

Overweight and obesity in seven to nine-year-old Brazilian students: data from the Brazilian Sports Project

Sobrepeso e obesidade em escolares brasileiros de sete a nove anos: dados do projeto Esporte Brasil

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ABSTRACT

Objectives: To describe the prevalence of overweight and obesity in Brazilian schoolchildren aged seven to nine years and determine its association with gender, age and geographic region.

Methods: This cross-sectional epidemiological study enrolled 2,913 students (1,478 boys and 1,435 girls) aged seven to nine years and was conducted between 2004 and 2005. The body mass index cutoff values proposed by the International Obesity Task Force were used as a diagnostic criterion for overweight and obesity. The chi-square test was used for comparison of proportions, and differences in prevalence rates were determined by testing for comparison between two proportions.

Results: The prevalence of overweight and obesity was 15.4 and 7.8% in boys and girls, respectively, with similar proportions in both genders and across all ages. In boys, overweight and obesity were only associated with geographic region ($p < 0.001$), with a higher prevalence found in children from the South region. In girls, the prevalence of overweight was highest among those aged seven years and those from the North region. In addition, an overall higher prevalence of obesity was observed among children from the South region.

Conclusions: Schoolchildren from the South region of Brazil have a higher prevalence of overweight and obesity than those from other areas of the country. We concluded

that overweight and obesity in childhood are on an upward trend, and our findings corroborate the results reported in other Brazilian studies.

Key-words: children; schoolchildren; obesity; epidemiology; overweight.

RESUMO

Objetivo: Descrever a prevalência de sobrepeso e obesidade em escolares brasileiros de sete a nove anos e verificar a associação com as variáveis: sexo, idade e região geográfica.

Métodos: Estudo epidemiológico transversal conduzido em 2.913 escolares (1.478 do sexo masculino e 1.435 do feminino) com idade entre sete e nove anos. Como critério de diagnóstico de sobrepeso e obesidade foram utilizados os pontos de corte do índice de massa corpórea, propostos pela *International Obesity Task Force*. A comparação entre as proporções foi realizada mediante o teste qui-quadrado. As diferenças entre as proporções foram testadas por meio do teste de comparação entre duas proporções.

Resultados: A prevalência de sobrepeso e obesidade foi de 15,4 e 7,8% em meninos e meninas, respectivamente, com proporções similares entre sexo e idades. No sexo masculino, foi verificada associação do sobrepeso e obesidade apenas com região geográfica ($p < 0,001$), com prevalências mais elevadas nas crianças da região Sul. No feminino, sobrepeso mais

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elevado foi observado nas crianças de sete anos da região Norte, enquanto a prevalência de obesidade foi maior nas crianças da região Sul.

Conclusões: As crianças da região Sul apresentam maiores prevalências de sobrepeso e obesidade que aquelas das demais regiões do país. Os achados do presente estudo apontam uma tendência de aumento na prevalência de sobrepeso e obesidade na infância e corroboram os resultados encontrados em pesquisas mais abrangentes realizadas no Brasil.

Palavras-chave: criança; estudantes; obesidade; prevalência; sobrepeso.

Introduction

Over the past few years, the prevalence of obesity has increased considerably in developed⁽¹⁾ and developing⁽²⁾ countries. In Brazil, a comparison of data from the National Family Expenditure Survey (*Estudo Nacional da Despesa Familiar*, ENDEF), held in 1974/75, and the Standards of Living Survey (*Pesquisa sobre Padrões de Vida*, PPV), conducted between 1996 and 1997 in the Southeast and Northeast regions of the country, showed a 4.1 and 13.9% increase in the prevalence of overweight among children and adolescents respectively⁽³⁾. Other surveys of children from various municipalities in Brazil have revealed prevalence rates of overweight and obesity ranging from 8.4 to 19.0%⁽⁴⁻⁹⁾ and 3.1 to 18% respectively⁽⁴⁻⁹⁾.

The period between the seventh and ninth years of life, which is only one of the age ranges of childhood, has been established as one of the critical periods for development of obesity⁽¹⁰⁾. The increased prevalence of overweight and obesity in this age range is therefore a cause for concern, as it is associated with increases in cardiovascular risk factors⁽¹¹⁾ greater risk of obesity in adulthood⁽¹²⁾.

