Article

Nutritional Status and Food Neophobia Among Children and Adolescents Assisted by a Non-Governmental Organization

Estado Nutricional e Neofobia Alimentar de Crianças e Adolescentes Atendidos por Organização Não Governamental

Estado Nutricional y Neofobia Alimentaria en Niños y Adolescentes Atendidos por Organización no Gubernamental

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Abstract

Introduction: food neophobia consists of resistance to trying new or different foods, which can lead to malnutrition, especially in childhood and adolescence. Aim: To analyze the nutritional status and the presence of food neophobia in children and adolescents assisted by a non-governmental organization. Methods: Cross-sectional study with a quantitative approach, carried out with 80 children and adolescents aged between 5 and 14 years. Guarantees were used to investigate the socioeconomic and health profile, food consumption and anthropometric measurements. The level of neophobia was measured by the Food Neophobia Scale. Student's t and Chi-Square tests were applied with a significance level of 5%. Results: Females accounted for 51.2% of the studied population and the mean age was 8.4 (± 2.31) years. The prevalence of overweight was 38.7%, of which 33.7% had food neophobia. The dietary pattern shows the significant presence of ultra-processed foods and low consumption of vegetables and fruits. Conclusion: The findings of this study showed a considerable percentage of overweight children and a significant presence of food neophobia. Thus, it becomes relevant to implement effective food and nutrition education actions with the aim of encouraging the promotion of adequate and healthy eating habits from childhood onwards.

Keywords: child, adolescent, nutritional status, avoidant restrictive food intake disorder, organizations

Resumo

Introdução: A neofobia alimentar consiste na resistência em experimentar novos ou diferentes alimentos, podendo levar à desnutrição, principalmente na infância e adolescência. Objetivo: Analisar o estado nutricional e a presença de neofobia alimentar em crianças e adolescentes atendidos por uma organização não governamental. Métodos: Estudo transversal com abordagem quantitativa, realizado com 80 crianças e adolescentes com idade entre 5 e 14 anos. Utilizaram-se garantias para investigar o perfil socioeconômico e de saúde, consumo alimentar e medidas antropométricas. O nível de neofobia foi medido pela Escala de Neofobia Alimentar. Aplicaram-se os testes t de Student e Qui-Quadrado com nível de significância de 5%. Resultados: O sexo feminino correspondeu a 51,2% da população estudada e a idade média foi de 8,4 (± 2,31) anos. A prevalência de excesso de peso foi de 38,7%; destes, 33,7% apresentavam neofobia alimentar. O padrão alimentar evidencia a presença significativa de alimentos ultraprocessados e baixo consumo de hortaliças e frutas. Conclusão: Os achados deste estudo evidenciaram um percentual considerável de crianças com excesso de peso e presença significativa de neofobia alimentar. Assim, torna-se pertinente

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a implementação de ações efetivas de educação alimentar e nutricional com o objetivo de estimular a promoção de hábitos alimentares adequados e saudáveis desde a infância.

Palavras-chave: criança, adolescente, estado nutricional, transtorno alimentar restritivo evitativo, organizações

Resumen

Introducción: La neofobia alimentaria consiste en la resistencia a probar alimentos nuevos o diferentes, lo que puede conducir a la desnutrición, especialmente en la niñez y adolescencia. Objetivo: Analizar el estado nutricional y la presencia de neofobia alimentaria en niños y adolescentes atendidos por una organización no gubernamental. Métodos: Estudio transversal con enfoque cuantitativo, realizado con 80 niños y adolescentes con edades entre 5 y 14 años. Se utilizaron garantías para investigar el perfil socioeconómico y de salud, el consumo de alimentos y las medidas antropométricas. El nivel de neofobia se midió mediante la Escala de Neofobia Alimentaria. Se aplicaron las pruebas t de Student y Chi-Cuadrado con un nivel de significancia del 5%. Resultados: El sexo femenino representó el 51,2% de la población estudiada y la edad media fue de 8,4 (± 2,31) años. La prevalencia de sobrepeso fue del 38,7%, de los cuales el 33,7% presentaba neofobia alimentaria. El patrón dietético muestra la importante presencia de alimentos ultraprocesados y el bajo consumo de verduras y frutas. Conclusión: Los hallazgos de este estudio mostraron un porcentaje considerable de niños con sobrepeso y una presencia importante de neofobia alimentaria. Por lo tanto, se vuelve relevante implementar acciones efectivas de educación alimentaria y nutricional con el objetivo de incentivar la promoción de hábitos alimentarios adecuados y saludables desde la infancia.

