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Prevalence and factors associated with overweight among Brazilian children younger than 2 years

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Abstract

Objective: To describe the prevalence of overweight, analyze its progression from 1989 to 2006 and identify factors associated with it among children younger than two years in Brazil.

Methods: Data for the Women and Children National Demography and Health Survey (PNDS 2006) were collected using questionnaires and anthropometric measurements. The study sample included 1,735 children aged 0 to 24 months (910 boys; 825 girls). Nutritional status was defined according to the weight-for-height index (W/H; WHO, 2006), and children were classified as overweight if their W/H z score was greater than +2.

Results: Prevalence of overweight in Brazil was 6.54%. The highest prevalence of overweight was found in the southern (10.0%) and midwestern (11.1%) regions, among families with a per capita income higher than one minimum wage (11.8%), in social classes with a greater purchasing power (9.7%), among children whose birth weight was greater than 3 kg (8.04%) and whose exclusive breastfeeding lasted less than five months (7.4%). According to a fitted multiple logistic regression model, factors associated with overweight were: birth weight ≥ 3 kg [odds ratio (OR) = 5.2, 95% confidence interval (95%CI) 2.56-10.56], per capita income ≥ 1 minimum wage (OR = 2.50, 95%CI 1.20-5.21), residence in midwestern region (OR = 2.40, 95%CI 1.01-5.72).

Conclusions: The comparison of the prevalence found in the 2006 survey with the 1989 and 1996 values revealed that overweight among children younger than two years tends to decrease. The risk factors identified suggest that further actions should be conducted to prevent obesity among infants living in the midwestern region of Brazil, whose birth weight was greater than 3 kg and whose families had a per capita income higher than one minimum wage.

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Introduction

Epidemiological data show that unfavorable nutritional, social and environmental factors at critical moments in human development may affect both metabolism and susceptibility to chronic diseases in adult life.[1] Children with a high body mass index have greater chances of developing hyperlipidemia and insulin resistance,[2] as well as obesity and cardiovascular diseases in adult life.[3] Overweight in infancy may also have immediate consequences, such as hypertension[4] and type 2 diabetes.[5]

Anthropometric characteristics of pediatric populations are some of the best indices of childhood health because of their close association with environmental factors.[6] Among children younger than 5 years, and particularly among infants, the effect of environmental factors is

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more important than genetic factors for the expression of their growth potential.[7] Health and nutrition are affected by maternal education, socioeconomic status, access to healthcare, breastfeeding and morbidity.[8] Feeding, diseases, general care, hygiene, living arrangements and basic sanitation reflect the living conditions of a child in the past and in the present.[9]

National health surveys conducted in Brazil in the last decades[10-12] demonstrated that there has been an increase in overweight among children younger than 5 years. Prevalence of anthropometric variations in two Brazilian surveys pointed to an increase in obesity in the less developed regions.[13] The Women and Children National Demography and Health Survey (PNDS 2006), published in 2008[14] showed that overweight prevalence among children younger than 5 years in Brazil is 7.3%. When compared with PNDS 1996,[12] statistically significant reductions were found in the prevalence of deficit of height for age (from 13.4 to 6.7%) and of weight for age (from 4.2 to 1.8%), which suggests that there was a substantial reduction in the risk of childhood malnutrition in Brazil, although there was no evidence of variation in the risk of obesity along time.[15]

Surveys conducted in Brazil usually report on prevalence estimates for children younger than 5 years.[10-12] Little is known about overweight estimates and associated risks for Brazilian children younger than 2 years. Data about children younger than 5 years are routinely generated in anthropometric surveys, which, however, do not provide data to support specific programs and policies for infants because the factors associated with nutritional disorders in this subgroup may be more strongly determined by the social and biological vulnerability of the first 2 years of life. At the same time, Child Health Care initiatives for this age group have been more frequent and have proven to be more effective.[16]

The analysis of methods used in population surveys revealed that the use of data about childhood health and nutrition recalled by mothers provide more accurate information when subgroups with younger individuals are included. In these groups, the time to be recalled is shorter and, consequently, the quality of information is higher.[17]

Few population studies analyzed the nutritional status of Brazilian children younger than 2 years, although this type of study is fundamental for healthcare and public policy planning. Therefore, this study describes overweight prevalence, analyzes its progression from 1989 to 2006 and identifies associated factors among Brazilian children younger than 2 years.

Methods

Data were collected from PNDS 2006, coordinated by the Brazilian Center for Analysis and Planning and the

Brazilian Health Ministry and funded by UNESCO. The PNDS was a national survey that included 15,575 women aged 15 to 49 years and about 5,000 children younger than 5 years. Data were collected in the five Brazilian geographic regions and in urban and rural areas, and the purpose was to describe the profile of the population of women of reproductive age and of children younger than 5 years in Brazil. Two face-to-face questionnaires were applied to women, vaccination cards were checked, and anthropometric measurements of women and children were made. The study population lived in private homes in common and non-special areas (including *favelas*), and participants were selected from 10 sampling states, which made up a combination of all five Brazilian geographic regions and urban and rural areas. Original survey databases have already been published and are available at http://bvsms.saude.gov.br/bvs/pnds.[18] After obtaining the available database, a subsample of 1,735 children (910 boys and 825 girls) aged 0 to 24 months was selected. Children older than 24 months, those no longer alive at the time of the interview and those that did not live with their mother were excluded.

