http://www.periodicos.uem.br/ojs/index.php/CiencCuidSaude
ISSN on-line1984-7513
DOI: 10.4025/cienccuidsaude.v20i0.59966

ORIGINAL ARTICLE

EVALUATION OF NUTRITIONAL STATUS AND DIET OF CHILDREN AND ADOLESCENTS WITH DOWN SYNDROME

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ABSTRACT

Introduction: Children with Down syndrome (DS) may have a prevalence of neophobia and food selectivity, overweight, and obesity. A healthy and balanced diet is of utmost importance for the proper growth of these children. **Objective:** To evaluate the adequacy of diet components and the nutritional status of children and adolescents with Down syndrome followed up at the outpatient care of genetic pediatrics, Hospital das Clínicas de Botucatu. **Method:** A cross-sectional descriptive clinical study, with a collection of clinical data and nutritional assessment, using anthropometric data and dietary records to evaluate the diet. Statistical analysis of the Chi-square and Tukey tests were performed. **Results:** A total of 35 children and two adolescents were included. Nutritional diagnoses were 2.7% lean, 81.1% eutrophic, 8.1% obese, and 8.1% at risk or overweight. There was an excess of lipid intake in overweight and obese children, and a fiber-deficient diet was prevalent since the first year of age, as well as extra calories and adequate iron and zinc intake. Among the two adolescents, a diet with deficits in macro and micronutrients, except for vitamin C and cholesterol, stood out. **Conclusions:** A diet with an excess of calories, carbohydrates, and lipids, as well as a fiber-deficient diet, indicates an unbalanced diet among children and adolescents with DS, especially after one year of age, despite their adequate nutritional status.

Keywords: Child. Down Syndrome. Nutrition Assessment. Child Nutrition.

INTRODUCTION

Down syndrome (DS) is the most common chromosomal condition in Brazil and worldwide. It is the most prevalent genetic syndrome in pediatrics, and its incidence increases proportionally with the mother's age[1-2]. DS was first described by physician John Langdon Down in 1866, and knowledge of this genetic condition has evolved due to research, with physician Jerome Lejeune, in the 20th century, having identified an additional chromosome in pair 21, which occurs in 95% of cases, justifying the terms Down syndrome or Trisomy 21[1-2].

Children with DS are more susceptible to several clinical conditions[3], such as a higher incidence of complications at birth, ranging from prematurity, cardiac and gastrointestinal malformations, respiratory complications[1-2] and, during life, a greater propensity to leukemia and early onset of Alzheimer's[3], thus justifying multidisciplinary and specialized care for this population.

A healthy and balanced diet is essential for everyone's growth and health, especially forchildren and adolescents with DS, since there is an increase in free radicals because of the metabolic and genetic changes among patients with SD, therefore intensifying cellular oxidative stress. The genes on the extra chromosome 21 increase the expression of the enzyme

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superoxide dismutase (SOD) by up to 50%, which leads to arise in free radicals and premature cell aging[4-6].

In addition to metabolic and genetic changes, individuals with DS may have anatomical and functional changes in the gastrointestinal tract, there by causing eating difficulties, such as chewing and swallowing disorders, neophobia, and food selectivity[3]. Such conditions may lead to the habit of inadequate eating patterns, causing nutritional disorders and changes in basal metabolism[7] in children with DS.

Molecular mechanisms resulting from chromosomal alteration in DS may lead to a cut off in basal metabolism that has not been fully elucidated yet. In patients with this syndrome, there are high leptinlevels, accountable for appetite control, which leads them to binge eating, which, in association with low basal metabolic rate and frequent thyroid changes in 28% to 64% of children with DS, may facilitate overweight and obesity, especially when associated with lack of physical activity, hypotonia, and poor nutritional habits[3,8-9].

Obesity and overweight are commonly found in these individuals, increasing with ageing[10-11]. Thus, nutritional assessment becomes essential in addition to a detailed survey of the food itself and way of the feeding of children with DS, aiming to ensure the daily intake of nutrients within their nutritional needs and specificities, as well as considering vitamin supplementation based on this analysis, as some authors suggest[6].