Palabras clave: niño, adolescente, estado nutricional, trastorno de la ingesta alimentaria evitativa/restrictiva, organizaciones

Introduction

Food neophobia is characterized as a personality trait in which there is lack of interest in trying food options and certain inclination to reject new and unfamiliar food, being highly prevalent during early childhood, declining in adolescence and remaining stable throughout adulthood (Łoboś & Januszewicz, 2019; Torres et al., 2020). A healthy and varied diet provides energy and nutrients necessary for proper growth and development, in addition to helping maintain health (Simon et al., 2022). It is observed that most of the dietary habits originate in childhood and that the family plays a fundamental role in this formation (Della Torre et al., 2022; Lopes et al., 2020)

The influence is especially relevant in childhood, but seems to extend through the adolescence period. Thus, together with the family's habits, values and customs, preferences or rejection of food tastes, smells, textures and colors will form the food profile of the child and/or adolescent (Leão et al., 2022). It is known that, for children's growth and development to occur adequately, it is necessary that they have an age-appropriate supply of energy and nutrients, in addition to the fact that their deprivation or excess can lead to deviations such as underweight/malnutrition or overweight/obesity (Ministério da Saúde, 2023; Maranhão et al., 2018).

It is at the time of transition to an adult diet that predispositions to neophobic responses may arise; such attitudes exert a significant negative impact on variety of the diet because fewer food options are consumed, even generating nutritional deficits (Maranhão et al., 2018). Reluctance to try new food options is frequently linked to the anticipated fear that they will taste bad.

Some strategies can reduce food neophobia, such as knowledge about each food product and how it interacts with the body, as well as the parents' behavior during meals that can influence a child's diet (Torres et al., 2020).

This research was planned in order to continue an extension action already carried out in a Non-Governmental Organization (NGO) from a city in southern Minas Gerais, Brazil, through the Extension Project called "*Nós da Nutrição: entre o sabor, o saber e o fazer*" ("We of Nutrition: Between taste, knowledge and action"), with the objective of analyzing the nutritional status and presence of food neophobia in children and adolescents assisted by the NGO.

Methods

A descriptive, exploratory and cross-sectional study with a quantitative approach conducted with children and adolescents aged from 5 to 14 years old, assisted by an NGO in a municipality in southern Minas Gerais.

The research was conducted during active days at the locus, between September and December 2019, including children and adolescents registered at the NGO who were able to answer the questions and agreed to participate voluntarily by signing the Free and Informed Assent Form. All parents who agreed to the voluntary participation of their children were asked to sign the Free and Informed Consent Form, with a complete explanation about the study nature, objectives, methods and procedures used in data collection.

The anthropometric assessment was performed by measuring weight and height, obtained according to techniques recommended by the World Health Organization (WHO) and adopted by the Ministry of Health (*Ministério da Saúde*, MS) (Ministério da Saúde, 2022). To classify the nutritional status, the Body Mass Index [BMI = Weight (kg)/Height $(m)^2$] was calculated and the nutritional status was determined by the BMI for the age (BMI/Age), expressed as a Z score, and compared to the standard WHO reference (De Onis et al., 2007; World Health Organization, 2007).

FN was measured with the Brazilian version of the *Food Neophobia Scale* (FNS), validated in Brazil by Previato and Behrens (2015). The questionnaire consists of 10 FN-related assertions scored using a 7-point scale (from Disagree to Totally agree). The total score was calculated by adding up the scores for each item, resulting in a total score from 10 to 70 points. FN was classified according to the mean value of 45.06 and its related standard deviation (±6.94). Thus, the participants with scores ≤ 38 were classified as with low neophobia (or neophilia), those between 38.1 to 51.9 were considered neutral, and those with scores ≥ 52 as with high neophobia (Olabi et al., 2009, Previato & Behrens, 2015).