Weight and height of the children were measured according to the World Health Organization (WHO) recommendations.[19] Details of the anthropometric measurement techniques have been described in the official PNDS 2006 report.[14]

Overweight was defined as weight-to-height (W/H) z score greater than +2. Values found in the sample of ± six standard deviations were classified as outliers and excluded from the study.[19] The WHO 2006 curve was used as the reference distribution.[20]

Prevalence was described for the country as a whole and according to sex (male and female), residence area (urban or rural), Brazilian geographic region (northern, northeastern, southern, southeastern and midwestern), maternal education (< 7 years and ≥ 7 years), maternal age (< 21 years and ≥ 21 years), per capita income in number of minimum wages (< 1 MW and ≥ 1 MW), exclusive breastfeeding (< 5 months and ≥ 5 months), birth weight (< 3 kg and ≥ 3 kg), food and nutritional security (food security/insecurity, mild/moderate food insecurity and severe food insecurity)[21] and classes according to family buying power in increasing order (A1-C1 and C2-E).[22] Estimates were calculated considering the sample expansion factor, as defined by the PNDS-2006 team.

Overweight was the dependent variable in statistical analyses. The reference categories of the variables used in univariate and multiple analyses were those of lower prevalence in the sample under study. The southeastern region was chosen as the reference criterion for region because it has the highest per capita income in the country. A chi-square test was used to evaluate the association between variables.

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The multiple logistic regression model was adjusted to identify potential confounding factors, which might change effects, and to estimate odds ratio for overweight and for the variables of interest, controlling for the effects of the other variables included in the final model. Variables for which was p < 0.20 in bivariate analysis were included in the model, and variables for which was p < 0.05 remained in the final model. The STATA 10.0 software was used for all statistical analyses considering the modeling of complex samples, which provided national representativeness to the five Brazilian regions (northern, northeastern, midwestern, southern and southeastern).

This study was approved by the Medical Ethics Committee of Universidade Federal de São Paulo (number 1524/10).

Results

Overweight prevalence in Brazil as a whole was 6.5%. Table 1 shows prevalence and odds ratio for overweight. The highest prevalence was found in the southern (10.0%) and midwestern (11.1%) regions, in families with a per capita income greater than one minimum wage (11.8%), in the social classes with a greater purchasing power (9.7%), in the group of children whose birth weight was greater than 3 kg (8.04%) and who were breastfed for less than 5 months (7.4%).

Table 2 shows adjusted odds ratio for factors associated with overweight: birth weight ≥ 3 kg [odds ratio (OR) = 5.2; 95% confidence interval (95%CI) 2.56-10.56], per capita income ≥ 1 minimum wage (OR = 2.50; 95%CI 1.20-5.21) and midwestern region (OR = 2.40; 95%CI 1.01-5.72).

Figure 1 shows the estimated prevalence for Brazilian children according to age and the Brazilian surveys of 1989, 1996 and 2006. For children younger than 2 years, prevalence decreases from 9.0% in 1989 to 6.5% in 2006.

Discussion

Overweight prevalence among Brazilian children younger than 2 years was 6.5%. There was a 2.5% decrease along the 17 years covered by the 1989[10], 1996[11] and 2006[12] surveys, and, in contrast, an increase of 4.7% among children aged 2 to 5 years. These trends suggest the existence of social and biological vulnerability because, although overweight shows a decreasing trend among children younger than 2 years, rates are still much higher than the expected 2.5% that defines optimal food, health and nutrition for all infant populations.[19]

The analysis of overweight prevalence among infants in the different geographical regions revealed a variable trend. The southeastern region was the only region where a decrease was found, as prevalence was 13.3[11], 8.8[12] and 4.5% at the three time points, which shows a decrease of 2/3 since 1989[10], that is, a decrease of 0.5% per year. The

other regions had less clearly defined patterns. Geographic changes express the differences in the etiology of overweight and may reflect economic, social and cultural characteristics of each region.[23] The decrease of childhood overweight may be explained by the promotion of breastfeeding, higher maternal education[24] and access to information and education about health, nutrition and infant diet. The increase in overweight, in contrast, is primarily explained by early weaning,[25] higher income and greater availability of industrialized foods,[26] as well as the advertising of foods with a high caloric density and low nutritional value.[27]

At the same time, families whose per capita income was higher than one minimum wage had 2.5 times greater chances of having overweight children. Overweight in developed countries is greater among children in low socioeconomic classes,[28] but in developing countries, the occurrence of overweight tends to be greater among children in high socioeconomic classes.[24,29] This study also found a greater prevalence of overweight among children in social classes with greater purchasing power and whose families were not exposed to severe food insecurity, which is in agreement with the association with the per capita income.