The present study aimed to assess the adequacy of diet elements and the nutritional status of children and adolescents with Down syndrome undergoing outpatient follow-up at a specialized health center aimed at providing a better quality of life to this audience, considering that several specificities come with DS there are, and some difficulties related to its nutritional profile.

METHOD

A cross-sectional clinical study with children and adolescents with DS aged up to 15 (to be completed), as this is the maximum age for follow-up in this health service, conducted at the genetic childcare clinic of the Hospital das Clínicas de Botucatu (HCFMB), these being the inclusion criteria. Data collection from all those who consulted in this timeframe took place from November 2017 to September 2018 in which they were invited to participate in the study, composing, therefore, a convenience sample.

We carried out: structured interviews using a research protocol; 24-hour dietary recall; and clinical assessments with nutritional classification. In a second moment, after quantifying the nutrients in the diet, dietary guidance was carried out, aiming to guarantee the daily intake within the nutritional needs according to the sex and age of the child or adolescent.

This convenience sample included 35 children aged 2 months to 12 complete years[12-13], of both sexes, with a confirmed diagnosis of DS. Two teenagers also participated, a total “n” of 37 included. Three children who failed to complete all the steps foreseen in the study were excluded.

The collection of the research protocol retrieved maternal data, birth condition, length of pregnancy (term, preterm), single pregnancy, twin pregnancy, vaginal delivery or cesarean section; sex; birth weight; congenital malformation; current illnesses, neonatal admissions, and admissions in the first year of age; deformities and pathologies; data on changes in the thyroid-stimulating hormone (TSH), on the neonatal screening test and/or in the blood, and on the current diagnosis of thyroid disease and use of medication; congenital heart disease and classification of severity through hemodynamic repercussions on the echocardiogram – severe heart disease or mild heart disease – and use of medications; vitamin and micronutrient supplementation regularly, considering vitamins A and D, iron and zinc.

As for body weight and height, and an anthropometric digital scale was used with up to 150kg with 100g precisionand a division of 0.5 cm. And the height was measured with a pediatric anthropometric ruler. The nutritional diagnosis was performed using the PedZ software using curves from the Center for Diseases Control growthstandards, considering the “Down syndrome”[14], according to sex and age, also calculated using the PedZ software (www.pedz.de).

According to the values of weight corresponding to height and BMI, we considered children under 5 years of age with a nutritional diagnosis of thinness, normal weight, risk of being overweight, overweight, and obesity. And for those over 5 years old, according to the BMI, the classification was the same, except when the z-score was greater than or equal to +1 ranging to the score +2; and considered overweight and obese if a score is greater than or equal to +2 up to a z-score +3. Thus, for statistical analysis, we settled the two age groups: less than or equal to 5 and greater than 5 years of age.

The 24-hour dietary recall (24HR) refers to the amount of food eaten in the 24 hours of the day before, through an interview[15] carried out by the author of this article with the child's sponsor. In the study, food records were made for three days on the roll before the appointment, one of them being unusual, on the weekend.

After the 24HR survey, the diet's macro and micronutrients count was performed through the Nutrition Support Program – NutWin [software][16] – and the nutritional standards, according to nutrient and age group, were considered for the adequacy assessment, deficient or excessive food consumption according to the Dietary Reference Intake (DRI), recommended by the National Research Council[17].

To have a better adequacy analysis of macro and micronutrients from the participant's diet, we chose to perform statistical analysis according to age groups, classified as: under 6 months; between 6 and 12 months of age; between 12 and 36 months; between 37 and 60 months; over 60 and under 144 months; and over 144 months.

For statistical analysis of the collected data, variance analysis was performed; and for multiple comparisons between means, the Tukey test was performed and the Student's t and chi-square tests were used, considering significance if $p<0.05$.