The consequences of obesity in childhood are multiple, and the interaction among its various risk factors has led to a progressive increase in morbidity and mortality⁽¹³⁾, causing concern among government health agencies⁽¹⁴⁾. Studies on the prevalence of overweight and obesity suggest that these outcomes may be influenced by genetics⁽¹⁵⁾, environmental factors (family and friends)⁽¹⁶⁾, physical activity or lack thereof⁽¹⁷⁾, sedentary behavior⁽¹⁸⁾, and socio-demographic characteristics^(8,19,20).

Epidemiological studies enrolling children from all regions of the country at a single point in time are rare in Brazil, thus showing that the true prevalence of overweight

and obesity has yet to be elucidated. The present study sought to describe the prevalence of overweight and obesity in Brazilian schoolchildren aged seven to nine years and determine the association of overweight and obesity with gender, age, and geographic region.

Methods

Data for the present descriptive study were extracted from a cross-sectional epidemiological survey known as Esporte Brasil Project (PROESP-BR), a permanent observatory of growth, development and nutritional status indicators of Brazilian children and adolescents between the ages of seven and 17.

PROESP-BR is part of a set of projects conducted by the Centers for Sporting Excellence (*Centros de Excelência Esportiva*, CENESP), a network of centers affiliated with the Departamento de Excelência Esportiva e Promoção de Eventos of the Secretaria Nacional de Esporte de Rendimento do Ministério do Esporte. More detailed information on the development and methodological aspects of PROESP-BR have previously been published elsewhere⁽²¹⁾ The present study was approved by the Universidade Federal de Santa Catarina Research Ethics Committee.

The study population consisted of children between the ages of seven and nine enrolled in public and private schools in all five regions of Brazil (North, Northeast, Central West, Southeast, and South). Participants with body mass index values more than 4 standard deviations below or above the mean were excluded. This unusual value of ± 4 standard deviations was chosen to preserve sample heterogeneity to the greatest extent possible.

As of the 2004/2005 biennium, the PROESP-BR database contained information on schoolchildren from 23 Brazilian states and the Brazilian Federal District. Data were collected in three states in the Central West region (n308), eight states in the Northeast region (n128), five states in the North region (n138), four states in the Southeast region (N=547), and three states in the South region (n1792).

Anthropometric and demographic data were collected by the physical education teachers of each PROESP-BR participating school. All teachers were trained and had access to instructions on tests and measurements made available on a website (www.proesp.ufrgs.br), including an instructional video specifically prepared by faculty of the Universidade Federal do Rio Grande do Sul School of Physical Education

for standardization and improved visual presentation of measurement techniques⁽²¹⁾.

The variables used in this study were gender, age, geographic region, and body mass index (BMI, body mass/height²). Classification of nutritional status (into normal weight, overweight, or obesity) was based on the BMI cutoff values recommended by the International Obesity Task Force for subjects between the ages of two and 18. These cutoff points vary according to age and gender⁽²²⁾.

The sample was first described according to gender. The chi-square test was used for comparison of proportions. The prevalence rates of overweight and obesity in the study population according to gender, age, and region were then calculated. Differences in prevalence were ascertained by a comparison of two proportions test, with a 95% confidence

interval (95%CI). The significance level was set at 0.05 for all statistical analyses.

Results

The study sample comprised 2,913 schoolchildren between the ages of seven and nine (1,478 boys and 1,435 girls). The distribution of participants according to gender, age, and region is shown in Table 1.

The prevalence of overweight and obesity for each variable subgroup and for the total sample are shown in Table 2. Prevalence rates were similar in both genders and across all ages. Regarding geographic region, however, higher prevalence rates of overweight and obesity were found in the South of Brazil.

Gender-stratified prevalence rates of overweight and obesity are shown in Tables 3 and 4. In male subjects, prevalence rates were similar across all ages, and were highest in children from the South region. Among female participants, the prevalence rates of overweight and obesity were highest in the seven-year-old age group. Whereas the prevalence of overweight was highest in children from the North region, obesity was most prevalent in the South.

Discussion

This was the most recent nationwide Brazilian study to show the prevalence of overweight and obesity in seven-to-nine-year-old schoolchildren according to gender, age, and geographic region.