The dietary variables were collected using a validated food frequency questionnaire (Mendes et al., 2011). The frequencies corresponding to daily intake of sweets, soft drinks, fruits and vegetables were evaluated as 1 time, 2 times and 3 times or more per day. The frequency for fruits and vegetables was dichotomized into less than three times and 3 or more times a day, according to the recommendations of the Dietary Guidelines for the Brazilian population (Ministério da Saúde, 2014; Souza et al., 2011).

The children and adolescents were asked about skipping meals, looking for information about nutrition, economic class and physical activity.

The data were entered into Excel. Data distribution normality was analyzed using the *Shapiro-Wilk* test and the comparisons between means were made using *Student*'s *t*-test for parametric data, whereas the non-parametric data were compared by means of the *Mann-Whitney* test. Frequencies were calculated for categorical data, and the chi-square or *Fisher*'s

exact tests were used to evaluate associations between the categorical variables. The statistical analyses were performed using Sigma Plot, version 14.0 (*Systat Software Inc.*), adopting a 5% significance level.

The study was prepared in accordance with Resolution 466/12 of the National Health Council/Ministry of Health and approved by the Committee of Ethics in Research with Human Beings (CAAE: 12996619.1.0000.5142 and opinion No. 3,383,979).

Results

The research evaluated 80 children and adolescents, with a mean age of 8.4 (±2.31) years old, 51.25% (n=41) of them female. There were more girls than boys among the children (n=28 and n=22, respectively) and fewer among the adolescents evaluated (n=13 and n=17, respectively). No statistical association was found between the anthropometric variables and gender (Table 1).

Table 1

Age and Anthropometric Variables of Children and Adolescents Assisted by the NGO, According to Gender. Alfenas, 2020

Variables	Girls Mean ± SD	Boys Mean ± SD	p-value[a]
Total (n=80)			
Age (years old)	8.4 ± 2.31	9.0 ± 1.95	0.175
Weight (kg)	33.5 ± 13.74	34.49 ± 14.39	0.321
Height (m)	1.32 ± 0.16	1.35 ± 0.14	0.379
BMI (kg/m^2)	18.35 ± 4.07	18.42 ± 4.08	0.580
5-9 years old (n=50)			
Age (years old)	7.1 ± 1.40	7.7 ± 1.21	0.211
Weight (kg)	27.6 ± 11.2	28.8 ± 8.1	0.476
Height (m)	1.25 ± 0.1	1.27 ± 0.1	0.396
BMI (kg/m^2)	17.3 ± 3.8	17.5 ± 2.5	0.513
10-14 years old (n=30)			
Age (years old)	11.2 ± 1.21	10.8 ± 1.07	0.463
Weight (kg)	46.8 ± 18.4	42.1 ± 12.7	0.418
Height (m)	1.48 ± 0.13	1.45 ± 0.13	0.537
BMI (kg/m^2)	20.6 ± 5.13	19.7 ± 4.6	0.738

Note. Data presented as mean ± standard deviation. [a]*Student*'s *t* test.

The predominance of the population evaluated was concentrated in eutrophy (58.8%), with a higher percentage of girls (65.9%). As for overweight and obesity, the majority were boys, with 28.2% and 18% prevalence, respectively. The difference between the genders was not statistically significant in terms of nutritional status (p=0.581). Likewise, when economic class, omission of meals (the habit of skipping meals) and search for diet-related information were evaluated, no significant differences were found (p>0.05) (Table 2).

Table 2

Characteristics of the Population Under Study (n=80). Alfenas-MG, 2020

	Total (n=80)		Girls (n=41)		Boys (n=39)		p-value[b]
	n	%	n	%	n	%	
Nutritional status							0.581
Underweight	2	2.5	1	2.4	1	2.5	
Eutrophy	47	58.8	27	65.9	20	51.3	
Overweight	18	22.5	7	17.1	11	28.2	
Obesity	13	16.2	6	14.6	7	18.0	
FN degree							0.102
Mild	15	18.7	11	26.8	4	10.3	
Neutral	53	66.3	26	63.4	27	69.2	
High	12	15.0	4	9.8	8	20.5	
Physical activity							0.037
Yes	47	58.8	19	46.3	28	71.8	
No	33	41.2	22	53.7	11	28.2	
Economic class							0.870
B	5	6.3	3	7.3	2	5.1	
C	35	43.7	17	41.5	18	46.2	
D-E	40	50.0	21	51.2	19	48.7	
Skips meals							0.982
Yes	36	45.0	18	44	18	46.1	
No	44	55.0	23	56	21	53.9	
Seeks information about nutrition							
Yes	17	21.3	9	22	8	20.5	0.908
No	63	78.7	32	78	31	79.5	

Note. FN: Food Neophobia. FN ≤ 38: Low neophobia or neophilia; from 38.1 to 51.9: Neutral; FN ≥ 52: High neophobia. [b]Chi-square test.