The investigation was approved by the Research Ethics Committee (CEP) of theFaculdade de Medicina da Unesp de Botucatu (Unesp Medical College of Botucatu), according to Resolution n. 466/12-CNS-MS[18] (CAAE no. 62014216.0.0000.5411/2017).

RESULTS

The age distribution of the 37 included ones ranged from 2 months to 14 years of age, with 18.9% under one year of age (n= seven) and, of these, four were under 6 months of age (10.8%); 54.1% between 1 and 5 years (n = 20); 21.6% between 5 and 10 years of age (n = eight); two over 10 years old and two over 12 years old (5.4%).

Table 1 shows the sample's characterization according to birth conditions, comorbidities, hospital admissions, breastfeeding, and feeding physiology. Birth weight ranged from 800g to 4.15 kg, with 21.6% (n = eight) of the children with low birth weight. As for gestational age, 34.4% (n = 12) were preterm, among these seven had low birth weight (58.3%), and all had congenital heart disease (100.0%); one of the underweight children was not premature (8.3%).

Malformation at birth happened in 32.4% (n = 12) of those included, four were premature (33.3%) and, of these, three were born with low birth weight (25.0%). Congenital cataract, skeletal dysplasia, cryptorchidism, congenital clubfoot, and cardiac malformation were reported, the most frequent in 21.6% (n = eight) of those included in the study.

The prevalence of admission to a neonatal unit was 51.3% (n = 19) and, of these, seven were preterm with low birth weight (36.8%). Among the 22 (59.5%) who required hospital admissionin the first year of age, 11 were premature (50.0%), eight with low birth weight (36.3%), seven premature and with low birth weight (31.8%), and 16 had congenital heart disease (72.7%).

Current illnesses such as reflux (n = two, 8.7%), rhinitis (n = three, 13.0%), pneumonia (n = two, 8.7%), recurrent urinary tract infection (n = one, 4.3%), asthma (n = one, 4.3%), hypothyroidism (n = four, 17.4%), anemia (n = one, 4.3%), among others, were reported in 62, 2% (n = 23) of those included. These alterations were presented in nine with prematurity (39.1%) and seven (30.4%) with low birth weight, being five (21.7%) premature and with low birth weight. Admission to a neonatal unit was necessary for 12 (52.2%) of these children and 15 (65.2%) required admission during the first year of age.

Congenital heart disease prevailed in 54.0% (n=20) and the mild form was the most frequent in 18 children (90.0%); regular use of

medications such as propranolol and furosemide was reported for three children (8.1%). Thyroid dysfunction had an incidence of 56.7% (n = 21), but there was a report of the use of levothyroxine in 13.5% (n = five) of the children.

A total of 56.7% (n = 21) of those included had exclusive breastfeeding (EBF) in the first 6 months of life, with a mean total breast feeding time of six months. The introduction of complementary feeding varied between 4 and 12 months of age, considered adequate for 48.6% (n = 18) of those included (Table 1).

Table 1. Characterization of children and adolescents with Down syndrome, outpatient care of genetic pediatrics, Botucatu-SP, 2017-2018.

Variables	Total (n)	Percentage (%)
Data on birth and delivery		
Low weight	08	21.62
Prematurity	12	32.43
Prematurity and low birth weight	07	16.21
Single pregnancy	37	100.0
Cesarean section	21	56.76
Male sex	17	45.95
Female sex	20	54.05
Birthmal formation	12	32.43
Pathologies and hospital admissions in the first year of age		
Currentheartdisease	20	54.05
Severeheartdisease	2	10.00
Mildheart disease	18	90.00
Prematurity and lowbirth weight+ congenital heart disease	05	13.51
Current disease	23	62.16
Neonatal admission	19	51.35
Neonatal admission and prematurity	11	29.72
Neonatal admission and lowbirthweight	08	21.62
Hospital admission in first year of age	22	59.46
Thyroid dysfunction and medication		
TSH altered in the neonatal heel prick	4	10.81
Clinical hypothyroidism	3	8.11
Subclinical hypothyroidism	13	34.14
Currenthypo thyroidism	1	2.70
Treatment – levothyroxine	5	13.51
Breast feeding and Feeding Physiology		
EBF* upto 6 months	21	56.75
Adequate swallowing	35	94.59
Slow chewing	6	16.22
Increasedappetite	8	21.62
Early satiety	5	13.51
Food refusal	24	64.86
Bowelhabit	12	32.43

* EBF – Exclusive breastfeeding.

