PERSPECTIVES
DOI: 10.12957/demetra.2022.65591

DEMETRA
Alimentação, Nutrição & Saúde

Priscila Maximino[1]
Luana Romão Nogueira[2]
Ana Carolina Leme[1]
Raquel Ricci[1]
Nathália Gioia[1]
Camila Fussi[1]
Mauro Fisberg[1]

[1] Centro de Excelência em Nutrição e Dificuldades Alimentares, Instituto de Pesquisa e Ensino em Saúde Infantil (PENSI), Hospital Infantil Sabará, Fundação José Luis Egydio Setúbal. São Paulo, SP, Brasil.

[2] Centro Universitário Internacional e Estácio, Curso de Nutrição. São Paulo, SP, Brasil.

Correspondence
Ana Carolina Leme
acarol.leme@gmail.com

Breakfast nutrient profile and food sources among children with feeding difficulties

Perfil nutricional e alimentar do café da manhã de crianças com dificuldades alimentares

Abstract

Objective: To assess breakfast consumption, nutrient profile and food sources of children with feeding difficulties. ***Methods:*** Cross-sectional study with 137 infants, preschoolers, and school age children from a reference center for feeding difficulties in São Paulo, Brazil. Socio-demographic characteristics were excluded from clinical anamnesis. Breakfast is defined as the first meal of the day that breaks the fast after the longest period of sleep and is consumed between 5-10am. Children that do not fit on this definition were considered breakfast skippers. Parents self-reported their children's food intake. Breakfast nutrient profile and food sources were identified. Descriptive statistics, Kruskal-Wallis and *t*-Student tests were used considering a significance of 5% ($p < 0.05$). ***Results:*** Most children had breakfast (80.3%) and had a median energy intake of 54.67kcal/day. Children with fear of feeding had lower energy, carbohydrate, protein, and other nutrients intake as compared to picky/fussy eaters and children with limited appetite. Picky/fussy eaters had lower intake for vitamin E, calcium, dietary fiber, potassium, riboflavin, and vitamin K, and total sugars. Baby-food formulas and cereals, milk, and breads were among the top energy food sources consumed, regardless of age group, sex, and type of feeding difficulties. ***Conclusions:*** Breakfast consumption in children with feeding difficulties is not satisfactory and underlies the need for actions to improve regular and well-balanced meals.

Keywords: Children. Breakfast. Food. Food Fussiness

Resumo

Objetivo: Avaliar o consumo, perfil nutricional e fontes de alimentos consumidos no café da manhã por crianças com dificuldades alimentares. ***Métodos:*** Estudo transversal com 137, lactentes, pré-escolares, e crianças em idade escolar de um centro de referência em nutrição e dificuldades alimentares em São Paulo, Brasil. Características sociodemográficas foram retiradas da anamnese clínica. Café da manhã foi definido como a primeira refeição do dia após um longo período de sono, consumido entre 5 e 10 horas da manhã. Crianças que não apresentaram consumo de acordo com essa definição foram consideradas como não consumidoras de café da manhã. Os pais relataram o consumo alimentar de seus filhos. Perfil nutricional e fontes de alimentos do café da manhã foram identificados. Estatística descritiva e testes de Kruskal-Wallis, e *t*-Student foram utilizados com nível de significância de 5% ($p<0.05$). ***Resultados:*** A maioria das crianças consomem café-da-manhã (80,3%), e apresentam uma mediana de energética de 54,67kcal/dia. Crianças com fobia alimentar apresentaram menor consumo de energia, carboidrato, proteínas e outros nutrientes comparadas às crianças seletivas e com apetite limitado. Seletivos apresentaram menor consumo de vitamina E, cálcio, fibras, potássio, riboflavina, vitamina K e açúcar total. Fórmulas e cereais infantis, leite e pães foram as principais fontes de energia consumidas,

independentemente do grupo etário, sexo e tipo de dificuldades alimentares. ***Conclusão:*** Consumo de café da manhã em crianças com dificuldades alimentares não é satisfatório e destaca a necessidade de ações para melhoria do consumo regular e equilibrado.

Palavras-chave: Crianças. Desjejum. Alimento. Seletividade Alimentar.

INTRODUCTION

Feeding difficulties are reported in 20% to 30% of children worldwide.[1,2] Criteria for pediatric feeding disorders have been addressed in two distinguished designations: (i) avoidant restrictive food intake disorder (ARFID)[3] and (ii) pediatric feeding disorder (PFD).[2,4] ARFID is defined as an eating/feeding disturbance in which children cannot maintain normal nutrition and present food selectivity, poor appetite, or fear/anxiety about eating that is not related to cultural feeding practices, food scarcity, abnormal body/weight image, or concurrent medical or mental condition.[3] ARFID is differentiated from less consequential feeding concerns when children present at least one of the four criteria: (i) weight loss or poor growth; (ii) nutrient deficiency; (iii) dependence on oral or enteral supplements; or (iv) significant psychosocial dysfunction. However, a more interdisciplinary consensus group[5] launched the definition of PFD to include feeding problems associated with medical comorbidities or not. Thus, it is defined as "impaired oral intake that is not age appropriate and is associated with medical, nutrition, skill, or psychosocial dysfunction".[2,4] Also, feeding problems are disorders that involve at least one functional domain (medical, nutrition, skill, or psychosocial) and last over 3 months. While both definition statements encourage assessing the parent and child and the use of interdisciplinary approach, they differ in many different ways.[5] Thus, parents seeking for their children treatment in outpatients' clinic, may de-emphasize specific types of eating behaviors (selectivity, poor appetite, and fear of feeding) and include feeding difficulties associated with medical problems or delayed development.[2]

Pediatric feeding difficulties are usually followed by a pattern of oral consumption of nutrients that differs from accepted standards;[2] thus, lower food intake can lead to a distortion of nutrient intake through poor variety of foods.[6] Evidence has shown that children with feeding difficulties consume less fiber, which reflects on lower fruit and vegetables intake.[7] Alternatively, milk consumption has been one of the top food sources consumed by preschoolers and schoolers with feeding difficulties.[8,9] Children may be replacing solid to liquid foods due to difficulties in their feeding practices, and milk can be one alternative for feeding due to its organoleptic characteristics.[10] Therefore, meals may present most problematic behavioral problems in children, especially among infants and preschoolers. For example, a study with 201 Australian young children found that at least 45.5% of parents were concerned about their child feeding practices during meals.[11] Eating problems during early childhood can be consolidated during the forthcoming years and adulthood.[12] Research in this area is vital to ensure healthy food choices, eating behaviors, and meal practices to be developed in early life.[13,14]

Breakfast is one of the meals that have received an important recognition, since it is associated with several benefits, including adequate weight status and cognitive performance.[15] However, studies have found that up to 7% of young children skip this meal[16,17] and this prevalence is increased in those with feeding difficulties.[9,12] Important sources of nutrients in the diet might be under- or over-consumed in this population group,[18] especially among those with feeding difficulties. There is a gap regarding breakfast consumption and their food sources in children with feeding difficulties in Brazil. Consequently, public health policies, clinical practices, and behavioral-change strategies on recommendations for breakfast consumption are diverse, and focused on international evidence, mainly in Canada, Denmark, France, UK, USA, and Spain.[19] So this study aimed to examine breakfast consumption, nutrient profile and food sources among children with feeding difficulties from a reference center in São Paulo, Brazil.