On the other hand, there was a significant association between the "gender" and "physical activity" variables (p=0.037), in which it was possible to observe that most of the boys (71.8%; n=28) practiced some physical activity while only 46.3% (n=19) of the girls reported such practice. However, it was observed that 15% of the individuals were classified as food neophobics (high degree), whereas 18.7% were neophilic (low neophobia degree) and 66.3% were considered neutral (neither neophilic nor neophobic), with a non-significant gender difference (p>0.05) (Table 2).

Likewise, it was possible to observe that the FN score of the total population and of the adolescents did not differ statistically between girls and boys; however, in relation to the child population (from 5 to 9 years old), it was possible to state that the boys presented higher FN scores than the girls in the same age group (p=0.041) (Table 3).

Table 3

Food Neophobia Scores Among Children and Adolescents Assisted by the NGO, According to Gender. Alfenas-MG, 2020

	Total (n=80)	Girls (n=41)	Boys (n=39)	p-value[a]
Total	*45.06 ± 6.94*	*44.71 ± 6.79*	*46.17 ± 6.85*	*0.098*
	Total (n=50)	Girls (n=28)	Boys (n=22)	p-value[a]
5-9 years old	*44.2 ± 6.68*	*42.5 ± 6.55*	*46.36 ± 6.33*	*0.041*
	Total (n=30)	Girls (n=13)	Boys (n=17)	p-value[a]
10-14 years old	*46.03 ± 6.97*	*46.15 ± 7.99*	*45.94 ± 6.34*	*0.936*

Note. Data presented as mean ± standard deviation. [a]*Student*'s *t* test

The FN score seemed to increase with the subjects' age, as shown in Table 3, although there was no significant correlation between the FN score and age (p=0.059; data not shown).

In relation to the daily food intake pattern, 95% of the children and adolescents assisted had low intake of vegetables and 76.25% reported inadequate fruit consumption, with no statistical difference between the genders (p>0.05). In addition to that, curiously, all reported consuming sweets such as chocolates, cakes, ice creams and other desserts at least once a day. It was also observed that 95% of the population consumed candy and chewing gum, that 92.5% ate savory snacks, 97.5% consumed fast food such as sandwiches and pizzas, and that 98.75% drank soft drinks and industrialized juices every day. There was no statistical difference between food consumption and gender (p>0.05) (Table 4).

Table 4

Daily Food Consumption Pattern. Alfenas-MG, 2020

	Girls (n=41)		Boys (n=39)		p-value[b]
	n	%	n	%	
Vegetables					
Low intake	39	95	37	95	1.000
Adequate intake	2	5	2	5	
Fruits					
Low intake	34	83	27	69	0.240
Adequate intake	7	17	12	31	
Sweets					
Daily intake	41	100	39	100	0.666
Infrequent intake	0	0	0	0	
Candies and chewing gums					
Daily intake	40	97.5	36	92	
Infrequent intake	1	2.5	3	8	0.353
Savory snacks					
Daily intake	39	95.12	35	89.74	0.426
Infrequent intake	2	4.87	4	10.25	
Fast food					
Daily intake	39	95.12	39	100	0.494
Infrequent intake	2	4.87	0	0	

	Girls (n=41)		Boys (n=39)		p-value[b]
	n	%	n	%	
Soft drinks					
Daily intake	41	100	38	97.43	0.488
Infrequent intake	0	0	1	2.56	

Note. [b]Chi-square or Fisher's Exact tests

Discussion

In this study, the eutrophy frequency was higher than for excess weight; however, the percentage of the total population evaluated as with excess weight was 38.7%, with 22.5% overweight and 16.2% obese. This represents a very relevant prevalence, confirming that the prevalence of overweight and obesity in children and adolescents has increased in Brazil (Pelegrini et al., 2021; Simões et al., 2018; Souza e Silva et al., 2021). High percentages were also shown in the study by Grillo et al. (2018), where 23% of the participants presented excess weight and no significant differences were observed between the genders, as was the case in this paper.