Mothers reported swallowing as adequate in 94.6% (n = 35); the two children who had impaired swallowing were premature and one was also lowbirthweight; slow chewing was reported by 16.2% (n = 6), of these, three had heart disease (50.0%) and one child was premature and with low birth weight (16.6%). Appetite was increased in 21.6% (n = 8) of those included, and 13.5% (n = 5) had early satiety. A total of64.9% (n = 24) had reports of food refusal and irregular bowel habits in 32.4% (n = 12) of those included, all were orally fed, and no neurological damage was identified.

The mean age of eutrophic children and adolescents was 40.9 months (between 2 and 161 months), overweight was 84 months (3 and 65 months) and for the obese, the mean age was 93.6 months (between 75 and 115 months). The only child who had a nutritional diagnosis of thinness was 27 months old, and the one at risk of being overweight was 37 months old. Among those included, without stratifying by age group, it was observed that most were considered eutrophic (81.1%) (Table 2).

Table 2. Nutritional classification* of children and adolescents with Down syndrome, outpatient care of genetic pediatrics, Botucatu-SP, 2017-2018.

Nutritional Diagnosis	Total (n)	Percentage (%)
Thiness	1	2.70
Eutrophy	30	81.10
Over weight risk	1	2.70
Over weight	2	5.40
Obesity	3	8.10

*Classification according to specific standards of curves for SD[14].

Table 3 shows the predominance of normal weight in the age groups under study, and for 40% of those older than 5 years, the diagnoses showexcessive weight (risk of overweight, overweight, and obesity) (p = 0.06). None of those included had short height.

Among the 20 children and adolescents with heart disease associated with Down syndrome, one (5.0%) was at risk of being overweight and one (5.0%) obese. The child with a nutritional diagnosis of current thinness had no history of prematurity or low birth weight.

Table 3. Frequency distribution according to nutritional diagnosis* and age group of children and adolescents with Down syndrome, genetic pediatrics clinic, Botucatu-SP, 2017-2018.

Nutritional Classificiation	Age group			p-value
	< 5 years N(%)	≥ 5 years N(%)	Total N(%)	
Eutrophy	24(88.90)	6(60.00)	30(81.10)	
Thiness	1(3.70)	0(0.00)	1(2.70)	0.06
Excessive weight[1]	2(7.40)	4(40.00)	6(16.20)	
Total	27	10	37	

Statistical analysis using Fisher's exact test.
* Classification according to specific curves for DS[14].
[1]Excessive weight = overweight, obese and risk of overweight

In the analysis of the diet's elements, there was an excessive intake of calories by 22 of those included (59.5%, mean of 1,181.3 Kcal/d), and of carbohydrates and lipids by 17 of them (45.9%, mean of 152.65 g/d and 38.73 g/d, respectively). Insufficient protein intake by 27.0% of those included (n = 10, mean of 54.30 g/d) and fiber deficiency by 66.8% (n = 24, mean of 14.38 g/d).

Table 4 shows the macro and micronutrients according to the children's age groups. Protein intake was excessive in all age groups, except for two adolescents, which had deficient intake (p = 0.07). This extra dietary intake was mainly due to excessive intake of dairy sources, rich in protein. Fiber intake was adequate among children under 1 year of age, due to non-excessive intake of milk formulas and fruits, which was statistically significant concerning other age groups which showed a prevalence of deficient fiber intake (p = 0.005).

The children's diet had adequate zinc, with excess intake (p = 0.002) by some age groups. While vitamin A intake was adequate in most age groups and deficient in children aged between 60 and 144 months (n = 5, 62.5%, p = 0.10). There were no significant excesses or deficits among the other diet elements under study (Table 4).