METHODS

Participants and settings

This was a cross-sectional study of patients from an ambulatory center for children with feeding difficulties. Children were included by convenience to participate if they seek for treatment at the center and had any feeding difficulty complaint. The patients were 270 children, however, only 137 individuals provided reliable measurements for dietary intake and breakfast consumption from 2014-2019. Data was obtained based on the interview conducted with the child's parent/caregiver during the first multidisciplinary counseling, after analyses of medical records. All study procedures were administered after parents and children ≥7years old gave written consent/assent. The study was approved by the Institutional Review Board from the research institute (3.835.047; CAAE 32939314.0.0000.5567).

Feeding difficulties

Feeding difficulties were based on the definition proposed by Milano *et al*.[2] on picky/fussy eaters, children with fear of feeding, and poor appetite.

Socio-demographic and feeding characteristics, and weight status

Socio-demographic information was pulled down from the clinical anamnesis, and included child age and age group [infants (0-2 years), preschoolers (2-6 years), and schoolers (≥6 years)], child sex, child place of birth (São Paulo or another Brazilian city), maternal school background (≤ high school, college degree, and graduate degree), and time of study at school (full-time, part-time, and, do not study).

Other questions from feeding practices were also asked, such as transition age from breastfeeding to complementary feeding and family feeding, family history of feeding difficulties, and force eating. As parents feeding style, i.e., being authoritative, authoritarian, indulgent, and uninvolved can influenced on pediatric feeding difficulties,[20] this was used to describe sample characteristics. The Caregivers' Feeding Styles Questionnaire[21,22] was used to measured parents/caregivers feeding style. It was adapted and showed adequate validity for the Brazilian context.[23]

Maternal (self-reported) and child weight status (measured) were calculated and classified accordingly for chidren[24,25] and adults[26] in underweight, normal weight, overweight, and obesity.

Diet intake

Parents completed a food record, which included details about all food and beverages consumed. Food records included comprehensive instructions and examples to help parents understand the level of detail required and estimate portion sizes.[27] Upon completion, food records were reviewed by a clinical registered dietitian (RD) from the multi-disciplinary center for completeness, detail, and clarity. When necessary, parents were contacted by the RD to obtain additional information. Completed food records were entered into the Nutrition Data System for Research software (NDS-R version 2007).[28] The NDS-R software is based on the US Department of Agriculture food composition table; thus, a standardized procedure matching local foods to the USDA composition table was performed by a trained dietitian to minimize errors.

Definition of Breakfast

Breakfast is defined as the first meal of the day that breaks the fast after the longest period of sleep and is consumed between 5-10am, comprising any energy-containing food or beverage (excludes water, tea,

coffee), and may be consumed at any location.[19,29] Food records from children that do not fit on this definition were considered breakfast skippers.

Energy and nutrients

Energy, macronutrients, excess and deficiency of nutrients of interest to public health, as well as other nutrients, were calculated. Nutrients of interest to public health were commonly lacking in the diet of the population (vitamin A, C, D and E, dietary folate, calcium, magnesium, potassium, fiber and iron) or consumed in excess (added sugars, saturated fats and sodium).[30,31]

Food groups categorization: What We Eat in America (WWEIA) food classification system

To investigate the food sources of energy, the WWEIA food classification system[32] was adapted and used to classify all foods consumed by Brazilian and other Latin American populations.[30,31] Briefly, the original classification system was designed by the NHANES/United States Department of Agriculture to calculate the contribution of food energy and nutrients from the food categories. There are approximately 3,000 food items, and each food item has unique food codes. Under the food classification system, each food code is assigned to one of the 131 food categories (e.g., pizza; ready-to-eat cereals, higher in sugar; and milk, whole), which were organized within subgroups (n=46; mixed dishes - pizza; ready-to-eat cereals; and milk) and major groups (n=15; mixed dishes; grains; and milk and dairy). This study targeted a sample of children with feeding difficulties; hence, different feeding practices are observed. There is the need to include and maintain certain categories, such as milk and dairy, and baby-food/formulas. Furthermore, since certain groups are not common to this group of children, alcoholic beverages, Mexican and Asian mixed dishes were removed from the analysis.

Data analysis

Analyses were conducted using SAS on Demand for Academics Dashboard (SAS Institute Inc., 2021). Descriptive statistics of the study sample were calculated as mean (standard error) for continuous variables, and frequency (%) for categorical variables. The normality of the distribution was assessed using the skewness distribution (±1.96 z scores) for dietary variables. Due to non-normal distribution, differences between dietary variables and age groups were assessed using the Kruskal-Wallis and *t*-Student tests. Median and interquartile range (IQR) for the dietary variables were presented. The proportion of the children food sources of energy was calculated. Means per capita of energy consumed in each food group were expressed as percentage of the total, to allow relatively across sex and age groups. For all tests, a significant level of 5% ($p<0.05$) was established.

RESULTS

Socio-demographic characteristics of the sample

Demographic characteristics of children from the reference center are summarized in table 1. The participants' mean age was 3.91 (95%CI 3.39, 4.42) years, and 63.5% were male. Most children were consuming breakfast (n=110, 80.3%), and breakfast consumers presented a slightly lower BMI (M=15.92, 95%CI 15.36, 16.48) than non-breakfast consumers (M=16.61, 95%CI 15.01, 18.21 Children who had

breakfast were earlier transitioning from breastfeeding to complementary feeding (M=5.42, 95%CI 5.06, 5.82) as compared to non-breakfast consumers (M=6.19, 95%CI 4.52, 7.86). Breakfast consumers had equally authoritarian and indulgent (33.68%) parents, followed by authoritative (29.47%), and uninvolved (3.16%) parents

Table 1. Socio-demographic characteristics of children with feeding difficulties in relation to breakfast consumption. São Paulo, 2014-2019.

