

Variables associated with overweight in children from a shantytown in the Northeast of Brazil

Fatores associados ao excesso de peso em crianças de uma favela do Nordeste brasileiro

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ABSTRACT

Objective: To determine the frequency and the main factors associated with overweight and obesity in children living in a slum area in the northeast of Brazil.

Methods: This cross-sectional study was conducted with a sample of 86 children (40 eutrophic and 46 overweight/obese) aged 5 to 9 years selected among 508 children in this age group evaluated and registered in the Family Health Unit (Unidade Saúde da Família, USF). Overweight/obesity were defined according to the cutoff points established by Cole *et al* were used. Biological and socioeconomic variables, dietary habits, time spent on television, and sedentary habits were analyzed. Association tests were conducted to analyze the data. Significance was set at $p < 0.05$.

Results: The prevalence of overweight/obesity among the 508 children was 13%. Excessive calorie intake, consumption of artificially sweetened drinks, and sedentary habits were significantly associated with overweight and obesity.

Conclusions: The prevalence of overweight/obesity was high in the group assessed and it was associated with excessive calorie intake, consumption of artificially sweetened drinks and sedentary lifestyle. These factors should be taken into consideration in the planning and development of interventions and prevention strategies.

Key-words: Child, overweight, obesity, eating habits, physical activity.

RESUMO

Objetivo: Determinar a frequência e os principais fatores associados a sobrepeso e obesidade em crianças moradoras de uma favela do Nordeste do Brasil.

Métodos: Estudo transversal com amostra de 86 crianças (40 eutróficas e 46 sobrepeso/obesas), com idade entre cinco e nove anos, selecionadas em um universo de 508 crianças nesta faixa etária, avaliadas e cadastradas na Unidade de Saúde da Família (USF). Para definição de sobrepeso/obesidade, foram utilizados os pontos de corte estabelecidos por Cole *et al*. Pesquisaram-se variáveis biológicas, socioeconômicas, hábitos alimentares, tempo em frente à televisão e sedentarismo. Para a análise dos dados foram empregados os testes de associação, sendo significativa $p < 0,05$.

Resultados: A frequência de sobrepeso/obesidade entre as 508 crianças foi 13%. Ingestão calórica excessiva, consumo de refresco artificial açucarado e sedentarismo foram os fatores associados ao sobrepeso e à obesidade.

Conclusões: A frequência de sobrepeso/obesidade foi relevante no grupo estudado e os fatores que estiveram associados ao sobrepeso/obesidade foram ingestão calórica excessiva, consumo de refresco artificial açucarado e sedentarismo, que constituem pontos a serem trabalhados na população como forma de intervenção e prevenção de agravamentos no futuro.

Palavras-chave: criança; sobrepeso; obesidade; hábitos alimentares; atividade física.

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Introduction

The increase in the prevalence of obesity in developing countries has been studied in Latin America, as well as in countries like India and China⁽¹⁾. Between 1989 and 1996⁽²⁾, there was an increase from 2.5 to 4.5% in the prevalence of obesity among children younger than 5 years old from low-income families in the northeast of Brazil. In 2003, Leão *et al* evaluated students enrolled in public and private schools of Salvador, state of Bahia, and found a prevalence of 30% of obesity in students from private schools and 8.2% in students from public schools⁽³⁾. Some studies have found discordant results regarding the frequency of overweight in Recife, state of Pernambuco. In 2005, overweight and obesity prevalence rates of 26.2 and 8.5% have been detected in school children and adolescents, respectively. Balaban *et al* found an overweight prevalence rate of 7.1% and an obesity prevalence rate of 3% in students from a low-income community^(4,5).

Several factors are associated with the etiology of obesity, including biological, psychological, behavioral, social and economic factors⁽⁶⁾. Obesity can occur at any age, being triggered by factors such as early weaning, inappropriate food introduction, eating disorders and family relationship problems, mainly during growth spurt periods⁽⁷⁾. Environmental conditions have played an important role in obesity increase (sedentary lifestyle, which means spending long periods of time watching television, using the computer, playing video games, lack of appropriate places for entertainment activities, in addition to higher availability of food rich in carbohydrates and fat), as well as stimulation of food consumption promoted by the media⁽⁶⁾.