After the first year of age, a diet with an excess of lipids and calories and adequacy of iron and zinc was found. Among the two adolescents included in the study, a diet with a deficit in macro and micronutrients, except for vitamin C and cholesterol, was predominant.

Lipid intake was inadequate for 6.7% of children (n = four) and one overweight adolescent, and fiber intake was deficient by 63.3% (n = 19) of eutrophic children.

Table 4 shows adequate iron intake by 72.9% (n = 27) of those included, with a mean of 9.43 mg/d (p = 0.02). Micronutrients intake (zinc, iron, and vitamin C) was adequate for most children; three infants (42.8%) had vitamin A intake above the recommended limit (p = 0.10).

Only for two children aged between 12 and 36 months (16.7%) and for two children aged between 60 and 144 months (25.0%) the diet was with high cholesterol; for all others, it was with adequate amounts (p = 0.54).

Regarding the two adolescents included in the study, a low-calorie anddeficientdiet inmost macro and micronutrients was found, being theintake of lipids, cholesterol, and vitamin C only adequate for one of the adolescents, and for the other the diet had adequate zinc, iron, vitamins A and C and cholesterol.

Table 4. Adequacy of calories, macro, and micronutrientsintake, according to the age group of children with DS (n = 35), outpatient care of genetic pediatrics, Botucatu-SP, 2017-2018.

Age group (months)	Adequate N (%)	Deficient N (%)	Excess N (%)	p-value
		Calories		
≤ 6	0 (0.0)	1(25.0)	3(75.0)	**0.02**
7 - ≤12	0 (0.0)	3(100.0)	0 (0.0)	
>12 - ≤ 36	1(8.3)	2(16.7)	9(75.0)	
> 36 - ≤ 60	3(37.5)	0 (0.0)	5(62.5)	
> 60 - ≤144	1(12.5)	2(25.0)	5(62.5)	
		Proteins		
≤ 6	1(25.0)	1(25.0)	2(50.0)	0.07
7 - ≤12	0 (0.0)	2(66.7)	1(33.3)	
>12 - ≤ 36	1(8.3)	1(8.3)	10(83.3)	
> 36 - ≤ 60	1(12.5)	0 (0.0)	7(87.5)	
> 60 - ≤144	0 (0.0)	4(50.0)	4(50.0)	
		Carbohydrates		
≤ 6	0 (0.0)	3(75.0)	1(5.0)	0.16
7 - ≤12	0 (0.0)	3(100.0)	0 (0.0)	
>12 - ≤ 36	1(8.3)	2(16.7)	9(75.0)	
> 36 - ≤ 60	1(12.5)	3(37.5)	4(50.0)	
> 60 - ≤144	2(25.0)	3(37.5)	3(37.5)	
		Lipids		
≤ 6	1(25.0)	0 (0.0)	3(75.0)	**0.04**
7 - ≤12	0 (0.0)	3(100.0)	0 (0.0)	
>12 - ≤ 36	3(25.0)	2(16.7)	7(58.3)	
> 36 - ≤ 60	3(37.5)	0 (0.0)	5(62.5)	
> 60 - ≤144	4(50.0)	2(25.0)	2(25.0)	
		Fibers		
≤ 6	4(100.0)	0 (0.0)	0 (0.0)	**0.005**
7 - ≤12	3(100.0)	0 (0.0)	0 (0.0)	
>12 - ≤ 36	3(25.0)	9(75.0)	0 (0.0)	
> 36 - ≤ 60	1(12.5)	7(87.5)	0 (0.0)	
> 60 - ≤144	2(25.0)	6(75.0)	0 (0.0)	
		Zinc		
≤ 6	2(50.0)	0 (0.0)	2(50.0)	**0.002**
7 - ≤12	3(100.0)	0 (0.0)	0 (0.0)	
>12 - ≤ 36	8(66.7)	0 (0.0)	4(33.3)	
> 36 - ≤ 60	3(37.5)	0 (0.0)	5(62.5)	
> 60 - ≤144	8(100.0)	0 (0.0)	0 (0.0)	
		Iron		
≤ 6	4(100.0)	0 (0.0)	0 (0.0)	**0.02**
7 - ≤12	0 (0.0)	3(100.0)	0 (0.0)	
>12 - ≤ 36	8(66.7)	4(33.3)	0 (0.0)	
> 36 - ≤ 60	6(75.0)	2(25.0)	0 (0.0)	
> 60 - ≤144	8(100.0)	0 (0.0)	0 (0.0)	

Statistical analysis using Fisher's exact test.