	Total (n=137)	Breakfast		p-value
		Consume breakfast [1] (n=110)	Skip breakfast or consume only liquids or water (n= 27)	
		Median (95%CI)		
Age (years)	3.91 (3.39, 4.42)	3.91 (3.32, 4.49)	3.91 (2.77, 5.04)	0.67
Age of Appearance for FD (months)	16.43 (12.81, 20.06)	15.59 (11.76, 19.41)	19.85 (9.59, 30.11)	0.08
BMI (kg/m^2)	16.06 (15.51, 16.60)	15.92 (15.36, 16.48)	16.61 (15.01, 18.21)	**0.03**
Transition age from BF to CF (months)	5.59 (5.13, 6.05)	5.42 (5.04, 5.82)	6.19 (4.52, 7.86)	**<0.001**
Transition age from CF to FF (months)	13.06 (12.07, 14.04)	13.04 (11.85, 14.22)	13.11 (11.17, 15.05)	0.71
Energy (kcal/day)	1293.94 (1213.46, 1374.43)	1310.10 (1197.75, 1422.45)	1222.75 (962.16, 1483.34)	0.53
		% Frequency		
Child sex				
Female	36.5 (50)	36.36 (40)	37.04 (10)	0.95
Male	63.5 (87)	63.64 (70)	62.96 (17)	
Child age group				
Infant	26.28 (36)	25.45 (28)	29.63 (8)	
Pre-schoolers	52.55 (72)	53.64 (59)	48.15 (13)	0.79
Schoolers	21.17 (29)	20.91 (23)	22.22 (6)	
Child place of birth				
São Paulo	88.06 (118)	87.04 (94)	92.31 (24)	0.46
Another Brazilian city	11.94 (16)	12.96 (14)	7.69 (2)	
Feeding Difficulties				
Picky/Fussy eater	63.91 (85)	63.21 (67)	66.67 (18)	
Fear of feeding	4.51 (6)	4.72 (5)	3.70 (1)	0.94
Poor appetite	31.58 (42)	32.08 (34)	29.63 (8)	
Parental Style				
Authoritarian	37.29 (44)	33.68 (32)	52.17 (12)	
Authoritative	24.58 (29)	29.47 (28)	4.35 (1)	0.05
Indulgent	35.59 (42)	33.68 (32)	43.48 (10)	
Uninvolved	2.54 (3)	3.16 (3)	---	
Maternal School background				
≤ high school	7.58 (10)	7.48 (8)	8.00 (2)	0.93
College degree	92.52 (122)	92.52 (99)	92.00 (23)	
Family history for FD				
Yes	43.81 (46)	46.43 (39)	33.33 (7)	0.23
No	56.19 (59)	53.57 (45)	66.67 (14)	
Forced eating				
Yes	48.39 (60)	47.47 (47)	52.00 (13)	0.69
No	51.61 (64)	52.53 (52)	48.00 (12)	

Table 1. Socio-demographic characteristics of children with feeding difficulties in relation to breakfast consumption. São Paulo, 2014-2019.(Continues)

	Total (n=137)	Breakfast		p-value
		Consume breakfast [1] (n=110)	Skip breakfast or consume only liquids or water (n= 27)	
Child school period				
Full-time	17.78 (24)	16.67 (18)	22.22 (6)	0.55
Part-time	51.85 (70)	50.93 (55)	55.56 (15)	
Do not study	30.37 (41)	32.41 (35)	22.22 (6)	
Child weight status				
Underweight	5.93 (8)	7.41 (8)	---	0.06
Normal weight	80.74 (109)	82.41 (89)	74.07 (20)	
Overweight	5.93 (8)	3.70 (4)	14.81 (4)	
Obesity	7.41 (10)	6.48 (7)	11.11 (3)	

Note: CF: Complementary Feeding, CI: Confidence Interval, FD: Feeding Difficulties, FF: Family Feeding.
[1]Breakfast consumers were defined as at least one energy-dense food item. Those consuming only water, tea, or coffee were defined as breakfast skippers.

Energy and nutrients profile among breakfast consumers

Table 2 and 3 reported the energy and nutrient profile for breakfast consumption for overall study population, by age group, sex, and type of feeding difficulties. Children had a median energy intake of 54.67 (IQD 16.54, 115.20) kcal for breakfast intake. There were significant differences between energy and some nutrients with age groups. Schoolers showed higher energy (Median=66.00; IQR 20.38, 123.76 kcal), vitamin C (4.86; 1.00, 12.79 mg), calcium (11.00; 0.40, 38.39 mg), magnesium (5.57; 2.00, 15.90 mg), fiber (0.82; 0.40,1.50 g), potassium (38.65; 5.00, 98.08 mg), iron (0.64; 0.33, 1,22 mg), and trans-fat acids intake (0.08; 0.00, 0.38 g) as compared to other age groups. Pre-schoolers had only higher intakes for cholesterol (9.79; 0.00, 20.63 mg) and vitamin B12 (0.72; 0.17, 1.10µg). Infants had higher carbohydrate (30.79; 13.73, 49.46g), protein (7.68; 3.61, 9.28 g), vitamin A (7.00; 0.77, 43.96µg), zinc (1.25; 0.88, 2.09 mg), phosphorous (154.00; 76.73, 248.24 mg), thiamin (0.21; 0.10, 0.31 mg), niacin (1.40; 0.70, 3.03 mg), vitamin B6 (0.17; 0.07, 0.23 mg), and, vitamin K (7.83; 2.45, 12.21 µg).

Differences between sex and energy and nutrient profile have been observed. Female children had higher intakes for energy (199.29; 115.62, 273.99 kcal), carbohydrates (26.14; 15.00, 38.44 g), saturated fats (2.37; 1.39, 4.16 g), sodium (116.11; 72.33, 250.62 mg), vitamin A (51.14; 0.00, 73.21 µg), vitamin E (0.16; 0.02, 0.44 mg), iron (1.73; 0.62, 3.32 mg), total sugars (11.01; 0.11, 21.10 g), cholesterol (9.41; 0.00, 22.35 mg), thiamin (0.19; 0.10, 0.31mg), niacin (1.38; 0.38, 2.24mg), vitamin K (5.50; 1.57, 10.89µg). Males had only higher intake for vitamin C (9.13; 0.05, 33.83).

.

Table 2. Energy and nutrient profile for breakfast consumption among children with feeding difficulties according to age group. São Paulo, 2014-2019

