

Evaluation of the prevalence and nutritional and social determinants of overweight in a population of schoolchildren: a cross-sectional analysis of 5,037 children

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SUMMARY

Objective: To evaluate the prevalence and nutritional and social determinants of overweight in a population of schoolchildren in Southern Brazil. **Methods:** Cross-sectional descriptive study of 5,037 children of both genders, between 6 and 10.9 years of age, from public and private schools of Maringá, Paraná, PR, Brazil. Evaluation of factors associated with excess weight (overweight and obesity) included gender, age, school type, socioeconomic level, education of the head of the family, eating habits, and means of commuting to school. After univariate analysis (Fisher's exact test), we adjusted a logistic regression model and used Wald's test for decision-making ($p < 0.05$). **Results:** The mean age was 8.7 ± 1.3 years, with 52.8% females; 79.1% of the students attended public school and 54.6% had families of socioeconomic class A or B. Regarding nutritional status, 24% of children were overweight (7% obesity, 17% overweight). Being male, attending a private school, and having a head of the family with over four years of education were significantly associated with excess weight. In relation to food, inadequate intake of carbohydrates was associated with a 48% greater chance of overweight/obesity ($p < 0.001$; OR: 1.48; 95%CI: 1.25-1.76). **Conclusion:** The prevalence of overweight found in this study is approximate to that reported in national studies. Its association with gender and inadequate food intake indicates that these factors should be considered in initiatives aimed at preventive measures in childhood.

Keywords: School health; overweight; obesity; food consumption.

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INTRODUCTION

Excess weight is a major public health problem, representing an epidemic process¹. Worldwide, there were over 155 million overweight or obese school-age children in 2002². According to the World Health Organization (WHO) in 2010, the number of obese children under five years of age was over 43 million. Of these, roughly 35 million were in developing countries. Moreover, approximately 92 million children in the same period were at risk of overweight^{3,4}. The worldwide prevalence of childhood overweight and obesity increased from 4.2% in 1990 to 6.7% in 2010. This trend is expected to reach 9.1% of the child population worldwide, or approximately 60 million children in 2020⁴.

In Brazil, between the 1970s and late 1990s, the prevalence of overweight among children and adolescents went from 4.1% to 13.9%. In Africa, the number of overweight children increased from 4 million in 1990 to 13.5 million in 2010^{4,5}. Children living in low and middle-income countries are more vulnerable to poor feeding, as they are more exposed to foods with high contents of fat, sugar, and salt, in addition to a high energy-density diets that are low in micronutrients, and tend to be low-cost. These food consumption patterns, together with low levels of physical activity, have resulted in the childhood obesity epidemic^{3,6-8}.

The number of meals, food consumption behavior, and physical activity of individuals are learned early in life. If the environment where the child lives in provides an adequate intake in terms of quantity and quality of food, and physical activity and movement, this may prevent future health complications. The objective of this study was to evaluate the prevalence and the nutritional and social determinants of excess weight in a population of schoolchildren in Southern Brazil.

METHODS

The school-based cross-sectional study was carried out in Maringá, a city of approximately 330,000 inhabitants in the state of Paraná, Southern Brazil. The Human Development Index of the city is high (HDI = 0.84, whereas the average in Brazil is 0.79). The fieldwork was performed between March and December 2006.

This study was approved by the Ethics Committee of the Universidade Estadual de Maringá (Protocol No. 016/2006), in accordance with the provisions of Resolution 196/96 of the National Health Council on research involving humans.

SAMPLE

The study target population consisted of children between 6 and 10 years, of both genders, enrolled in elementary school in 2006. The data obtained from the Department of Education of Paraná and from the Union of Private Schools of Maringá were used as a basis for the proportions of students included in the sample of public and private schools.

The schools were selected considering all city quadrants. Children from all selected schools were invited to participate in the research and took home the instruments of data collection (questionnaire on socioeconomic status and personal data) to be answered by those responsible for the children, as well as the informed consent to be signed by their parent or guardian. The necessary analyses and collection of material sent to the homes were made in the school environment, at a date previously defined by the school and in a specific location intended for this purpose.