Even though there was no difference between the genders, a tendency was found in the eutrophia percentage among the girls, and in the overweight and/or obese percentages among the boys. In the literature, it is possible to verify that weight gain among boys can be a consequence of their increased muscle mass, especially during adolescence (Silva et al., 2018).

A similar frequency of overweight and obesity was found in a study conducted with adolescents by Coelho et al. (2012), confirming the need for continuous monitoring of nutritional status in this age group, as obesity and excess weight increase the risk of developing chronic non-communicable diseases such as hypertension, dyslipidemia, and type 2 diabetes in adulthood (Llewellyn et al., 2016; Simmonds et al., 2016).

Data from the 2008-2009 Family Budget Survey (*Pesquisa de Orçamentos Familiares*, POF) showed that excess weight and obesity are found with significant frequency, starting from 5 years of age in all income groups and in all Brazilian regions and that, in 2009, one out of three children aged from 5 to 9 years old were above the weight recommended by the WHO. In turn, among the adolescents from 10 to 19 years old, excess weight in both genders was diagnosed in nearly one-fifth of them, and obesity was found in one-fourth of the total excess weight cases. More recent studies focused on the adolescent population point out that excess weight can reach 25% in this age group (Bloch et al., 2016; Instituto Brasileiro de Geografia e Estatística [IBGE], 2008). Such findings contradict the nutritional transition in the country, demarcated by adherence to a diet pattern rich in low-energy-density food products; regarding the school population, in the National School Health Survey (*Pesquisa Nacional de Saúde Escolar*, PeNSE), conducted in 2019, consumption of processed and ultra-processed food products was evidenced in the school environment, thus associating them with the excess weight and obesity rates (Batista Filho & Rissin, 2003; De Medeiros et al., 2020).

Some studies point out that the socioeconomic profile of children and adolescents, such as low parental schooling and unemployment, may also contribute to the risk of developing nutritional status disorders due to poor quality diet (Santos et al., 2018). In this study, it was observed that half of the population was classified as low economic class (D-E), pointing to a situation of social vulnerability.

When it came to seeking information about in nutrition, most of the participants did not report such practice and there was no statistical difference between the genders. Information about food options is necessary for better eating habits in children, and it has been discussed that, when mothers have better knowledge about diet, their children eat more fruit and tend to know more about healthy food options, although it is still essential that more studies are conducted on this theme (Maranhão et al., 2018).

The results showed that only 58.8% of the children and adolescents practiced some physical activity. Similar results were found by Previatto and Behrens (2018) working with 132 adolescents, of which only 54.5% were physically active. It is worth noting that there was an association between gender and physical activity, with the latter reported more frequently by boys. Likewise, such situation was evidenced in a research study conducted in all the Brazilian states, verifying that only 20.2% of the Brazilian adolescents practice some physical activity periodically, with higher prevalence of sedentary lifestyles among the girls (Condessa et al., 2019).

When investigating the practice of physical activity, the National Household Sample Survey (*Pesquisa Nacional por Amostra de Domicílios*, PNAD) conducted in Brazil indicated that 56% of the adolescents between 15 and 17 years of age do not practice any physical activity, reason being lack of interest (IBGE, 2017). It is known that lack of physical exercise increases body adipose tissues, also contributing to the development of obesity and excess weight, which can lead to metabolic changes and obesity in adulthood, among other diseases (Jebeile et al., 2022).

The FN level in both genders was observed to be low, with a majority of participants classified as neutral (mean of 45.06). However, the result found in this study was similar to that of Previato and Behrens (2017) (Previato & Behrens, 2017), who observed that 69.7% of the adolescents were considered neutral (neither neophilic nor neophobic) and only 15.9% were food neophobic, verifying low FN levels. As in the current study, these same authors also found no differences between the genders. Roßbach et al. (2016) also found no difference in FN levels and gender in a survey conducted with 166 adolescents between the ages of 10 and 18.

