



ORIGINAL ARTICLE

Nutritional status of children and adolescents: case-study in Southeastern, Brazil
Estado nutricional de crianças e adolescentes: estudo de caso no sudeste brasileiro

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ABSTRACT

Introduction: The nutritional status in cases of overweight and obesity in children and adolescents is considered a global health reference for future trends and for enabling strategic planning. The main reason for this is the increase in the consumption of low-nutrient and high-calorie food. **Aims:** The present study aimed at verifying the nutritional status of children and adolescents, as well as demonstrating nutritional trends. **Methods:** Some schools in the city of São Gonçalo do Sapucaí, southeastern Brazil, were visited. The student's weight, height and age were assessed in a total of 646 students, from which 198 were preschoolers, 369 schoolchildren and 79 adolescents. **Results:** Nutritional assessment uses diagnostic methods to assess factors of nutritional disorders. Tested by a chi-square, the evaluation shows that overweight, which is considered one of the most alarming public health problems in Brazil, is the current problem. **Conclusion:** It was concluded that there was a low rate of child malnutrition and an actual overweight rate. The relation among health, sports and leisure and education departments is very relevant to create nutritional intervention programs which are associated with the practice of physical activity linked to nutritional education aiming at reducing overweight rates and childhood obesity.

RESUMO

Introdução: O estado nutricional em casos de sobrepeso e obesidade em crianças e adolescentes é considerado uma referência global de saúde para tendências futuras e para possibilitar o planejamento estratégico. A principal razão para isso é o aumento no consumo de alimentos com baixo teor de nutrientes e alto teor calórico. **Objetivos:** O presente estudo teve como objetivo verificar o estado nutricional de crianças e adolescentes, bem como demonstrar tendências nutricionais. **Métodos:** Algumas escolas foram visitadas na cidade de São Gonçalo do Sapucaí, Sudeste, Brasil. O peso, altura e idade foram avaliados em um total de 646 alunos, sendo 198 pré-escolares, 369 escolares e 79 adolescentes. **Resultados:** A avaliação nutricional usa métodos diagnósticos para avaliar fatores de distúrbios nutricionais. Testada pelo teste qui-quadrado, a avaliação mostra que o excesso de peso, considerado um dos problemas de saúde pública mais alarmantes no Brasil, é o problema atual. **Conclusão:** Concluiu-se que havia uma baixa taxa de desnutrição infantil e uma taxa real de excesso de peso. A relação entre os departamentos de saúde, esporte e lazer e educação é muito relevante para criar programas de intervenção nutricional que estão associados à prática de atividade física vinculada à educação nutricional visando reduzir as taxas de sobrepeso e a obesidade infantil.

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Introduction

The assessment of the nutritional condition uses diagnostic methods to evaluate the extent, behavior and factors of nutritional disorders. In addition, it allows the identification risk groups and intervention possibilities.¹ These methods have been extensively discussed with the purpose of improvement, resulting in reliable classifications of the nutritional status of the population.²

The evolution of nutritional status through a change in dietary pattern indicates a significant increase in cases of overweight and obesity, especially in children and adolescents.³ This age group is considered a global health reference for future trends and for enabling strategic planning.³

The prevalence of overweight and obesity has been increasing in most countries, which is considered one of the most significant nutritional problems nowadays. The World Health Organization (WHO) considers obesity as an epidemic, especially in children and teenagers, with adverse consequences.⁴

This situation is commonly found in several Brazilian regions, which generates a nutritional imbalance associated with the high incidence of chronic diseases such as hypertension and diabetes,⁵ showing the need of preventive measures. Early diagnosis provides rapid interventions and prevents complications, considering that time plays an important role in the treatment and adoption of healthy habits.²

In addition to providing targeted information on the need for intervention, the topic addressed in the present study highlights the importance of these studies in regional investigations, since they may be the starting point for solving the global problem. In addition, there is a shortage of data, mainly for the state of Minas Gerais, demonstrating the importance of new studies and publications.