A few decades ago, overweight and obesity were rare conditions in children with low socioeconomic status. Currently, the increasing prevalence of overweight in this population supports the theory that malnutrition in the beginning of life can lead to obesity in the future, as a sequela of protein-energy malnutrition. Protein-energy malnutrition would lead to a decrease in the needs of energy, affecting the baseline metabolic rate and promoting the accumulation of body fat, which would thus enable a positive energy balance even with a normal energy intake⁽⁸⁾. Some studies have highlighted the relationship between poverty and obesity and other chronic diseases in adulthood, concluding that nutritional disorders during fetal life or in childhood can determine structural and functional metabolic alterations in the body, favoring the accumulation of excessive abdominal fat in adulthood⁽⁸⁻¹⁰⁾.

The consequences of this disease are detectable in the short and long terms, e.g. cardiovascular diseases, type 2 diabetes, and orthopedic disorders, among others. Such problems are costly for the health system due to the increase in the chances of getting sick and the need for hospitalization. In addition, the whole country, and especially the working sector, experiences productivity losses due to morbidity in the economically active population.

In such a context, the objective of the present study was to investigate the frequency and the main factors associated with overweight and obesity in children between five and nine years old living in a slum area called Favela do Frago, Olinda, state of Pernambuco, Brazil.

Methods

Among the 508 children registered in the Family Health Unit (Unidade Saúde da Família, USF), aged five to nine years, 11 months and 29 days, we selected 68 overweight/obese children. Subjects were divided into two groups: overweight/obese children (OO) and eutrophic children (EU). Children with genetic syndromes associated with obesity and/or who were using medication that could affect their weight and/or height were not included in this study.

For each overweight child, we selected one eutrophic child as control, matched by age and sex. These children lived within the shortest distance possible to enable the administration of dietary and socioeconomic questionnaires, as well as surveys on physical and leisure activities.

Only 46 OO children participated in the second phase of the study, and only 40 EU children agreed to take part in the study until the research was completed. The major obstacle faced by the principal investigator during data collection was the absence of children's guardians (both at the USF and at their homes) who could provide permission for the children's participation in the study.

The sample (eutrophic and overweight/obese children) was selected after anthropometric assessment of all children from 5 to 9 years old registered in the USF upon authorization from their guardians. The research protocol was approved by the Research Ethics Committee of Instituto Materno-Infantil de Pernambuco (IMIP), according to the guidelines of the National Health Council Resolution n° 196/1996.

Data were collected by a nutritionist experienced in administering dietary questionnaires and measuring anthropometric variables and two appropriately trained research assistants. The variables investigated were: maternal

educational level, number of siblings, practice of physical and leisure activities, time spent watching television and eating habits. Short stature and low birth weight were also investigated.

The definition of overweight/obesity was based on the international cutoff points of body mass index (BMI) for overweight and obesity proposed by Cole *et al*, which were established according to mean values of data from several national surveys (Brazil, Great Britain, Hong Kong, Netherlands, Singapore and the USA) and are recommended by the World Health Organization⁽¹¹⁾.

With the purpose of investigating eating habits, we used a survey on usual daily food intake, which assesses the patient's eating pattern, and a 24-hour recall (24hR), which enables the quantification and identification of food consumed before the interview. Leftovers and food preparation methods were investigated to obtain reliable data on the amount of food consumed.

Also with regard to the children's food intake, in addition to the daily calorie consumption, we investigated the frequency of intake of fried food (for breakfast, lunch and dinner), sandwich cookies consumed alone (without beverages), sandwich cookies consumed with artificially sweetened beverages (artificial juice and/or soft drinks), soft drinks consumed alone, artificial juice consumed alone, high intake of bread (more than 150g/day), and low intake of fruits and vegetables.

Level of physical and leisure activities and time spent watching television were assessed using a physical activity questionnaire (PAQ-C), translated and adapted by Silva and Malina with the purpose of excluding physical and sports activities that are not practiced in Brazil. This questionnaire intends to investigate children and adolescents' level of physical activity during the seven days prior to answering the questionnaire⁽¹²⁾.