Regular intake of vitamins occurred in 43.2% (n = 16) of the children, with iron (n = ten, 62.5%), Ad-til® (n = eight, 50.0%), multivitamins (n = five, 25.0%), zinc (n = four, 25.0%), vitamin C (n = 3, 18.7%), Omega3 (n = two, 6.2%), folic acid (n = one, 6.2%), vitamin K (n = one, 6.2%) and B12 (n = one, 6.2%).

Lipid intake was statistically higher among children and adolescents at risk of being overweight and overweight compared to eutrophic children. Only one child had thinness classification, for that reason, it is not included in the analysis of the nutrient mean distribution (Table 5).

Table 5. Distribution of means and standard deviation (SD) of nutrient intake, according to the nutritional diagnosis* of children and adolescents with Down syndrome, outpatient care of genetic pediatrics, Botucatu-SP, 2017-2018.

		Variables				
Nutritional Diagnosis		**Calories (Kcal/d)[#]**	**Protein (g/d)[##]**	**Carbohydrate(g/d)**	**Lipid (g/d)[**]**	**Fiber (g/d)**
Eutrophy	Mean	1,118.1	51.6	145.4	35.9B	14.1
	SD	395.2	23.9	57.8	12.1	8.0
Obesity	Mean	1,591.6	73.1	209.0	51.9AB	17.1
	SD	199.5	9.3	26.9	21.9	5.0
Overweightrisk/ overweight	Mean	1,535.9	67.0	187.7	58.5A	16.6
	SD	506.7	40.7	67.8	13.2	14.5
P-value		0.06	0.25	0.12	**0.007**	0.76
		Zinc (g/d)	**Iron (g/d)**	**Vit. C (g/d)**	**Cholesterol (g/d)**	**Vit. A (g/d)**
Eutrophy	Mean	8.3	9.1	167.8	180.5	738.6
	SD	5.5	4.4	386.1	191.0	614.8
Obesity	Mean	9.6	10.6	375.2	216.8	390.1
	SD	2.5	1.3	482.5	47.5	142.7
Overweightrisk/ overweight	Mean	11.8	12.2	106.4	147.8	583.1
	SD	1.6	3.0	91.1	128.0	427.7
P-value		0.53	0.42	0.63	0.90	0.59

Variance analysis, followed by Tukey's test. *Classification according to specific curves for DS[14]; **Means followed by at least one letter in common do not differ statistically.
[#] Kcal/d = Kilocalorie/day; [##]g/d = grams/day.

DISCUSSION

The nutritional epidemiological transition has been a reality for the last three decades. While malnutrition in children declines at a very fast pace, the prevalence of overweight and obesity in the Brazilian population increases. Thus, antagonism of temporal trends between malnutrition and obesity is established, defining one of the hallmarks of the country's nutritional transition process[19-20].

The rise in the prevalence of overweight and obesity at increasingly early ages has concerned researchers and health professionals, because of the damage and health issues caused by overweight, such as high blood pressure, heart disease, diabetes, hyperlipidemias, among others[21]. Therefore, the concern that inspired this study on children and adolescents with DS is justified, given a significant percentage of children born prematurely, with low birth weight and cardiac malformations, as addressed in the referred literature[1,2,4].