Therefore, the present study aimed at verifying the nutritional status of children and adolescents, as well as demonstrating nutritional trends using scientific literature to suggest multidisciplinary practices that may modify the status.

Methods

Study design and sample

The Ethics Committee approved the present work under protocol 045202/2014 and the authorization of each school principal was requested and obtained along with the consent of the children's legal guardians.

Subsequently, between September and October 2014, six public schools located in the city of São Gonçalo do Sapucaí, southern Minas Gerais state were visited. There are 25.517 inhabitants in the city and the geographic area is 516.683 km².

The weight and height of children and teenagers from one to thirteen years of age were checked and measured with an analog scale and a tape measure. The birth date was collected from each school registry.

The sample of 646 students was obtained with the consent of children and teen's parents at random in the

study and it was separated into groups to obtain a better visualization of the results according to the age group and the different classifications imposed by the WHO. In this way they were organized as follows:

- **Group 1:** 198 Preschoolers (one to five years old);
- **Group 2:** 369 Schoolchildren (from five years and one month to ten years old);
- **Group 3:** 79 Adolescents (from ten years and one month to 13 years and 10 months old).

After collecting data on height and weight, we obtained the following values according to the health department: weight/age (W/A), which reflects the individual's growth and development; height/age (H/A), which is the best indicator of cumulative effect on child growth in adverse situations; weight/stature (W/S), which is sensitive to the diagnosis of overweight, requiring additional measures for greater accuracy and demonstrates the balance of body dimensions or growth process. Also, Body Mass Index/Age (BMI)/A^{6,7} were evaluated based on the relation between the observed weight and reference weight by age and sex. The nutritional status was evaluated through the calculation of the Z score for the W/A, H/A, W/S and (BMI)/A indexes, according to the population reference of the WHO.^{8,9}

Measurement protocol

To classify the nutritional status, the WHO⁸ parameters were used. Children from 0 to 5 years of age, according to the H/A index with the following cut-off points:

- Z<-3 → very short stature for age;
- Z≥-2 → eutrophy.

For the classification according to the W/A index, the cut-off points were:

- Z<-3 → very low weight;
- Z between -3 and -2 → low weight;
- Z between -2 and +2 → eutrophy;
- Z>+2 → high weight.

For the classification based on the W/S and (BMI)/A indexes, the cut-off points were:

- Z between -3 and -2 → thinness;
- Z between -2 and -1 → eutrophy;
- Z between +1 and +2 → overweight risk;
- Z between +2 and +3 → overweight;
- Z>+3 → obesity.

For children ranging from 5 to 10 years of age, there are no parameters for the W/S index in the WHO⁹ reference and the classifications adopted for the (BMI)/A are different in the cut-off points of overweight risk. Thereby, overweight is replaced by obesity and obesity is replaced by severe obesity. The other parameters are the same as stated above.

Regarding adolescents aged from 10 to 13 years old, the parameters which are applied are H/A and (BMI)/A, following the same patterns of children from 5 to 10 years old.⁹

Statistical analysis

For data analysis, the percentage was calculated by means of comparison and a chi-square test (χ^2) was used to verify if there was a significant difference between the variables. The level of significance established was $\alpha=0.01$. The software used to perform the statistical analyzes was the Bioestat.¹⁰ To analyze the nutritional trends, we used specialized scientific literature to prove the change in the food habits, comparing them with the results of our research.

Results

Compared with data from the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística - IBGE*),¹¹ the total number of students evaluated in this study represented 46.34% of the children enrolled in school. The chi-square test showed a significant difference between group 1 and group 2 for the nutritional status classification. For the Weight/Age ratio compared to the anthropometric data of the WHO⁸ reference, a prevalence of high weight was observed in 10.1% for group 1 and 13.8% for group 2, which presented 0.8% of low weight (**Table 1**).

Table 1. Classification of the nutritional status of preschoolers and school children, according to the weight/age index (W/A).