Table 1 - Percentage distribution of study variables. Esporte Brasil Project (PROESP - BR), Brazil, 2004–2005

	Male (n=1,478)	Female (n=1,435)
Age (years)		
7	19.1%	17.9%
8	27.6%	24.9%
9	53.3%	57.2%
Region		
North	4.8%	4.7%
Northeast	4.2%	4.6%
Central West	12.4%	8.6%
Southeast	16.8%	20.8%
South	61.7%	61.3%

Table 2 - Prevalence of overweight and obesity according to associated factors. Esporte Brasil Project (PROESP - BR), Brazil, 2004–2005.

Variable	Nutritional status						p-value
	Normal weight		Overweight		Obesity		
	P	95%CI	P	95%CI	P	95%CI	
Gender							0.680
Male	76.1	74.5-77.6	15.9	14.6-17.3	8.0	7.1-9.0	
Female	77.5	76.0-79.0	15.0	13.7-16.3	7.5	6.6-8.5	
Age (years)							0.201
7	75.3	73.7-76.8	15.2	13.9-16.6	9.5	8.5-10.6	
8	75.4	73.8-76.9	15.8	14.5-17.2	8.8	7.8-9.9	
9	77.9	76.4-79.4	15.4	14.1-16.8	6.7	5.8-7.7	
Region							<0.001
Northeast	78.1	76.6-79.6	14.8	13.6-16.1	7.0	6.1-8.0	
Central West	82.1	80.7-83.5	14.3	13.1-15.6	3.6	3.0-4.3	
North	81.9	80.5-83.3	13.0	11.8-14.3	5.1	4.4-5.0	
South	72.3	70.6-73.9	17.5	16.2-18.9	10.2	9.2-11.4	
Southeast	86.8	85.5-88.0	10.2	9.2-11.4	2.9	2.4-3.6	
Overall	76.8	75.2-78.3	15.4	14.1-16.8	7.8	6.9-8.8	

P: prevalence; 95%CI: 95% confidence interval.

Table 3 - Prevalence of overweight and obesity by associated factor in boys. Esporte Brasil Project (PROESP - BR), Brazil, 2004–2005.

Variable	Nutritional status						p-value
	Normal weight		Overweight		Obesity		
	P	95%CI	P	95%CI	P	95%CI	
Age (years)							0.587
7	78.7	76.5-80.7	13.5	11.9-15.3	7.8	6.5-9.3	
8	76.5	74.3-78.6	15.0	13.3-16.9	8.6	7.3-10.1	
9	75.0	72.7-77.1	17.3	15.5-19.3	7.7	6.4-9.2	
Region							<0.001
Northeast	75.8	73.6-77.9	14.5	12.8-16.4	9.7	8.3-11.3	
Central West	79.9	77.9-81.9	16.8	15.0-18.8	3.3	2.5-4.3	
North	85.9	84.0-87.6	8.5	7.2-10.0	5.6	4.5-6.9	
South	72.5	70.2-74.1	17.3	15.5-19.3	10.2	8.8-11.8	
Southeast	83.9	81.9-85.7	12.4	10.8-14.2	3.6	2.8-4.7	
Overall	76.1	73.9-78.2	15.9	14.2-17.9	8.0	6.7-9.5	

P: prevalence; 95%CI: 95% confidence interval.

Table 4 - Revalence of overweight and obesity by associated factor in girls. Esporte Brasil Project (PROESP - BR), Brazil, 2004–2005

Variable	Nutritional status						p-value
	Normal weight		Overweight		Obesity		
	P	95%CI	P	95%CI	P	95%CI	
Age (years)							0.005
7	71.6	69.2-73.9	17.1	15.2-19.1	11.3	9.8-13.0	
8	74.2	71.9-76.4	16.8	15.0-18.8	9.0	7.6-10.6	
9	80.8	78.7-82.8	13.5	11.8-15.4	5.7	4.6-7.0	
Region							<0.001
Northeast	80.3	78.2-82.3	15.2	13.4-17.2	4.5	3.5-5.7	
Midwest	85.5	83.6-87.2	10.5	9.0-12.2	4.0	3.1-5.1	
North	77.6	75.4-79.7	17.9	16.0-20.0	4.5	3.5-5.7	
South	72.2	69.8-74.5	17.6	15.7-19.7	10.2	8.7-11.9	
Southeast	89.3	87.6-90.8	8.4	7.1-9.9	2.3	1.6-3.2	
Overall	77.5	75.3-79.6	15.0	13.2-16.9	7.5	6.2-9.0	

P: prevalence; 95%CI: 95% confidence interval.