Biological, anthropometric, sociodemographic and lifestyle data were entered into the software Epi-Info 6 using double data input. Dietary intake data were entered into specific tables. The quantitative analysis of daily calorie intake was performed using Virtual-Nutri I[®], a software for calculating the nutritional composition of food. The total caloric value was compared to the recommendations for energy intake established by the Recommended Dietary Allowances (RDA) considering the age groups included in our sample.

The statistical analysis was based on the use of Pearson's chi-square test to analyze the association between the va-

riables and the outcome. The level of significance was set at 0.05, and the analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 8.0.0 (SPSS Incorporation, 1977).

Results

A frequency of 13% of overweight/obese subjects was found. There was no statistically significant association between sex and overweight/obesity ($p=0.92$). The age group with the highest frequency of overweight/obesity was between six and nine years old, accounting for 48% of the cases. With regard to the maternal level of education, 61% of the mothers had between one and eight years of schooling.

Table 1 shows the individuals' ages, level of physical activity and time spent watching television according to their nutritional status. We detected that 74% of the children were insufficiently physically active in the case group compared with the control group ($p<0.05$). Seventy-two percent of the cases watched television for 3 hours a day or longer compared with 70% of the controls; however, the difference was not statistically significant ($p=0.86$) (Table 1).

In terms of eating habits (Table 2), an inappropriate amount of calorie intake was observed. The OO group had an excessive consumption of calories according to the recommendations of the RDA for age. Energy intake data ranged

Table 1 – Age, level of physical and leisure activities and time spent watching television according to nutritional status in children from Favela do Fragoso, Olinda, state of Pernambuco, 2007

Variables	Overweight		Eutrophic children		p-value*
	n	%	n	%	
Age (years old)					0.99
5	6	13	4	10	
6	11	23.9	9	22.5	
7	10	21.7	9	22.5	
8	8	17.3	7	17	
9	11	23.9	11	27	
Level of physical activity					0.04
Low physical activity	34	73.9	21	52.5	
High physical activity	12	26.1	19	47.5	
Time spent watching television (h/day)					0.86
0 to 2	13	28.4	12	30	
3 or more	33	71.6	28	70	

Table 2 - Calorie intake and nutritional status of children living in Favela do Fragoso, Olinda, state of Pernambuco

Nutritional status	Calories/day						
	Mean	SD	Minimum	P50	Maximum	RDA	ADE (%)
Overweight	2.250	384	1.696	2.158	2.997	1.900	115.7
Eutrophic children	1.776	259	1.110	1.818	2.313	1.900	91.1

RDA: Recommended Dietary Allowances (mean for age group from five to nine years); ADE: adequacy percentage.; SD: standard deviation

Table 3 – Eating pattern and nutritional status of children living in Favela do Fragoso, Olinda, state of Pernambuco

Eating habit	Nutritional status							
	Overweight (n=46)		Eutrophic children (n=40)		OR	95%CI	p-value*	
	n	%	n	%				
Fried food for breakfast	14	30	25	10	1.3	0.5 to 3.8	0.57	
Sandwich cookies alone	28	61	20	50	1.6	0.6 to 4.0	0.31	
Artificial beverage + sandwich cookies	12	28	5	12	2.7	0.8 to 10.1	0.08	
Soft drink alone	22	49	17	42	1.3	0.5 to 3.3	0.55	
Artificial juice alone	27	59	8	20	5.7	2.0 to 17.0	<0.001	
Fried food for lunch	28	62	14	35	3.1	1.1 to 8.2	0.01	
High intake of bread	9	20	5	12	1.8	0.5 to 7.5	0.33	
Absence of fruits	37	80	27	67	2.0	0.7 to 5.9	0.17	
Absence of vegetables	36	78	35	87	0.5	0.1 to 0.9	0.26	
Fried food for dinner	21	46	19	47	0.9	0.4 to 2.4	0.86	

* Pearson's chi-square test; OR: odds ratio; 95%CI: 95% confidence interval.

from 1,696 to 2,997 kcal/day, the highest amount, exceeding in 158% the adequate calorie intake. Calorie intake was significantly higher in the overweight group ($2,250 \pm 384$ kcal/day) than in the eutrophic group ($1,776 \pm 259$ kcal/day).