Nutritional state	Weight/Age			
	Group 1 ^a		Group 2 ^b	
	N	%	N	%
Adequate	178	89.9	315	85.4
Low weight	0	0	3	0.8
High weight	20	10.1	51	13.8
Total	198	100	369	100

^a $\chi^2 = 142.01$ $p < 0.0001$; ^b $\chi^2 = 228.24$ $p < 0.0001$

Regarding the Height/Age index, a prevalence of high weight was observed for group 1 and 3% and 1.5% were considered short and very short, respectively. Furthermore, group 2 presented 0.3% of very short stature (**Table 2**).

Group 1 presented a prevalence of 27.8% for the risk of overweight when observing the W/S index. For the (BMI)/A, 26.8% were in the risk of overweight (**Table 3**).

For the classification of the nutritional status in relation to the (BMI)/A index obtained for each child in comparison to the anthropometric data found in the WHO⁸ reference, a prevalence of 1.1; 9.8; 3.8 and 23.5% was observed for the thinness, obesity, severe obesity and overweight, respectively for Group 2. The (BMI)/A index for group 3 was 5.1; 8.9; 3.8 and 20.2 for the thinness, obesity, severe obesity and overweight, respectively (**Table 4**).

Discussion

Brazil has gone through recent historical moments of economic, political and social agitation. The change over the last fifty years has been driven by both external and internal factors and because of the globalization process. This scenario was described by Batista Filho and Rissin¹² as the "Brazilian model".

The "Brazilian model" presented a transitional process regarding nutritional aspects.^{13,14} In the 80s there was a concern with the problems related to malnutrition among children and adolescents.^{13,15} However, due to the contemporary situation the attention is focused on problems related to obesity.^{2,16-18}

The increasing supply of food which has large amounts of hypercaloric elements represents a great risk.⁵ Ferreira and Ott¹⁵ showed that there was a malnutrition rate of approximately 40% for some states in southeastern Brazil in the 1980s. More recently, Ramos, Dumith and César¹⁹ showed a concern about the rates of overweight and obesity, which totaled 19.1%. Moreover, the problem of overweight and obesity has tripled in the last five decades¹³ and this rapid increase has been characterized as a global epidemic.²⁰ According to Rodrigues *et al.*,²¹ Brazil has been marked by an increase

Table 2. Classification of the nutritional status of preschoolers, school children and adolescents according to the height/age index (H/A).

Stature	Height/Age					
	Group 1 ^a		Group 2 ^b		Group 3 ^c	
	N	%	N	%	N	%
Adequate	189	95.5	368	99.7	79	100
Short stature	6	3	0	0	0	0
Very short stature	3	1.5	1	0.3	0	0
Total	198	100	369	100	79	100

^a $\chi^2 = 166.85$ $p > 0.0001$; ^b $\chi^2 = 365.28$ $p > 0.0001$; ^c $\chi^2 = 78.74$ $p > 0.0001$

Table 3. Classification of the nutritional status of preschool children according to weight/height (W/H) and body mass/age index (BMI/A).

Nutritional state	Group 1			
	Weight/Height ^a		Body Mass Index/Age ^b	
	N	%	N	%
Eutrophy	113	57	110	55.5
Thinness	1	0.5	1	0.5
Overweight risk	55	27.8	53	26.8
Overweight	16	8.1	18	9.1
Obesity	13	6.6	16	8.1
Total	198	100	198	100

^a $\chi^2 = 98.33$ $p > 0.0001$; ^b $\chi^2 = 90.20$ $p > 0.0001$

from 4.1 to 13.9% of overweight and obesity in childhood and adolescence stages in the last 20 years. According to data from Vigitel,²² 51.0% of the Brazilian population is considered overweighted and 17.4% obese.

The results of this study are worrisome and show exactly what has been documented in the studies: prevalence of overweight in children and adolescents. The nutritional transition is also evidenced, since in this study we can observe the low malnutrition index that varied between the groups from 0.5 to 5.5% and the high indexes of overweight that reached approximately 24%. Although the sample population of this work has its peculiarities, the results can be extrapolated to other Brazilian children that fit in the same age group.