	Total (n=137)	Median (IQD Range)			p-value
		Age group			
		Infants (n=36)	Pre-schoolers (n=72)	Schoolers (n=29)	
Energy (kcal)	54.67 (16.54, 115.20)	53.82 (18.22, 116.01)	52.58 (14.63, 112.50)	66.00 (20.80, 123.76)	**<0.001**
Macronutrients					
Carbohydrate (g)	24.00 (11.19, 36.41)	30.79 (13.73, 49.46)	24.00 (10.63, 36.56)	24.81 (11.19, 32.50)	**<0.001**
Protein (g)	6.57 (2.64, 9.09)	7.68 (3.61, 9.28)	6.64 (3.59, 8.96)	4.95 (2.60, 7.97)	**<0.001**
Fat (g)	5.72 (2.83, 8.11)	5.72 (3.50, 6.99)	5.62 (3.09, 9.05)	5.94 (2.16, 8.04)	0.55
Overconsumed nutrients					
Added Sugars (g)	4.50 (1.82, 9.83)	5.43 (1.49, 9.91)	4.50 (1.51, 9.83)	3.97 (1.99, 8.82)	0.35
Saturated Fats (g)	0.60 (0.24, 1.80)	0.60 (0.23, 1.60)	0.57 (0.22, 1.91)	0.60 (0.30, 1.65)	**0.02**
Sodium (mg)	26.45 (4.81, 86.52)	27.24 (3.53, 86.40)	24.65 (5.11, 82.66)	38.00 (5.41, 96.00)	0.05
Shortfall nutrients					
Vitamin A RAE (mcg)	6.39 (1.00, 41.30)	7.00 (0.77, 43.96)	6.21 (1.16, 35.17)	6.90 (1.20, 58.62)	**<0.001**
Vitamin D (mcg)	0.80 (0.25, 2.60)	0.50 (0.23, 2.29)	0.80 (0.25, 2.60)	0.90 (0.28, 2.60)	0.21
Vitamin E (mg)	0.32 (0.17, 0.70)	2.75 (0.86, 11.00)	0.31 (0.16, 0.67)	0.31 (0.18, 0.70)	0.76
Vitamin C (mg)	3.97 (0.90, 13.75)	2.75 (0.86, 11.00)	4.26 (0.89, 14.00)	4.86 (1.00, 12.79)	**0.01**
Dietary Folate Equivalents (mcg)	7.50 (1.82, 22.76)	7.50 (1.95, 22.86)	6.91 (1.80, 21.58)	9.70 (1.96, 29.10)	0.65
Calcium (mg)	8.25 (2.98, 36.00)	7.73 (2.80, 42.41)	8.06 (3.00, 34.50)	11.00 (0.40, 38.69)	**0.02**
Magnesium (mg)	5.33 (1.97, 14.00)	4.75 (1.95, 12.43)	5.33 (1.84, 14.44)	5.57 (2.00, 15.90)	**<0.001**
Dietary Fiber (g)	0.70 (0.34, 1.45)	0.70 (0.34, 1.36)	0.70 (0.32, 14.44)	0.82 (0.40, 1.50)	**0.00**
Potassium (mg)	34.50 (6.60, 94.00)	29.55 (5.25, 84.00)	34.75 (7.21, 97.33)	38.65 (5.00, 98.08)	**<0.001**
Iron (mg)	0.59 (0.30, 1.13)	0.51 (0.25, 0.93	0.57 (0.30, 1.14)	0.64 (0.33, 1.22)	**<0.001**
Other nutrients					
Total Sugars (g)	7.16 (0.00, 18.21)	10.85 (0.00, 22.08)	10.54 (2.00, 20.18)	10.73 (1.24, 15.51)	0.53
Trans fat (g)	0.07 (0.00, 0.29)	0.00 (0.00, 0.32)	0.09 (0.00, 0.28)	0.08 (0.00, 0.38)	**0.01**
Cholesterol (mg)	3.30 (0.00, 20.63)	0.00 (0.00, 20.63)	9.79 (0.00, 20.63)	4.14 (0.00, 15.00)	**<0.001**
Zinc (mg)	1.21 (0.47, 2.19)	1.25 (0.88, 2.09)	1.18 (0.61, 2.46)	0.99 (0.42, 1.68)	**<0.001**
Selenium (mg)	7.08 (3.31, 11.11)	8.14 (3.97, 11.09)	7.23 (3.23, 11.96)	7.14 (3.76, 11.58)	0.28
Phosphorus (mg)	142.88 (54.39, 225.25)	154.00 (76.73, 248.24)	148.50 (64.89, 237.65)	107.96 (65.10, 218.01)	**0.01**
Riboflavin (mg)	0.32 (0.12, 0.50)	0.32 (0.11, 0.48)	0.33 (0.15, 0.50)	0.20 (0.09, 0.45)	**<0.001**
Thiamin (mg)	0.15 (0.09, 0.28)	0.21 (0.10, 0.31)	0.15 (0.09, 0.29)	0.15 (0.09, 0.23)	**<0.001**
Niacin (mg)	0.97 (0.29, 2.05)	1.40 (0.70, 3.03)	1.23 (0.26, 2.35)	0.96 (0.26, 1.78)	**<0.001**
Vitamin B6 (mg)	0.12 (0.07, 0.25)	0.17 (0.07, 0.23)	0.12 (0.07, 0.29)	0.10 (0.04, 0.19)	**<0.001**
Vitamin B12 (mcg)	0.65 (0.14, 0.96)	0.50 (0.05, 0.85)	0.77 (0.17, 1.10)	0.59 (0.21, 1.01	**<0.001**
Vitamin K (mcg)	3.99 (0.61, 12.19)	7.83 (2.45, 12.21)	3.69 (0.42, 10.97)	3.02 (0.92, 13.53)	**<0.001**

[1]Due to non-normality p-values were based on Kruskal Wallis test.

Table 3. Energy and nutrient profile for breakfast consumption among children with feeding difficulties according to sex and type of feeding difficulty. São Paulo, 2014-2019