The exclusion criteria considered children who did not return the signed informed consent or had incomplete clinical data.

DATA COLLECTION

Data collection was performed by a team of previously trained professionals⁹, members of the Study and Research Group on Obesity and Exercise from the Universidade Estadual de Maringá (GREPO/EMU), and occurred in the school environment, in closed rooms when possible, at previously scheduled times and during school hours.

VARIABLES

NUTRITIONAL STATUS

The outcome considered for this study was the nutritional status, which was classified from the body mass index (BMI) according to the cutoff points adjusted for gender and age proposed by Cole et al.^{10,11}. Based on this criterion, the diagnosis of underweight, normal weight, overweight, or obesity was made. Measurements of weight and height were made in triplicate, and the calculated mean value was used. The procedures used to estimate height and weight were those proposed by the WHO¹². The equipment used was: Tanita's electronic scale (Model 2202) with capacity of 136 kg and precision of 100 g, and SECA's stadiometer (Model Bodymeter 206).

With the exception of the prevalence in the studied sample, the data of underweight children were not used for the analysis of overweight determinants.

INDEPENDENT VARIABLES

The independent variables included in this study were: gender, age, school type (public or private), socioeconomic status and level of schooling of the family head (ABEP)¹³, eating habits, and means of commuting to school.

Regarding the level of schooling of the family head, two categories were considered: elementary school or more than elementary school. For the socioeconomic level, families were categorized as class A+B or C+D. There were no class E children.

DIETARY HABITS

Dietary habits (DH) were measured using a standardized questionnaire. The following DH were analyzed:

skipping meals (yes or no) and frequency of food consumption of 69 foods, which was answered by the children's parents or tutors, having as reference the last typical week. No specific amount was recorded from the collected data and, therefore, this information was not used to assess the frequency of weekly consumption of each food group. Foods were grouped into four categories: carbohydrates, proteins, fats, and fruit/vegetables. According to the frequency of consumption, scores were assigned (seven days/week = 6; six to four days/week = 5; three days/week = 4; two days/week = 3; one day/week = 2; seldom = 1, not consumed = 0). For the group of lipids, the following scores were attributed: seven days/week = 0; six to four days/week = 1; three days/week = 2; two days/week = 3; one day/week = 4; rarely = 5; not consumed = 6). Based on the scores achieved, the 70th percentile was calculated and two categories of classification were created for each food group: adequate dietary habits (percentile \geq 70) and inadequate dietary habits (percentile $<$ 70).

SCHOOL COMMUTING

This evaluation was included in the questionnaire by asking the children's parents and/or tutors the following question: How does your child goes from home to school (on foot or by bicycle, car or bus).

STATISTICAL ANALYSIS

The data were entered into an Excel® 2003 database twice, with automatic checks for consistency and amplitude. Statistical analysis was performed using the Statistica software, version 8.0.

To evaluate the association of each of the factors with the nutritional status of children, Fisher's exact test was used. Variable assessment was performed by adjusting a stepwise backward logistic regression model with $p < 0.10$ as the criterion for variable removal. In this model, the nutritional status (normal weight or overweight/obesity) was the response variable. The factors: gender; level of schooling of the head of the family; school type; socioeconomic status; consumption of carbohydrates, fruits, proteins, lipids; the habit of skipping meals or not; and means of commuting to home/school were included as explanatory variables. After adjustment, the OR values were estimated with 95% confidence intervals. The decision on the significance of the variables included in the model was made using Wald test. p -values < 0.05 were considered statistically significant.

RESULTS

A total of 5,037 children with complete data and signed informed consents were included. The total sample represented approximately 20.0% of children enrolled in 2005 in Maringá aged 6 to 10.9 years. The mean age was

8.7 ± 1.3 years, and 53.2% were female, 79.9% studied in public schools, 41.6% of the heads of the family had a level of education of elementary school, and 48.7% of the students belonged to families in socioeconomic class A + B.

