13

Rodriguez-Morales, A. J., Gallego, V., Escalera-Antenaza, J. P., Méndez, C. A., Zambrano, L. I., Franco-Paredes, C., Suaréz, J. A., … & Cimerman, S. (2020). COVID-19 in Latin America: The implications of the first confirmed case in Brazil

. Travel Medicine and Infectious Disease, 35, 101613

Siqueira, R. S. & Monteiro, C. A. (2007) Amamentação na infância e obesidade na idade escolar em famílias de alto nível socioeconômico. Revista de Saúde Pública, 41(1):5-12

Sistema de Vigilância Alimentar e Nutricional. Relatório consolidado de estado nutricional do ano de 2009.

Sistema de Vigilância Alimentar e Nutricional. Relatório consolidado de estado nutricional do ano de 2019.

Silva, C. B. Prevalência e Tratamento dos Fatores de Risco da Obesidade e Síndrome Metabólica. 2010. 68f. Dissertação (Mestrado) -Universidade Estadual Paulista, Presidente Prudente, 2010.

Silva, C. G., Takami, E. Y. G., Takami, E. Y. G., De Oliveira, K. F., & Viana, S. D. L. (2018). Estado nutricional de crianças e adolescentes residentes em comunidade carente. RBONE-Revista Brasileira De Obesidade, Nutrição E Emagrecimento, 12(75), 927-934.

Sobal, J., Rauschenbach, B. & Frongillo, E. A. (2003). Marital status changes and body weight changes: a US longitudinal analysis. Social Science and Medicine, 56(7), 1543-55.

Souza, J. B. de & Enes, C. C. (2003). Influência do consumo alimentar sobre o estado nutricional de adolescentes de Sorocaba-SP. Journal of the Health Sciences Institute, 31(1), 65-70.

Wang, Y., Monteiro, C. & Popkin, B. M. (2002). Trends of obesity and underweight in older children and adolescents in the United States, Brazil, China, and Russia. The American Journal of Clinical Nutrition, 75, 971-977.

World Health Organization. (1995). Physical status: The use of and interpretation of anthropometry, Report of a WHO Expert Committee. World Health Organization.

Organização Internacional do Trabalho (ILO). COVID-19 and the impact on agriculture and food security [Internet]. Geneva: ILO; 2020 [acessado 2022 fev 10]. https://tinyurl.com/y56qbbd8.

Organization WH. Obesity: preventing and managing the global epidemic: World Health Organization; 2000.

WHO, World Health Organization. Taking Action on Childhood Obesity. Geneva: World Health Organization; 2018. (WHO/NMH/PND/ECHO/18.1) Licence: CC BYNCSA 3.0 IGO. https://www.who.int/end-childhoodobesity/publications/taking-action-childhood-obesity-report/en/.

Zeferino, A. M. B., Barros Filho, A. A., Bettiol, H., & Barbieri, M. A. (2003). Monitoring growth. Jornal de Pediatria,79 (1), S23-S32.