	Median (IQD Range)						
	Sex		p-value	Feeding Difficulties			p-value
	Female (n=50)	Male (n=87)		Picky/Fussy Eater (n=85)	Fear of feeding (n=6)	Poor Appetite (n=42)	
Energy (kcal)	199.29 (115.62, 273.99)	160.62 (103.50, 258.48)	**0.01**	185.35 (97.68, 260.30)	132.78 (84.75, 268.60)	205.52 (133.01, 278.46)	**<0.001**
Macronutrients							
Carbohydrate (g)	26.14 (15.00, 38.44)	23.10 (10.27, 36.32)	**<0.001**	23.44 (11.33, 34.60)	19.33 (9.32, 53.06)	24.69 (12.77, 36.56)	**0.00**
Protein (g)	7.18 (4.09, 8.97)	6.64 (3.00, 8.23)	0.11	6.23 (2.60, 8.97)	5.55 (3.73, 7.22)	7.69 (4.17, 9.09)	**<0.001**
Fat (g)	5.93 (2.93, 9.05)	5.40 (2.92, 8.04)	0.09	5.05 (2.16, 8.17)	4.22 (2.13, 6.03)	6.70 (4.11, 8.04)	**<0.001**
Overconsumed nutrients							
Added Sugars (g)	5.43 (1.99, 11.36)	4.50 (1.69, 9.83)	0.73	4.50 (1.89, 9.76)	3.04 (2.51, 4.64)	5.95 (1.85, 11.98)	0.12
Saturated Fats (g)	2.37 (1.39, 4.16)	2.31 (0.67, 3.87)	**0.01**	2.37 (0.67, 3.85)	1.20 (0.53, 2.29)	3.26 (1.33, 4.47)	**<0.001**
Sodium (mg)	116.11 (72.33, 250.62)	108.18 (55.67, 177.40)	**<0.001**	108.18 (54.70, 177.40)	82.51 (81.11, 171.46)	113.91 (81.21, 186.12)	**0.01**
Shortfall nutrients							
Vitamin A RAE (mcg)	51.14 (0.00, 73.21)	45.56 (0.00, 76.01)	**0.03**	45.26 (0.00, 78.02)	9.98 (0.00, 52.72)	58.62 (0.00, 43.32)	0.15
Vitamin D (mcg)	1.18 (0.11, 3.33)	2.00 (0.07, 3.03)	0.33	1.28 (0.06, 3.03)	1.33 (0.42, 6.20)	2.13 (0.21, 3.33)	**<0.001**
Vitamin E (mg)	0.16 (0.02, 0.44)	0.13 (0.03, 0.53)	**<0.001**	0.11 (0.00, 0.41)	0.35 (0.12, 1.14)	0.15 (0.04, 0.46)	**<0.001**
Vitamin C (mg)	7.69 (0.03, 30.07)	9.13 (0.05, 33.83)	**<0.001**	6.19 (0.05, 41.14)	2.46 (0.00, 129.08)	8.60 (0.11, 30.00	0.84
Dietary Folate Equivalents (mcg)	15.27 (1.80, 47.81)	12.38 (3.30, 48.46)	0.50	13.49 (0.00, 48.46)	10.31 (0.45, 69.60)	12.38 (3.30, 43.32)	0.99
Calcium (mg)	224.08 (34.82, 311.41)	170.41 (67.22, 279.70)	0.50	154.84 (47.43, 311.41)	193.44 (20.75, 273.85)	235.35 (99.00, 317.09)	**<0.001**
Magnesium (mg)	23.45 (12.40, 41.96)	22.78 (12.94, 36.26)	0.05	22.78 (11.64, 36.26)	19.24 (17.00, 50.80)	24.75 (18.75, 41.18)	**<0.001**
Dietary Fiber (g)	1.00 (0.27, 1.91)	1.06 (0.04, 2.17)	0.07	0.72 (0.11, 2.10)	1.33 (0.42, 6.20)	1.00 (0.27, 2.21)	**0.03**
Potassium (mg)	181.26 (65.40, 409.97)	228.52 (86.31, 365.15)	0.72	190.98 (65.52, 387.14)	219.04 (144.42, 713.62)	294.97 (120.14, 407.87)	**<0.001**
Iron (mg)	1.73 (0.62, 3.32)	1.59 (0.20, 3.62)	**<0.001**	1.32 (0.20, 3.60)	1.23 (0.06, 3.62)	1.73 (0.62, 3.43)	**0.03**
Other nutrients							
Total Sugars (g)	11.01 (0.11, 21.10)	10.21 (2.00, 16.80)	**0.00**	7.48 (0.00, 17.71)	9.22 (0.11, 26.50)	10.85 (1.93, 20.18)	**0.01**
Trans fat (g)	0.17 (0.00, 0.32)	0.07 (0.00, 0.25)	0.34	0.06 (0.00, 0.25)	0.06 (0.00, 0.14)	0.24 (0.00, 0.30)	**<0.001**
Cholesterol (mg)	9.41 (0.00, 22.35)	2.53 (0.00, 20.63)	**<0.001**	4.95 (0.00, 19.59)	8.90 (0.00, 12.00)	8.50 (0.00, 22.35)	**0.01**
Zinc (mg)	1.22 (0.53, 2.37)	1.07 (0.46, 2.33)	0.26	1.06 (0.42, 2.28)	0.89 (0.83, 2.89)	1.18 (0.88, 2.46)	**<0.001**
Selenium (mg)	7.28 (3.88, 12.95)	7.23 (3.46, 11.58)	0.27	7.14 (3.03, 11.96)	5.55 (4.03, 6.51)	8.00 (5.71, 10.95)	**<0.001**
Phosphorus (mg)	150.48 (65.10, 252.01)	142.96 (60.60, 224.34)	0.07	142.88 (44.64, 219.02)	114.33 (505.50, 192.90)	203.01 (83.37, 260.71)	**<0.001**
Riboflavin (mg)	0.33 (0.11, 0.50)	0.31 (0.12, 0.45)	0.55	0.27 (0.11, 0.49)	0.32 (0.03, 0.37)	0.38 (0.15, 0.50)	**<0.001**
Thiamin (mg)	0.19 (0.10, 0.31)	0.14 (0.09, 0.30)	**0.01**	0.15 (0.09, 0.26)	0.09 (0.06, 0.37)	0.19 (0.11, 0.30)	**<0.001**
Niacin (mg)	1.38 (0.38, 2.24)	0.96 (0.26, 2.04)	**0.01**	0.88 (0.21, 2.21)	0.86 (0.22, 2.52)	1.42 (0.42, 2.35)	**<0.001**
Vitamin B6 (mg)	0.12 (0.06, 0.23)	0.11 (0.07, 0.29)	0.25	0.11 (0.05, 0.29)	0.08 (0.07, 0.33)	0.15 (0.08, 0.22)	**0.01**
Vitamin B12 (mcg)	0.65 (0.14, 1.03)	0.65 (0.10, 0.94)	**<0.001**	0.70 (0.10, 0.97)	0.48 (0.17, 0.68)	0.70 (0.21, 0.97)	**0.01**
Vitamin K (mcg)	5.50 (1.57, 10.89)	3.65 (0.45, 12.21)	**0.01**	2.44 (0.42, 12.19)	3.05 (0.41, 6.30)	6.21 (1.59, 10.89)	**<0.001**

[1]Due to non-normality p-values were based on Kruskal Wallis test.

Types of feeding difficulties were associated with nutrient profiles in the children sample. Children classified with fear of feeding had lower energy (132.78; 84.75, 268.60 kcal), carbohydrate (19.33, 9.32, 53.06 g), protein (5.55; 3.73, 7.22 g), fat (4.22; 2.13, 6.03 g), saturated fats (1.20; 0.53, 2.29 g), sodium (82.51; 81.11, 171.46 mg), vitamin D (1.33; 0.42, 6.20 µg), magnesium (19.24; 17.00, 50.80 mg), iron (1.23; 0.06, 3.62 mg), zinc (0.89; 0.83, 2.89mg), selenium (5.55; 4.03, 6.51mg); phosphorus (114.33; 505.50, 192.90 mg), thiamin (0.09; 0.06, 0.37 mg), niacin (0.86; 0.22, 2.52 mg), and vitamin B6 (0.08; 0.07, 0.33 mg) intake as compared to picky/fussy eaters and children with limit appetite. The only exception was for cholesterol (8.90; 0.00, 12.00 mg), which was higher for children with fear of feeding as compared to the other type of feeding difficulties. Picky/fussy eaters had lower intake for vitamin E (0.11; 0.00, 0.41 mg), calcium (154.84; 47.43, 311.41 mg), dietary fiber (0.72; 0.11, 2.10 g), potassium (190.98; 65.52, 387.14 mg), riboflavin (0.27; 0.11, 0.49 mg), and vitamin K (2.44; 0.42, 12.19 µg), and total sugars (7.48; 0.00, 17.71 g).

Food sources of energy for breakfast

The top categories for the overall population that contributed to 45.58% of energy and food sources were: formula prepared from powder (19.39%), whole milk (10.72%), yeast bread (6.31%), crackers, excludes saltines (5.19%), and, baby food cereals (e.g., multi-cereal Mucilon®) (3.97%).

Food sources of energy for breakfast for children according to sex, age groups and type of feeding difficulties are described on Supplement Table 1

Supplement Table 1. Food source of energy intake among breakfeast consumers according to sex and age group. São Paulo, 2014-2019

Main Group	Sub-group	Categories	Cons[1]	Mean	SE	%
		Females				
Baby foods and formulas	Infant formulas	Formula prepared from powder	81	148.02	8.90	16.18
Snacks and sweets	Sweet bakery products	Cookies and Brownies	45	233.97	15.55	14.14
Milk and dairy	Milk	Milk, whole	45	116.26	4.19	7.06
Fruits	Fruits	Bananas	63	77.30	7.26	6.57
Snacks and sweets	Crackers	Crackers, excludes saltines	38	126.41	13.21	6.48
		Males				
Grains	Bread, Rolls, Tortillas	Yeast breads	78	255.55	23.53	13.63
Milk and dairy	Milk	Milk, whole	115	162.02	9.34	12.26
Baby foods and formulas	Infant formulas	Formula, prepared from powder	149	101.08	7.02	9.91
Baby foods and formulas	Baby foods	Baby foods: cereals	35	340.11	23.53	7.83
Milk and dairy	Dairy drinks/substitutes	Milk substitutes	17	517.30	57.51	5.79
		Infants				
Milk and dairy	Yogurt	Yogurt, regular	36	252.38	9.43	13.23
Milk and dairy	Milk	Milk, whole	38	220.57	21.21	12.21
Baby foods and formulas	Infant formulas	Formula, prepared from powder	46	157.31	17.54	10.54
Fruits	Fruits	Apple	23	277.50	21.85	9.30
Grains	Bread, Rolls, Tortillas	Yeast breads	15	421.21	35.01	9.20
		Pre-schoolers				
Baby foods and formulas	Infant formulas	Formula, prepared from powder	119	112.98	6.87	11.66
Milk and dairy	Milk	Milk, whole	104	124.68	5.69	11.24
Baby foods and formulas	Baby foods	Baby foods: cereals	37	330.64	23.12	10.61
Milk and dairy	Dairy drinks/substitutes	Milk substitutes	18	486.24	61.95	7.59
Snacks and sweets	Sweet bakery products	Cookies and brownies	26	257.00	26.20	5.79