The children's eating pattern according to their nutritional status is shown in Table 3, including the most frequent habits detected by means of the usual daily food intake survey and the 24hR. The consumption of artificially sweetened juice alone (OR: 5.7; $p < 0.01$) and the intake of fried food for lunch (OR: 3.1; $p = 0.012$) were found to be associated with overweight/obesity.

Discussion

In the present study, a frequency of 13% of overweight/obese subjects was found. Our finding is higher than that reported by Silva, who found 10% of overweight/obesity in students of low socioeconomic status from Recife, state of Pernambuco, Brazil⁽⁵⁾. In the study by Leão *et al.*⁽³⁾, the authors found 8% of overweight/obesity among students from public schools in Salvador, state of Bahia. The increase in the prevalence of overweight/obesity in low-income

communities has been reported; however, some authors have included only schoolchildren in their samples. In our study, children between six and nine years old accounted for 47.8% of the overweight/obesity cases.

The peculiar characteristic of this population is the fact that it is from a low-income community, and its inhabitants survive in very poor conditions. Income was not significantly different between the groups of obese and eutrophic subjects. Studies conducted in slum areas have detected an increase in the rate of obesity among adults^(13,14); however, studies on childhood obesity in slum areas are more uncommon. Therefore, there are very few studies that can be compared to our results.

In the present study, 61% of the mothers had less than nine years of schooling. Among the mothers of overweight/obese children, 39% had completed high school. The comparison between maternal educational level and occurrence of diseases is relevant due to the association with the acquisition of knowledge regarding disease prevention.

Sedentary lifestyle has been constantly discussed as a factor contributing to the increased prevalence of obesity worldwide, including all social classes. Since physical activity plays

an important role in energy expenditure, its decrease might contribute to this “epidemic” of obesity. Some studies have suggested that obese people are less active and that there is an inverse relationship between physical activity and BMI. Physical activity can have a greater influence than diet on the increase in children’s body fat, and is also very important to prevent childhood obesity⁽¹⁵⁾. In our study, 74% of the overweight/obese children were sedentary. However, sedentary lifestyle was also highly prevalent in nonobese children (52%). There is a shortage of data regarding physical activity in the general population.

Recently, there have been more studies on leisure physical activities because individuals can control such activities (i.e., they are voluntarily performed); therefore, it is easier to obtain reliable information on this topic. National epidemiological studies have investigated adults and children older than ten years old, thus limiting the possibility of comparing their results with the ones found in the present study. Physical activity is considered to be an important strategy for health promotion. However, its implementation requires political decisions affecting social and physical environments, in the sense of promoting changes in urban infrastructure, schools and other places where children spend their free time. In low-income communities and urban clusters, the absence of community centers for leisure activities can stimulate children to have a sedentary lifestyle. The increasing rates of urban violence might also be a factor contributing to prevent children from leaving their homes, which often provide reduced physical space for leisure activities.

In the community analyzed in our study, sedentary lifestyle has probably contributed to the increase in the prevalence of childhood obesity. This may serve as a warning about the implementation of public health interventions which can contribute to improve these children’s lifestyle, mainly at school, where they spend a great part of the day, and because it is the appropriate place for educational activities. In addition, stimulating leisure activities in an environment with good infrastructure located in the community would be a beneficial measure for all, an indispensable tool for the treatment and prevention of new cases.

There has been suggested that lack of physical activity significantly contributes to the development of obesity. The number of hours spent watching television has been related to obesity in cross-sectional and longitudinal studies^(16,17). Ross, in a study assessing the association between physical activity, time spent watching television, and obesity, found that each hour spent watching television represented an

increase of 2% in the prevalence of obesity in adolescents. That author showed that watching television in childhood is an important predictor of obesity in adolescence, even when controlling for other variables⁽¹⁸⁾.

In the present study, we found a large number of hours spent watching television. In the OO group, 72% of the children spent at least three hours a day watching television. Similar data (70%) were found in the EU group. There was not a positive association with overweight/obesity, probably because this factor was frequent in both groups.