The chances of overweight were five times greater among children whose birth weight was greater than 3 kg (p = 0.000). Systematic reviews about the association between birth weight and childhood overweight found that both children whose birth weight was low and those with a high birth weight had greater probabilities of becoming obese in childhood, but this chance was greater for those born with a higher weight.[30,31] Our study also found that exclusive breastfeeding for less than 5 months, although not included in the final logistic regression model, had a odds ratio for overweight that was almost twice as high as
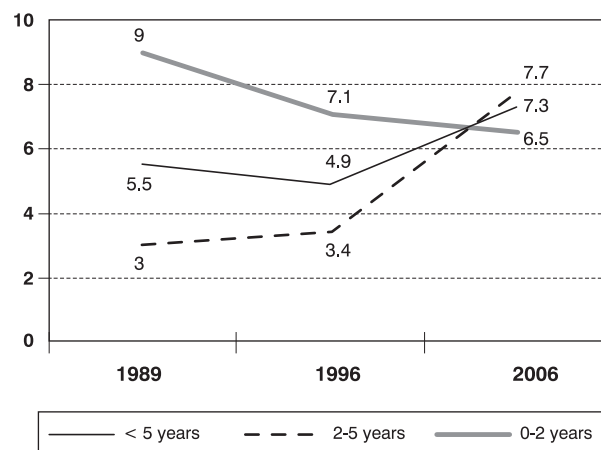

Figure 1 - Prevalence of overweight among Brazilian children according to age and Brazilian surveys in 1989, 1996 and 2006

that of children who had received exclusive breastfeeding for more than 5 months. The hypothesis that breastfeeding has a protective effect against obesity is not recent,[25] and our results confirm the importance of prenatal care and healthcare and nutrition follow-up during the first years of life.

Table 1 - Overweight prevalence among children younger than 2 years according to associated variables (crude odds ratio and 95% confidence interval). National Demography and Health Survey (PNDS 2006), Brazil

Variables	n	Overweight (prevalence)	Odds ratio (95%CI)	p
Sex				
Female	825	68 (6.07%)	1	0.554
Male	910	90 (6.97%)	1.16 (0.71-1.89)	
Residence				
Urban area	1169	102 (6.26%)	1	0.434
Rural area	566	56 (7.91%)	1.28 (0.68-2.42)	
Region				
Southeastern	323	29 (4.47%)	1	0.012
Midwestern	352	44 (11.13%)	1.91 (1.15-3.17)	
Southern	301	28 (10.01%)	1.71 (0.95-3.09)	0.074
Northeastern	350	29 (6.61%)	1.01 (0.53-1.92)	0.964
Northern	409	28 (7.37%)	1.15 (0.64-1.46)	0.624
Maternal age				
< 21 years	373	25 (5.89%)	1	0.680
≥ 21 years	1362	133 (6.77%)	1.16 (0.57-2.34)	
Maternal education				
< 7 years	652	66 (7.65%)	1.29 (0.73-2.28)	0.379
≥ 7 years	1077	92 (6.03%)	1	
Per capita income in minimum wages				
< 1	1201	100 (5.41%)	1	0.015
≥ 1	209	29 (11.83%)	2.34 (1.18-4.66)	
Social classes				
A1-C1	326	39 (9.68%)	1.78 (0.95-3.34)	0.070
C2+D+E	1393	21 (5.66%)	1	
Food and nutrition security				
Security mild moderate*	1592	150 (6.74%)	2.60 (1.03-6.57)	0.043
Severe insecurity	143	8 (2.7%)	1	
Birth weight				
< 3.0 kg	455	24 (2.41%)	1	0.000
≥ 3.0 kg	1250	131 (8.04%)	3.54 (1.81-6.92)	
Exclusive breastfeeding				
< 5 months	816	73 (7.37%)	1.69 (0.95-3.03)	0.074
≥ 5 months	641	48 (4.48%)	1	

95%CI = 95% confidence interval.
* Food security, mild insecurity and moderate insecurity.

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Table 2 - Factors associated with overweight in Brazilian children younger than 2 years. National Demography and Health Survey (PNDS 2006), Brazil

Variables	Odds ratio (95%CI)	p
Birth weight		
≥ 3.0 kg	5.20 (2.56-10.56)	0.000
Per capita income in minimum wages		
< 1 minimum wage	2.50 (1.20-5.21)	0.015
Region		
Midwestern	2.40 (1.01-5.72)	0.048

95%CI = 95% confidence interval.

The prevalence among Brazilian children younger than 2 years confirmed that overweight tended to decrease along the 17 years covered by the three surveys. These findings seem to suggest Child Health Care initiatives for infants have resulted in a decrease of obesity in this population. Therefore, actions to decrease obesity among infants should be preserved and promoted, and priorities should include exclusive breastfeeding, timely introduction of complementary foods, nutritional surveillance, and qualification of family members, caregivers and all those that participate in child care and in the promotion and adoption of adequate practices of infant healthcare and nutrition.

The risk factors identified in this study suggest that Child Health Care initiatives should be promoted for high-risk groups, and studies using similar methods should be conducted to identify risks associated with overweight among children aged 2 to 5 years.

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