Supplement Table 1. Food source of energy intake among breakfeast consumers according to sex and age group. São Paulo, 2014-2019(Continues)

Main Group	Sub-group	Categories	Cons[1]	Mean	SE	%
Schoolers						
Grains	Bread, Rolls, Tortillas	Yeast breads	23	420.62	44.93	22.99
Baby foods and formulas	Infant formulas	Formula, prepared from powder	65	98.00	8.71	15.14
Snacks and sweets	Crackers	Crackers, excludes saltines	25	155.06	11.79	9.21
Beverages	Sweetened beverages	Fruit drinks	24	121.72	4.81	6.94
Snacks and sweets	Sweet bakery products	Cookies and pies	19	148.05	6.71	6.68
Picky/Fussy eaters						
Milk and dairy	Milk	Milk, whole	152	149.19	7.36	15.91
Baby foods and formulas	Infant formulas	Formula, prepared from powder	118	132.28	8.61	10.95
Grains	Bread rolls and tortillas	Yeast breads	67	197.49	25.56	9.28
Milk and dairy	Yogurt	Yogurt, regular	40	242.89	10.75	6.82
Milk and dairy	Dairy drinks/ substitutes	Milk, substitutes	21	433.89	60.22	6.39
Fear of feeding						
Fruits	Fruits	Bananas	13	157.33	0.00	30.61
Milk and dairy	Milk	Milk, low-fat	15	123.76	0.00	27.78
Baby foods and formulas	Infant formulas	Formula, prepared from powder	31	49.94	15.04	23.17
Beverages	100% juices	Citrus juice	11	84.75	0.00	13.95
Grains	Bread, Rolls, Tortillas	Yeast bread	1	302.12	---	4.49
Poor Appetite						
Snacks and sweets	Sweet bakery products	Cookies and brownies	45	233.47	15.52	15.24
Grains	Bread, rolls, tortillas	Yeast breads	31	298.43	28.14	13.42
Baby foods and formulas	Infant formulas	Formula, prepared from powder	75	119.72	6.18	13.02
Fruits	Fruits	Apple	24	268.16	22.87	9.33
Grains	Bread, rolls, tortillas	Rolls and buns	35	167.86	20.85	8.52

Note: SE: standard error

[1]Cons: number of times foods have been consumed by the entire population

Female top five categories contributed to 50.43% of energy and the three main food sources were: formula, prepared from powder (16.18%), cookies and brownies (14.14%), and whole milk (7.06%). Male top five categories contributed to 49.42% and food sources were yeast breads (13.63%), whole milk (12.26%), and formula, prepared from powder (9.91%).

Concerning age groups, the top categories for infants contributed with 54.48% of energy and food sources were yogurt (13.23%), whole milk (12.21%), and formula, prepared from powder (10.54%). For pre-schoolers, the top categories contributed with 46.89% of energy and were formula, prepared from powder (11.66%), whole milk (11.24%), and baby food cereals (10.61%). Schoolers top food categories contributed with 60.96% energy and were yeast breads (22.99%), formula, prepared from powder (15.14%), and crackers, excluding saltines (9.21%).

The top food sources for picky/fussy eaters contributed with 55.57% of energy and food sources were whole milk (15.91%), formula, prepared from powder (10.95%), and yeast breads (9.28%). For children with limited appetite, top categories contributed with 59.53% of energy and food sources were cookies and brownies (15.24%), yeast breads (13.42%), and formula prepared from powder (13.02%). Given the low number of children categorized with fear of feeding (n=6, 4.51%), the food sources consumed contributed to

100% of energy, and the three sources were bananas (30.61%), low-fat milk (27.78%), and formula prepared from powder (23.17%)

DISCUSSION

This outpatient cross-sectional study identified the prevalence for breakfast consumption in children with feeding difficulties and assessed their breakfast nutrient profile and food sources. Findings showed that the percentage of children who had breakfast on the day evaluated was 80.3%. Infants and schoolers had higher intake for most nutrients analyzed as compared to preschoolers. Likewise, female children consumed higher energy and more nutrients than males. Children with fear of feeding showed lower energy for most nutrient intakes as compared to other feeding difficulties. Milk and dairy products, baby formulas, and breads were among the top sources of energy consumed by the overall sample, and stratified by sex, age groups, and feeding difficulties type. Such findings revealed that having breakfast in a population with feeding difficulties might be a problem for certain nutrient deficiencies, given the low variety of food sources consumed in this meal.

The percentage of children who have breakfast is very similar to previous European studies.[8,10] Among Polish schoolers (M= 8.7±0.5 years), 57% of girls and 43% of boys studied had breakfast (defined as consuming solid foods with or without beverages at the first eating episode of the day).[8] A Spanish study,[10] defined breakfast similarly as the current study and the Polish study, found that 93.4% of the children had breakfast, and that infants had less structured breakfast consumption. Alternatively, a Brazilian study (M=10.50; 95%CI 10.4, 10.6 years) with children from the Greater São Paulo area[33] showed that half of the children (n=224, 51.9%) did not have breakfast every day, and 48.1% consumed it everyday. Children were asked to identify the frequency of breakfast consumption, regardless of the type of food and beverages, and time of the day that were consumed this meal.

A standardized definition of breakfast consumption is important for future studies, especially among Brazilian children with health conditions that might impair their consumption. This is important to guide future research aiming to assess and better understand the role of breakfast in health and wellness.[29,34] Thus, nutritional profile and food sources for breakfast are important aspects that should be evaluated considering the children's health.[19,35]

Unlike other studies with children that did not consider having feeding difficulties,[10,36] 4% of energy intake in this study was consumed at breakfast, while other studies have found that more than 25% were consumed at this meal. The total energy intake consumed at breakfast is not a guarantee of good breakfast, as foods that are rich in energy and poor in other nutrients might be consumed. Children, especially the youngest ones, may be consuming formulas and other baby-food products that are known to be rich in these nutrients.[37,38] Children with feeding difficulties usually have lower energy intake,[6] which may be impacting on their breakfast energy and nutrients intake. Baby foods and formulas are a way for parents to overcome the nutrients deficiencies in this population.[20,39] Health professionals, researchers, and policy makers should act on effective strategies to gradually substitute baby-foods and formulas for foods/beverages commonly eaten by the family, in order to provide a healthy breakfast for this population.