The prevalence rates of overweight and obesity in the male and female subjects of our sample were 15.4 and 7.8% respectively, combining for an overall prevalence of excess weight (overweight±obesity) of 23.2%. Higher prevalence rates were reported by Costa *et al*⁽⁸⁾ and Ronque *et al*⁽⁷⁾, whereas lower rates were reported by Oliveira *et al*⁽⁴⁾ and Guimarães *et al*⁽⁹⁾. International studies have found higher rates in Italy⁽²³⁾ and South Africa⁽²⁴⁾. Even though the prevalence rates of overweight and obesity found in the present study were lower than those found in developed (and some developing) nations, they are still a cause for concern, mostly due to the strong association between excess weight and development of risk factors for cardiovascular and metabolic disease.

Prevalence rates of overweight and obesity were similar in both genders. These findings were consistent with those reported by Giugliano and Carneiro⁽⁵⁾, but differ from those

found by Soar *et al*⁽⁶⁾ and Ronque *et al*⁽⁷⁾. In our review of the literature, we found no clear consensus on gender differences in the prevalence of overweight and obesity; some Brazilian and international studies have reported higher prevalence rates among males^(6,7,24,25), while others have found a higher prevalence in females^(5,26).

Our results showed similar prevalence rates of overweight and obesity across all age ranges. In female subjects, excess weight rates declined with advancing age. A study conducted in Mexico⁽¹⁸⁾ detected a trend towards increasing overweight with advancing age (four-18 years). Conversely, Silva *et al*⁽²⁷⁾ found a progressive reduction in underweight and obesity with increasing age (seven-19 years).

An association between overweight and obesity and geographic region was found in both genders. Among male subjects, higher prevalence rates of overweight and obesity

were found in the South region, whereas among female participants, overweight rates were highest in the North region, and obesity, most prevalent in the South. Likewise, in a prior study of Brazilian adolescents, Pelegrini *et al*⁽²⁸⁾ reported higher prevalence rates of overweight and obesity in Southern Brazil. Other studies conducted in cities in the South region have also reported a higher prevalence of excess weight^(7,20,29,30) than have citywide studies conducted in other regions^(5,31). The higher prevalence rates of overweight and obesity found in the South region may be explained by easy access to fast food establishments, passive transportation (automobile use), and sedentary behavior (computer use and video gaming), all of which are directly associated with increase in excess body weight⁽³²⁾.

One possible explanation for the higher prevalence of overweight found in the North region is the nutritional transition detected in Brazil in recent years, in which malnutrition rates are decreasing and giving way to increasing overweight and obesity⁽³³⁾. This decline in the prevalence of malnutrition is clearly shown in nationwide and micro-regional studies, which revealed substantial reductions in malnutrition from the late 1970s through the late 1990s, particularly in the North and Northeast regions⁽³⁴⁾.

Our findings are of the utmost relevance for the early detection of overweight and obesity prevalence rates, particularly in schoolchildren, as this detection can support Public Health actions to improve population-wide quality of life. Although the present study did not focus on this aspect, healthy habits (in this context, physical activity and proper diet) acquired in childhood and adolescence tend to persist into adulthood, thus providing a measure of protection

against environmental factors and reducing relative risk of chronic non-communicable diseases.

The present study had two main limitations. Firstly, we did not control for certain variables that may have influenced BMI distribution, such as sexual maturity, physical activity, and nutritional habits. However, it bears noting that, as all children enrolled in the study were under ten years of age, maturity may not have influenced results to a significant extent. Secondly, the overarching goal of the Esporte Brasil Project is to scout future sports talent in all Brazilian regions. This jeopardized some stages of the sample selection process, which may have entailed a selection bias. One major advantage was the inclusion of children from all Brazilian regions, which allowed the study to reflect the current nationwide prevalence of overweight and obesity.

According to the data obtained in the present study, we may conclude that the prevalence of overweight and obesity among Brazilian children is a cause for concern. Furthermore, schoolchildren from the South region of Brazil are more likely to have overweight and obesity than those from other regions. Gender stratification showed that, among boys, prevalence rates of overweight and obesity were highest in the South region; in girls, rates of overweight were highest in the North region, while the prevalence of obesity was highest in the South as well.

Nationwide surveys of overweight and obesity are required, most importantly to allow early detection of these outcomes, which may then be addressed by control and prevention measures. These measures-public policies geared to fostering adoption of an active lifestyle and dietary education-may begin in school and then be encouraged to move into the family environment.

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