Dos Anjos *et al.*¹⁷ and Triches and Giugliani¹⁶ show similar results, in which many of the participants present adequate nutritional status. However, the summed values of "obesity", "severe obesity" and "overweight" reached approximately 34.74% of the evaluated population.

Children from Group 1 show greater concern for future consequences compared to the other groups of the study. It is at this stage that food habits and preferences

are built, mainly by the influence of the media,²³ since it exposes the consumption of inappropriate food such as snack, crackers, soft drinks, ice cream, fast food.^{24,25} For this reason, measures such as Resolution 38 of the National Fund for Development of Education (*Fundo Nacional de Desenvolvimento da Educação* in Portuguese) banned the supply of these kinds of foods in the school environment, stimulating the consumption of fruits and vegetables.²⁶

It is important to highlight the nutritional situation of the population, especially in childhood and adolescence stages, because eating habits acquired in these phases can influence preferences and practices in adulthood and, consequently, nutritional status.^{27,28} The etiology of this problem is multifactorial, covering environmental, genetic, socioeconomic and psychological aspects. The main factors are: 1) the absence of regular meals (such as breakfast); 2) the consumption of high-calorie food; 3) lack of knowledge in nutrition; 4) lack of parental control over their children; 5) improvement of family income; 6) the high cost of healthy food; 7) the absence of fruit consumption; and 8) sedentary lifestyle.^{5,16,29}

Table 4. Classification of nutritional status of schoolchildren and adolescents, according to body mass/age index (BMI/A).

Nutritional state	Body Mass Index/Age			
	Group 2 ^a		Group 3 ^b	
	N	%	N	%
Eutrophy	228	61.8	49	62
Thinness	4	1.1	4	5.1
Overweight	87	23.5	16	20.2
Obesity	36	9.8	7	8.9
Severe obesity	14	3.8	3	3.8
Total	369	100	79	100

^a $\chi^2 = 196.44$ $p > 0.0001$; ^b $\chi^2 = 36.36$ $p > 0.0001$

Another factor of relevance is the early weaning and the insertion of hypercaloric food since early stages of life. For Tardido and Falcão,¹³ this early insertion and reduction of physical activity mainly because of television, video games and computer are factors that aggravate obesity. Therefore, it is believed that the early detection of this in childhood could favor a monitoring of the weight variations since its inception providing the capacity for adequacy.¹

The pattern of this study shows an imbalance in the intake of adequate nutrients because industrialized food that is rich in sugars and fats is the favorite when compared to staple food, complex carbohydrate sources and dietary fibers.^{13,30} Furthermore, poor consumption of fruits and vegetables and high intake based on industrialized food which is rich in fat and salt seems to be a predictor of health problems that are mainly associated with chronic diseases such as hypertension and *diabetes mellitus*.³¹ This scenario shows the imperative need for intervention.

It is also reiterated that the nutritional evaluation of children and adolescents is considered as indirect indicative of the quality of life of the population.³² Therefore, this work ought to be carried out continuously to search for viable alternatives to reduce overweight rates and obesity.

Boccaletto *et al.*²⁴ state that schools are the most propitious spaces to stimulate the consumption of healthy

food through the inclusion of programs with emphasis on food and nutritional aspects. Therefore, it is suggested 1) a cooperative effort among the different participants (family, teachers, students and other professionals) to change this nutritional pattern; 2) the stimulation of new lines of work aimed at performing physical activities; 3) actions that aimed at healthy lifestyles involving the entire school community and food industry that prioritize disease prevention; 4) the creation of environments which would be conducive to physical activities; and 5) the dissemination of information regarding nutritional information, changes in eating habits, among others.

Conclusion

This study concludes that the evaluation shows there was a low rate of child malnutrition. However, the current challenge to be faced is an inverse problem related to overweight rates. We suggest that the partnership between the health, sports and leisure departments, together with the education department, be relevant for the creation of programs focused on the nutritional intervention associated with the practice of physical activity. To complement the work, it is also interesting to know the nutritional profile of these students to draw up a nutritional control plan for acquiring healthier habits.

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