PREVALENCE OF EXCESS WEIGHT AND ITS DETERMINANTS

Figure 1 shows the prevalence of excess weight in the studied sample. Excess weight was diagnosed in 24% of children, with 17% being overweight and 7% obese. The male gender and the fact that the child studied in private school were determinants of a higher chance of having excess weight. As shown in Table 1, in the univariate analysis, the level of schooling of the head of the family, inadequate carbohydrate intake, inadequate fruit intake, inadequate protein intake, and method of commuting to school (car/bus vs. walking/ bicycle) also resulted in a greater chance of having excess weight.

In the multivariate analysis, male children had a 17% greater chance of having excess weight in relation to female children. Regarding the school type, private school students had a 20% greater chance of having excess weight than the ones who attended public schools; the same occurred with children of parents with higher educational

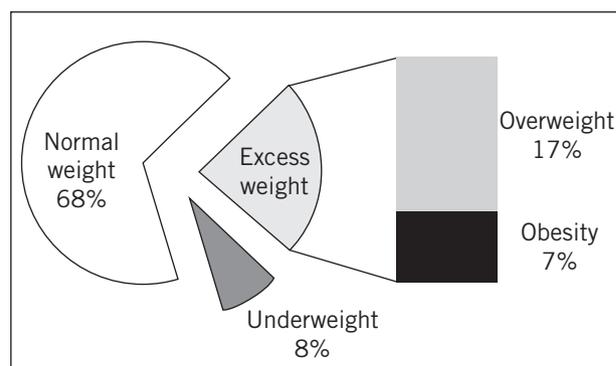


Figure 1 – Prevalence of overweight in 5,037 schoolchildren in Maringá, Paraná, 2006.

level. Regarding the qualitative aspects of nutrition, children with a history of excessive consumption of carbohydrates had a 48% greater chance of overweight and obesity. Also in relation to diet, inadequate consumption of fruits was an independent factor associated with an increased chance of having excess weight (Table 1).

DISCUSSION

The prevalence of schoolchildren with excess weight in this study is approximately equal to the average of national studies and of other Western countries, where the epidemic of obesity haunts the health of this generation.

In the present study, the presence of excess weight was significantly associated with inadequate intake of carbohydrates. If the environment where the child lives in provides

Table 1 – Univariate and multivariate logistic regression for the association between excess weight and the study variables in students from Maringá, Paraná, 2006

Variable	n	Normal weight	Overweight/ obesity	p-value ^a (univariate)	p-value ^b (multivariate)	OR (95%CI)
Gender						
Female	2448	1843 (75.3)	605 (24.7)			
Male	2185	1574 (72)	611 (28.0)	0.012	0.026	1.17 (1.02-1.35)
Type of school						
Private	967	662 (68.5)	305 (31.5)			
Public	3666	2755 (75.2)	911 (24.9)	< 0.001	0.037	1.20 (1.01-1.43)
Level of schooling of head of the family						
Elementary school	1821	1356 (74.5)	465 (25.5)			
> Elementary school	2548	1849 (72.6)	699 (27.4)	0.162	0.044	1.20 (1.01-1.43)
Carbohydrate group						
Adequate	1416	1124 (79.4)	292 (20.6)			
Inadequate	3217	2293 (71.3)	924 (28.7)	< 0.001	< 0.001	1.48 (1.25-1.76)
Fruit group						
Adequate	1439	1116 (77.6)	323 (22.5)			
Inadequate	3194	2301 (72)	893 (28)	< 0.001	0.035	1.19 (1.01-1.41)
Protein group						
Adequate	1477	1141 (77.3)	336 (22.8)			
Inadequate	3156	2276 (72.1)	880 (27.9)	< 0.001		
Lipid groups						
Adequate	1680	1213 (72.2)	467 (27.8)			
Inadequate	2953	2204 (74.6)	749 (25.4)	0.070		
Skip meals						
No	2887	2092 (72.5)	795 (27.5)			
Yes	1608	1223 (76.1)	985 (23.9)	0.009		
Going from /to school						
On foot/bicycle	1890	1444 (76.4)	466 (23.6)			
Car/bus	2559	1846 (72.1)	713 (27.9)	0.001		

^aFisher exact test, $p < 0.05$; ^blogistic regression model (stepwise), Wald test, $p < 0.05$; OR, odds ratio; CI, confidence interval.

an adequate intake in terms of quantity and quality of food, and physical activity and movement, this may prevent future health complications.