The high frequency of eutrophy among those with DS in the study, especially in the first five years of life, makes us think about the importance of using specific curves for those with DS[1,7], as well as the adequate regular follow-up by the health service, important for health promotion and disease prevention in this population of children and adolescents. Another finding, which also validates this significance, is that no child or adolescent, in different age groups, presented short height, contrary to what is described in the literature on short stature in children with DS when using non-specific curves for the syndrome[8-9]. Adequate dietary zinc intake may contribute to adequate height, as this mineral plays an important role in child growth[8].

Childhood obesity in children with DS, even if it results from conditions inherent to the syndrome - reduced resting metabolic rate, hypothyroidism, binge eating, and less satiety - is reported as frequent[3,8-9] and, in our study, it should not be disregarded the frequency of almost 20% of children and adolescents with diagnoses that indicate overweight, it is urgent to identify the factors that contribute to these diagnoses that can be corrected or intervened, such as those associated with dysfunction aleating[22].

Understanding the changes in the nutritional profile resulting from urbanization and industrialization, which lead to high-calorie intake and reduced physical activity with consequent accumulation of fat[21-22], is highly important to guide dietary education and changes in healthy habits in an individualized way by a pediatrician and a nutritionist.

At birth, the adequate food for the baby is breast milk, as breastfeeding prevents obesity, and breastfeeding is exclusively recommended until 6 months of age to reduce the incidence of infectious and autoimmune diseases, in addition to strengthening the bond between the mother and the child[1,20]. Thus, the average of exclusive and total BF found in our study is considered good under the most current data on Brazilian children: in 2019 it showed that 53% continue BF in the first year of age; among children under 6 months, the EBF rate is 45.7%; and for children younger than four months[23] it is 60%.

The proper food introduction in the first year of age, as well as a diet with sorted nutrients in a pleasant eating environment, allows the child to start having food preferences accountable for determining their eating pattern[20]. The expression of food neophobia can be controlled by several biological and environmental factors. Knowing nutritional characteristics, handling, preparation, and exposure to different foods throughout life play an important role in mitigating neophobic behavior[24]. Thus, the individualized interventions seen in the study may offer improvements in food composition and in the physiology of food for an adequate supply of macro and micronutrients. And they suggest that the results were positive for those included in the research, since there were no changes in swallowing and chewing, even for children with prematurity, heart disease. and thyroid dysfunction, which are frequent among those included.

Families that are unable to provide food and nutritional security conditions, for social issues, lead to deprivations that directly affect the lives of these children in terms of care and eating practices[25]. "Hidden hunger" is a non-explicit lack of micronutrients in the body, which can increase susceptibility to infections and affect the effectiveness of therapeutic interventions[21].

Researchers recommend eating foods rich in zinc and selenium, minerals that have an antioxidant effect and strengthen the immune system, preferably using the child's diet as a source, naturally eliminating excesses[5]. Zinc deficiency among those over 10 years of age suggests an unbalanced diet of this micronutrient, which is so important for the growth, immunity, and sexual development of those with DS[3,5], and should be dealtwith through dietary adjustments or supplementation, as was done among the children in the study.

Obesity and thinness occur due to excesses and deficiencies also among the eutrophic children and adolescents in the study, and an imbalance between macro and micronutrients was found, as seen in the assessment of the diet elements of all those included, including those with a diagnosis of eutrophy. They are, therefore, deficits and excesses that are harmful to the health of children and adolescents in the growth and development phase, resulting from an inadequate and unbalanced diet[9,21].

CONCLUSIONS

The data from this study, despite the limitation of its "n", confirm a trend towards an unbalanced diet, with excesses and deficits, high intake of carbohydrates and proteins, and a fiber-deficient diet, especially after the first year of age. Breastfeeding was a contributing factor to balanced dietary composition in the first year of age.

The eutrophy nutritional diagnosis of most of those included confirms the relevance of routine pediatric follow-up, breastfeeding, and individualized nutritional guidance, thus promoting adequate growth and preventing diseases or reducing problems and the worsening of comorbidities that may exist among children and adolescents with SD.

Diet is directly associated with good health since childhood and, therefore, an individualized approach to the diet nutritional elements of children and adolescents with Down syndrome is justified since the beginning of their follow-up in health services.