As for the child population (from 5 to 9 years old), the boys presented higher FN scores than the girls belonging to the same age group, going in the opposite direction of the study by Cooke et al. (2006), which pointed to diverse evidence that boys were more neophobic than girls. In the study conducted by Cooke and Wardell (2005), the findings state that the girls had a greater preference for vegetables and fruits than the boys, consequently increasing the variety of food options consumed. In addition to that, a number of studies point to greater dietary selectivity in boys, and that they tend to have eating problems already in early childhood (Germano et al., 2022; Viana et al., 2011).

There was no significant correlation between FN scores and age; however, it is known that FN is highly prevalent in early childhood, although it decreases during adolescence and remains stable in adulthood (Dovey et al., 2008). However, in a paper by Previato and Behrens (2017), an increase in FN with age was observed among adolescents.

It was possible to observe that most children and adolescents had low intake of vegetables and inadequate fruit consumption; on the other hand, there was high daily consumption of candy and chewing gum, savory snacks, fast food such as sandwiches and pizza, soft drinks and processed juices. It was also noticed that all participants consumed sweets such as chocolates, cakes, ice creams and other desserts every day. An explanation for this high

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consumption of caloric food products is that they are the tastiest and promote greater satiety, consequently impairing the intake of other food options, although there was no statistical difference between the genders.

The literature evidences high consumption of ultra-processed food products by children and adolescents, which can be strongly associated with changes in nutritional status. High consumption of fast food and adverse socioeconomic conditions can be related to the adolescents' nutritional status, contributing to obesity (Botelho & Lameiras, 2018). A study that evaluated the food consumption of 106 preschool and school children also found low intake of fruits, vegetables and legumes in 27% of the total sample, with approximately 52% of the children analyzed consuming processed food products once or twice a week and 14%, five times or more a week (Melo et al., 2019).

Another research study conducted with 600 adolescents showed prevalence values of daily fruits consumption of 32.9% and vegetables or legumes of 29%, with only 6.5% of the adolescents consuming both food options daily (Muniz et al., 2013). These findings corroborated our results, which showed insufficient consumption of fruits and vegetables among children and adolescents.

It is important to emphasize that it is not enough to be willing to try new food options but that it is necessary to adopt a habitual pattern of adequate intake of fruits and vegetables and low intake of food options rich in sugars and fats to promote health and prevent excess weight (Muniz et al., 2013).

Food neophobia and its behaviors determine the eating habits of children and adolescents, directly impacting their quality of life and health, where the fear of trying new food options can favor the consumption of ultra-processed food products over those *in natura*, which can lead to chronic non-communicable diseases (Silva et al., 2022). Thus, understanding the aspects related to neophobic behaviors is extremely important to develop an empathic look and to think of nutritional actions and strategies that do not promote embarrassment in children and adolescents.

Despite the findings, the current study has some limitations such as the use of the food frequency questionnaire, a limited tool because it collects retrospective data and depends on the interviewees' memory (Shim et al., 2014). Despite that, the questionnaire used is a validated tool that allows investigating the consumption of all food groups, and not only of fruits, vegetables, and legumes (Mendes et al., 2011).

Conclusion

In the present study, it was possible to characterize the majority of children and adolescents assisted by the NGO as eutrophic when evaluating the anthropometric data obtained; however, the high percentage of the sample classified as with excess weight stands out. This finding is worrisome because of the high consumption of food products rich in sugars and fats, and the inadequate intake of fruits and vegetables by a large part of the population under study. These results may assist in future research studies, as well as detect early nutritional problems that can compromise the nutritional status and health of children and adolescents.

Even though there was low food neophobia among those assisted by the NGO, there may be a certain tendency towards food neophobia among those considered neutral, or other

factors may have contributed to inappropriate choices in this study, such as low consumption of fruits and vegetables and high consumption of high-calorie density and nutritionally deficient food. In this sense, regardless of whether an individual is willing or not to try new food options, the analysis of food neophobia can assist in understanding the influence of the determinants on food choices.

The results obtained after conducting this research can generate subsidies for future papers aimed at encouraging healthy eating habits, such as carrying out food and nutrition education activities with the community assisted by the NGO such as children and adolescents, parents, and collaborators.

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