As observed in this study and by other authors¹⁴, demographic and socioeconomic factors, in addition to the type of school, are strongly associated with nutritional status.

Although obesity is more prevalent in the most economically disadvantaged population groups¹⁵, it unambiguously affects all ages, genders, and social classes. For 16.2% of the population of this study, a higher socioeconomic status influenced positive outcomes for excess weight ($p < 0.001$; OR = 1.37; 95% CI: 1.19-1.58). Giuliano et al.¹⁶ state that, in Brazil, there are more overweight or obese children in the higher classes, and who study mostly in private schools, as there is a direct association of the variables. In this study, the type of school showed a significant impact on weight gain, but not in the multivariate regression model ($p = 0.037$).

The prevalence of excess weight seems to begin around 5 years of age, especially in girls¹⁷. For Oliveira et al.¹⁸, the prevalence of overweight and obesity in schoolchildren showed no significant differences between genders, age ranges, and type of school in children with a mean age 7.1 ± 1.3 years. Other authors also did not describe an association between nutritional status and gender^{19,20}. In the Northeast, it was observed that among 1,927 students aged 6 to 9 years, 21.1% of them were overweight, and that in private schools the prevalence was 42.8% versus only 5.1% in public schools²¹. In Southern Brazil, 511 children aged 7 to 10 years, with high socioeconomic level, and prevalence rates of 19% overweight and 14% obesity, showed significant difference between genders only for obesity, from 9 years of age and older. According to the authors, the findings are higher than the average of the Brazilian population for this age group²².

It has been projected that, in 2020, chronic diseases associated with food consumption will be the cause of more than three quarters of deaths worldwide²³. In adolescents assessed in Rio de Janeiro, the prevalence of excess weight was 29.3% among boys and around 15.0% in girls. The foods that contributed most to the total energy consumption between those with and without excess weight were sugar, French-fries, and carbonated drinks²⁴. It is noteworthy that the sooner good eating habits are established, the lower the risk of problems related to obesity and its complications in later life.

The prevalence of excess weight found in this study is similar to that reported in national studies. Its association with gender and inadequate food consumption offers an important contribution to the prevention of these factors and to propose prevention initiatives in childhood.

A study carried out in 27 major cities in Brazil demonstrated that, in adolescents, the consumption of sweets on five days of the week or more was 58.3% among females and 42.6% among males²⁵. Other studies have shown that there is a tendency among obese individuals to underestimate their own consumption, as their consumption is usually shown to be similar or lower to that of normal-weight individuals, pointing out the difficulty in cross-sectional studies to demonstrate the association between food intake and obesity^{24,26}. The habit of skipping meals was shown to be common for approximately one third of the sample, showing that in addition to inappropriate behavior regarding diet composition, there are also problems in the fractioning and timing of meals.

The type of commuting to school in this study also shows the profile of the young Brazilian population, as demonstrated in the PeNSE 2009 study²⁵, which estimated that 618,555 young Brazilian students lead a sedentary lifestyle, and, in the national average, only 43.1% of the students are considered active. If physical activity in childhood is not combined with the maintenance of an active lifestyle during adulthood, studies have shown that the protection of health may be impaired^{27,28}.

However, there is evidence that in nine countries from Europe, Asia, Oceania, and North America, the prevalence of excess weight decreased significantly or was stationary in 467,294 children between ages 2 and 19 years²⁹. These findings redirect the discussion on the impact of this still-growing epidemic in Brazil, and the consequences of excess weight and physical inactivity in childhood.

Specific and well-founded actions must be carried out in order to ensure an adequate nutritional intake status of the juvenile population, as the increase of this morbidity in childhood results in strong economic impact and loss of quality of life. It is important that parents have access to information and understand their role in preventing childhood obesity, as a number of factors are required to establish successful and effective support.

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