The habit of watching television in this community might be stimulated by the fact that children need to stay home, since it is a safer environment, where parents can control their activities. We may therefore assume that the increasing rates of urban violence and the lack of environmental infrastructure in slum areas are the main factors responsible for children staying at home and being attracted to an activity that does not promote energy expenditure and even seems to stimulate the consumption of caloric food, effectively contributing to an increase in childhood obesity. Studies have shown an increase in obesity rates among children that spend long hours a day watching television, that is, children who spend three hours a day or more in front of the TV⁽¹⁶⁾. Melo *et al*⁽¹⁹⁾, in a systematic review of the literature on obesity treatment, found that the habit of watching television for three, four and five hours a day or longer is associated with prevalence rates of obesity of 25, 27 and 35%, respectively. In the study by Klesges⁽¹⁷⁾, the authors analyzed the effect of television on children’s baseline metabolic rates and found that it was reduced in children who used to watch a specific kind of TV show, and was even lower in obese children.

Regarding dietary assessment, it is important to highlight that it is a complex procedure. Each method has advantages and limitations. In our study, one of the limitations was the use of only one day for the 24hR, which was associated with the usual daily food intake with the purpose of comparing if the day investigated could be considered a typical day in the child’s diet. Data from the 24hR enabled us to classify the habits so that their respective frequencies could be measured, which made it easier to understand the children’s eating pattern and its association with their nutritional status.

Inappropriate habits, such as the consumption of fried food (for breakfast, lunch, and dinner), consumption of sandwich cookies and artificially sweetened beverages, and a high intake of bread, were frequent not only in the case group but also in the control group. The small size of the sample might be considered a methodological limitation,

mainly for the definition of associated factors. The broad confidence intervals of the variables analyzed confirm this hypothesis.

In the present study, children reported frequent consumption of food with high fat (fried food, sandwich cookies), sugar and cholesterol content, with little or no source of micronutrients. Such kind of food is defined as “junk food,” and its recurrent intake can bring negative consequences to the individual’s health in the future, with an increased risk of developing obesity, hyperlipidemia and other non-transmissible chronic diseases.

Consumption of fried food was frequently reported by children even during breakfast. This habit, in addition to adding calories to the daily diet and causing a sensation of satiety, is related to harmful effects on health in the medium and long terms. Nicklas *et al*⁽²⁰⁾ pointed out that these dietary factors contribute to increased blood levels of cholesterol and LDL.

Beverages rich in simple sugar have been associated with increased calorie intake and triglyceride levels⁽¹⁹⁾. In the community assessed in our study, the intake of sweetened beverages alone was reported as usual. A prospective study including 548 students found that BMI and the frequency of obesity increased for each additional portion of beverage containing refined sugar⁽¹⁹⁾. James *et al*⁽²¹⁾ conducted a case-control study in six elementary schools in the southeast of England involving children aged seven to 11 years to assess the impact of a decreased consumption of soft drinks on the prevention of childhood obesity in students. The authors concluded that a small decrease in the consumption of these beverages was as-

sociated with a reduction in the number of overweight children. Recently, the sale of highly caloric soft drinks has been forbidden at schools in the USA. Such measure established that elementary schools are only allowed to sell sugar-free juices, water, and low-fat milk to their students. Diet soft drinks are allowed only in high schools. In Brazil, similar measures have been taken, although in an isolated manner in some state capitals only (Brasília, Rio de Janeiro, and Florianópolis).

Based on the results of our study, we detected eating habits that contributed to a low consumption of dietary fiber. Absence of fruits and vegetables in the daily diet was reported by both groups. Poor consumption of fibers contributes to the development and/or maintenance of obesity. The intake of soluble and insoluble fibers has been reported to be a dietary factor capable of regulating body weight, acting as an obstacle for the intake of other carbohydrates because it affects glucose homeostasis; in addition, the fact that fibers are low-calorie and large-volume foods predisposes to the sensation of satiety⁽²²⁾.

Based on these findings, we may assume that the increased consumption of food rich in simple sugar and fat, with high calorie contents, and the reduced practice of physical activity probably are the main factors related to this community setting with regard to the origin of childhood obesity. Several authors⁽²³⁻²⁵⁾ have reported the nutritional transition related to changes in eating patterns due to changes in the structure of people’s diet associated with economical, social, demographic and health-related changes. The present study intended to contribute to the record of evidence supporting this nutritional transition in Brazil.

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