AVALIAÇÃO DO ESTADO NUTRICIONAL E DA DIETA DE CRIANÇAS E ADOLESCENTES COM SÍNDROME DE DOWN

RESUMO

Introdução: As crianças com síndrome de Down (SD) podem apresentar maior incidência de neofobia e de seletividade alimentar, sobrepeso e obesidade. A alimentação saudável e equilibrada é de suma importância para o crescimento adequado dessas crianças. **Objetivo:** Avaliar a adequação dos componentes da dieta e o estado nutricional de

crianças e adolescentes com síndrome de Down em seguimento no ambulatório de pediatria genética do Hospital das Clínicas de Botucatu. **Método:** Estudo clínico descritivo transversal, com coleta de dados clínicos e avaliação nutricional, realizadopor meio de dados antropométricos e recordatório alimentar para avaliação da dieta. Análise estatística dos testes de Qui-quadrado e de Tukey. **Resultados:** Foram incluídos 35 crianças e dois adolescentes. Os diagnósticos nutricionais foram 2,7% de magreza, 81,1% de eutrofia, 8,1% de obesidade e 8,1% em risco ou sobrepeso. Houve excesso de ingestão de lipídeos naqueles com sobrepeso e obesidade, e a dieta deficiente em fibras foi prevalente a partir do primeiro ano de vida, bem como excesso de calorias e adequação de ferro e zinco. Entre os dois adolescentes, predominou a dieta com déficits em macro e micronutrientes, exceto em vitamina C e colesterol. **Conclusões:** A dieta com excesso de calorias, carboidratos e lipídios, como tambémcom déficit de fibras, aponta uma alimentação pouco balanceada entre crianças e adolescentes com SD, principalmente após o primeiro ano de vida, apesar do seu adequado estado nutricional.

Palavras-chave: Criança. Síndrome de Down. Avaliação nutricional. Nutrição da criança.

EVALUACIÓN DEL ESTADO NUTRICIONAL Y DE LA DIETA DE NIÑOS Y ADOLESCENTES CON SÍNDROME DE DOWN

RESUMEN

Introducción: los niños consíndrome de Down (SD) pueden presentar mayor incidencia de neofobia yde selectividad alimentaria, sobrepeso y obesidad. La alimentación saludabley equilibradaes de gran importancia para el crecimiento adecuado de estos niños. **Objetivo:** la adecuación de los componentes de la dieta yel estado nutricional de niños y adolescentes con síndrome de Downasistidosen la clínica médica depediatría genética del*Hospital das Clínicas de Botucatu*. **Método:** estudio clínico descriptivo transversal, con recolección de datos clínicos yevaluación nutricional, realizado medianteindicadores antropométricos y recordatorio alimentario para la evaluación de la dieta. Análisis estadísticode laspruebas de ji-cuadrado y de Tukey. **Resultados:** fueron incluidos 35niños ydos adolescentes. Los diagnósticos nutricionales fueron 2,7% de delgadez, 81,1% de eutrofia, 8,1% de obesidady8,1% en riesgo o sobrepeso. Hubo exceso de ingestión delípidosenaquellos con sobrepeso y obesidad, yla dieta deficiente en fibrasfueprevalentea partir del primer año de vida, así como exceso de calorías y adecuación de hierro y zinc. Entre los dos adolescentes, predominóla dieta con déficits en macro y micronutrientes, excepto en vitamina C y colesterol. **Conclusiones:** la dieta con exceso de calorías, carbohidratosylípidos, como tambiéncondéficit de fibras, señala una alimentación poco balanceada entre niños y adolescentes con SD, principalmente trasel primer año de vida, apesar de su adecuado estado nutricional.

Palabras clave: Niño. Síndrome de Down. Evaluación Nutricional. Nutrición del Niño.

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Submitted: 23/08/2020
Accepted: 28/07/2021

FINANCIAL SUPPORT
FAPESP - Grant number: 2016/16650-2