Although energy intake was lower compared to the other studies, the nutrient intake found at breakfast was somewhat similar to studies with children from other high-income countries.[10,15,18] Breakfast consumers had higher vitamins and minerals intake as compared to breakfast skippers. As the characteristics for children being picky/fussy[6] and food neophobic,[40] a lower number of accepted foods was found as compared to children with poor appetite. Children with poor appetite range from those who are eating appropriately but

appear to eat too little. Differently from other feeding difficulties, poor appetite needs help to be recognized and respond appropriately to hunger and satiety, and may be a transitory characteristic of children.[4] Therefore, regarding feeding difficulties as a transitory problem[9,12,34] may be associated with better nutrient profile at breakfast and in other meals. According to previous studies with preschoolers (2-5 years old)[38,41] and picky-eating children,[42] lower or even no-intake of fruit and vegetables was observed.

Similarly, in high-income countries,[10,35] the most frequently consumed breakfast in Brazil consists of dairy products, particularly milk, and a grain food source. This is in line with what was found in the present study, and regardless of sex, age group, and type of feeding difficulties, children are consuming milk and/or milk-based formulas, and yeast breads. The inclusion of these staple foods does not necessarily mean that children are consuming adequate amounts of nutrients.

Strengths of the present study are the use of sample of patients from a multidisciplinary ambulatory service exclusively to treat children with feeding difficulties[43] and, as far as the authors know, there are no studies on breakfast specifically with this population in Brazil. However, some limitations should be noted. First, the sample was relatively small, which could have increased risk for type 2 error. Secondly, the use of self-reported measurements may be subject to memory and induce recall errors. Finally, the sample included primarily patients from the city of São Paulo, thus results may not be generalizable. Future research should consider exploring the breakfast profile of children with feeding difficulties among a large and/or representative sample of children with feeding difficulties

CONCLUSION

This study showed that most children with feeding difficulties ate breakfast and schoolers, male children, and those with fear of feeding consumed less vitamins and minerals. Their top energy food sources consumed were limited to baby-food formulas and cereals, milk, and breads. Thus, it is necessary to improve the quality of breakfast in order to increase nutrient density, given its importance according to the most recent evidence

REFERENCES

1. Babik K, Patro-Golab B, Zalewski BM, Wojtyniak K, Ostaszewski P, Horvath A. Infant feeding practices and later parent-reported feeding difficulties: a systematic review. Nutr Rev. 2021. https://doi.org/10.1093/nutrit/nuaa135

2. Milano K, Chatoor I, Kerzner B. A Functional Approach to Feeding Difficulties in Children. Curr Gastroenterol Rep. 2019;21(10):51. https://doi.org/10.1007/s11894-019-0719-0

3. Menzel J. Avoidant/restrictive food intake disorder: Assessment and treatment. Clinical handbook of complex and atypical eating disorders. New York, NY, US: Oxford University Press; 2018. p. 149-68. https://doi.org/10.1093/med-psych/9780190630409.003.0009

4. Kerzner B, Milano K, MacLean WC, Jr., Berall G, Stuart S, Chatoor I. A practical approach to classifying and managing feeding difficulties. Pediatrics. 2015;135(2):344-53. https://doi.org/10.1542/peds.2014-1630

5. Goday PS, Huh SY, Silverman A, Lukens CT, Dodrill P, Cohen SS, et al. Pediatric Feeding Disorder: Consensus Definition and Conceptual Framework. Journal of Pediatric Gastroenterology and Nutrition. 2019;68(1). https://doi.org/ 10.1097/MPG.0000000000002188

6. Taylor CM, Emmett PM. Picky eating in children: causes and consequences. Proc Nutr Soc. 2019;78(2):161-9. https://doi.org/10.1017/S0029665118002586

7. Taylor CM, Northstone K, Wernimont SM, Emmett PM. Picky eating in preschool children: Associations with dietary fibre intakes and stool hardness. Appetite. 2016;100:263-71. https://doi.org/10.1016/j.appet.2016.02.021

8. Kawalec A, Pawlas K. Breakfast Frequency and Composition in a Group of Polish Children Aged 7-10 Years. Nutrients. 2021;13(7). https://doi.org/10.3390/nu13072241

9. Maximino P, Leme ACB, Malzyner G, Ricci R, Gioia N, Fussi C, et al. Time to reconsider feeding difficulties in healthy children: a narrative synthesis of definitions and associated factors. Nutrire. 2021;46(2):20. https://doi.org/10.1186/s41110-021-00151-7

10. Cuadrado-Soto E, Lopez-Sobaler AM, Jimenez-Ortega AI, Bermejo LM, Aparicio A, Ortega RM. Breakfast Habits of a Representative Sample of the Spanish Child and Adolescent Population (The ENALIA Study): Association with Diet Quality. Nutrients. 2020;12(12). https://doi.org/10.3390/nu12123772

11. Adamson M, Morawska A, Wigginton B. Mealtime duration in problem and non-problem eaters. Appetite. 2015;84:228-34. https://doi.org/10.1016/j.appet.2014.10.019

12. Walton K, Kuczynski L, Haycraft E, Breen A, Haines J. Time to re-think picky eating?: a relational approach to understanding picky eating. The international journal of behavioral nutrition and physical activity. 2017;14(1):62-. https://doi.org/10.1186/s12966-017-0520-0

13. Wedde S, Haines J, Ma D, Duncan A, Darlington G. Associations between Family Meal Context and Diet Quality among Preschool-Aged Children in the Guelph Family Health Study. Can J Diet Pract Res. 2020;81(1):21-7. https://doi.org/10.3148/cjdpr-2019-022

14. Leme AC, Muszynski D, Mirotta JA, Caroll N, Hogan JL, Jewell K, et al. Diet Quality of Canadian Preschool Children: Associations with Socio-demographic Characteristics. Canadian Journal of Dietetic Practice and Research. 2021:1-5. https://doi.org/10.3148/cjdpr-2021-009

15. O"Neil CE, Nicklas TA. Breakfast Consumption versus Breakfast Skipping: The Effect on Nutrient Intake, Weight, and Cognition. Nestle Nutr Inst Workshop Ser. 2019;91:153-67. https://doi.org/10.1159/000493707

16. Alsharairi NA, Somerset SM. Skipping breakfast in early childhood and its associations with maternal and child BMI: a study of 2-5-year-old Australian children. Eur J Clin Nutr. 2016;70(4):450-5. https://doi.org/10.1038/ejcn.2015.184

17. Wijtzes AI, Jansen W, Jaddoe VW, Franco OH, Hofman A, van Lenthe FJ, et al. Social Inequalities in Young Children's Meal Skipping Behaviors: The Generation R Study. PLoS One. 2015;10(7):e0134487. https://doi.org/10.1371/journal.pone.0134487

18. Gimenez-Legarre N, Miguel-Berges ML, Flores-Barrantes P, Santaliestra-Pasias AM, Moreno LA. Breakfast Characteristics and Its Association with Daily Micronutrients Intake in Children and Adolescents-A Systematic Review and Meta-Analysis. Nutrients. 2020;12(10). https://doi.org/10.3390/nu12103201

19. Gibney MJ, Barr SI, Bellisle F, Drewnowski A, Fagt S, Livingstone B, et al. Breakfast in Human Nutrition: The International Breakfast Research Initiative. Nutrients. 2018;10(5). https://doi.org/10.3390/nu10050559

20. Harris HA, Ria-Searle B, Jansen E, Thorpe K. What's the fuss about? Parent presentations of fussy eating to a parenting support helpline. Public Health Nutr. 2018;21(8):1520-8. https://doi.org/10.1017/S1368980017004049

21. O'Connor TM, Hughes SO, Watson KB, Baranowski T, Nicklas TA, Fisher JO, et al. Parenting practices are associated with fruit and vegetable consumption in pre-school children. Public Health Nutr. 2010;13(1):91-101. https://doi.org/10.1017/S1368980009005916

22. Hughes SO, Power TG, Orlet Fisher J, Mueller S, Nicklas TA. Revisiting a neglected construct: parenting styles in a child-feeding context. Appetite. 2005;44(1):83-92. https://doi.org/10.1016/j.appet.2004.08.007

23. Fontanezi N.M. A relação entre os estilos parentais na alimentação, dificuldades alimentares e aspectos nutricionais de crianças. São Paulo. São Paulo: Universidade Federal de São Paulo; 2019. https://repositorio.unifesp.br/handle/11600/59878 (access on 28 nov 2022).

24. Organização Mundial de Saúde. Software for assessing growth and development of the world's children. WHO Anthro for personal computers. Geneva: WHO; 2011.

25. De Onis M. Curvas de Referência da Organização Mundial da Saúde. Genebra, Switzerland European Childhood Obesity Group; 2015.

26. Organização Mundial de Saúde. Obesity and overweight. Geneva: WHO; 2017.

27. Ribeiro LW, Ricci R, Maximino P, Machado R, Bozzini AB, Ramos C, et al. Clinical use of a food inventory to identify maternal underreport on children's food intake: Experience of a reference center in Brazil. Nutricion Clinica y Dietetica Hospitalaria. 2018;38:81-9. https://doi.org/10.12873/381LRibeiro

28. Harnack L. Nutrition Data System for Research (NDSR). In: Gellman MD, Turner JR, editors. Encyclopedia of Behavioral Medicine. New York, NY: Springer New York; 2013. p. 1348-50. https://doi.org/10.1007/978-1-4419-1005-9

29. O'Neil CE, Byrd-Bredbenner C, Hayes D, Jana L, Klinger SE, Stephenson-Martin S. The Role of Breakfast in Health: Definition and Criteria for a Quality Breakfast. Journal of the Academy of Nutrition and Dietetics. 2014;114(12, Supplement):S8-S26. https://doi.org/10.1016/j.jand.2014.08.022

30. Fisberg RM, Leme ACB, Previdelli A, de Mello AV, Martinez AG, Hermes Sales C, et al. Contribution of food groups to energy, grams and nutrients-to-limit: the Latin American Study of Nutrition and Health/Estudio Latino Americano de Nutricion y Salud (ELANS). Public Health Nutr. 2021;24(9):2424-36. https://doi.org/10.1017/S136898002100152X

31. Leme ACB, Fisberg RM, Mello AV, Sales CH, Ferrari G, Haines J, et al. Food Sources of Shortfall Nutrients among Latin Americans: Results from the Latin American Study of Health and Nutrition (ELANS). Int J Environ Health Res Pub Health. 2021. https://doi.org/10.3390/ ijerph18094967

32. Rhodes DG, Adler ME, Clemens JC, Moshfegh AJ. What we eat in America food categories and changes between survey cycles. Journal of Food Composition and Analysis. 2017;64:107-11. https://doi.org/10.1016/j.jfca.2017.07.018

33. Victo ER, Ferrari G, Sole D, Pires CAM, Araujo TL, Katzmarzyk PT, et al. [Association between the consumption of breakfast and the recommendation of physical activity and the nutritional status in children]. Cien Saude Colet. 2021;26(suppl 2):3907-16. https://doi.org/10.1590/1413-81232021269.2.30712019

34. O'Neil CE, Nicklas TA, Fulgoni VL, 3rd. Nutrient Intake, Diet Quality, and Weight Measures in Breakfast Patterns Consumed by Children Compared with Breakfast Skippers: NHANES 2001-2008. AIMS Public Health. 2015;2(3):441-68. https://doi.org/10.3934/publichealth.2015.3.441

35. Gibney MJ, Barr SI, Bellisle F, Drewnowski A, Fagt S, Hopkins S, et al. Towards an Evidence-Based Recommendation for a Balanced Breakfast-A Proposal from the International Breakfast Research Initiative. Nutrients. 2018;10(10). https://doi.org/10.3390/nu10101540

36. Matthys C, De Henauw S, Bellemans M, De Maeyer M, De Backer G. Breakfast habits affect overall nutrient profiles in adolescents. Public Health Nutr. 2007;10(4):413-21. https://doi.org/10.1017/S1368980007248049

37. Nicklas TA, O'Neil CE, Fulgoni VL, 3rd. Nutrient intake, introduction of baby cereals and other complementary foods in the diets of infants and toddlers from birth to 23 months of age. AIMS Public Health. 2020;7(1):123-47. https://doi.org/10.3934/publichealth.2020012

38. Liu J, Wu L, Um P, Wang J, Kral TVE, Hanlon A, et al. Breakfast Consumption Habits at Age 6 and Cognitive Ability at Age 12: A Longitudinal Cohort Study. Nutrients. 2021;13(6). https://doi.org/10.3390/nu13062080

39. Haines J, Haycraft E, Lytle L, Nicklaus S, Kok FJ, Merdji M, et al. Nurturing Children's Healthy Eating: Position statement. Appetite. 2019;137:124-33. https://doi.org/10.1016/j.appet.2019.02.007

40. Anjos LAD, Vieira D, Siqueira BNF, Voci SM, Botelho AJ, Silva DGD. Low adherence to traditional dietary pattern and food preferences of low-income preschool children with food neophobia. Public Health Nutr. 2020:1-8. https://doi.org/10.1017/S1368980020003912

41. Aanesen A, Katzmarzyk PT, Ernstsen L. Breakfast skipping and overweight/obesity in first grade primary school children: A nationwide register-based study in Iceland. Clin Obes. 2020;10(5):e12384. https://doi.org/10.1111/cob.12384

42. You Y, Zhang F, Han J, Liu R, Li B, Ding Z, et al. Breakfast preferences and consumption location among children at a median age of 7 in Shenzhen: Implications for managing overweight and obesity. Appetite. 2021;156:104851. https://doi.org/10.1016/j.appet.2020.104851

43. Maximino P, Machado RHV, Junqueira P, Ciari M, Tosatti AM, Ramos CdC, et al. How to monitor children with feeding difficulties in a multidisciplinary scope?: Multidisciplinary care protocol for children and adolescents. Journal of Human Growth and Development. 2016;26:331-40. https://doi.org/10.7322/jhgd.122816.

Contributors

Maximino P, Nogueira LR, Leme AC, Ricci R, Gioia N, Fussi C and Fisberg M participated in all stages, from the conception of the study to the revision of the final version of the article.

Conflict of Interest: The authors declare that there is no conflict of interest.

Received: February 22, 2022
Accepted: November 19, 2022