

Factors associated with nutritional status of 7-10 year-old schoolchildren: sociodemographic variables, dietary and parental nutritional status

Fatores associados ao estado nutricional de escolares de 7 a 10 anos: aspectos sociodemográficos, de consumo alimentar e estado nutricional dos pais

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Abstract

Objective: To estimate the prevalence of overweight / obesity in schoolchildren, and to investigate its association with parents' nutritional status, socioeconomic factors and food consumption. **Methods:** Cross-sectional study with 1,223 schoolchildren, 7 to 10 years old from Florianópolis, SC. We collected anthropometric measures directly and dietary intake of previous day; parents' data were collected from a socioeconomic and self-reported anthropometric questionnaire. Schoolchildren's nutritional status was defined using the Body Mass Index (BMI) for age and sex according to the reference data of the World Health Organization (2007), and parents' nutritional status was defined according to the World Health Organization BMI cutoff points (1995). We performed bivariate and multivariate analysis using Poisson regression. **Results:** Prevalence of overweight/obesity was 36.2% in boys and 32.7% among girls. The prevalence was 56.3% and 27.5% in fathers and mothers, respectively. In the final model, mother's ($p = 0.001$) and father's nutritional status ($p = 0.050$) remained directly associated with schoolchildren's overweight/obesity. The prevalence of overweight/obesity was 1.58 times higher in schoolchildren with overweight/obese mothers, and 1.41 times higher in schoolchildren with overweight/obese fathers, compared to mothers and fathers without the condition. **Conclusion:** There was a high prevalence of overweight/obesity among schoolchildren, which was associated with the nutritional status of mothers and fathers. These results confirm the need to prevent overweight/obesity in schoolchildren with actions that also involve the family environment in order to reduce obesity in this population.

Keywords: Nutrition assessment. Overweight. Obesity. Parent-child relations. Students. Food consumption.

Resumo

Objetivo: Estimar a prevalência de sobrepeso/obesidade em escolares e investigar sua associação com o estado nutricional dos pais, fatores sociodemográficos e de consumo alimentar. **Método:** Estudo transversal realizado com 1.223 escolares de 7 a 10 anos de Florianópolis, SC. Foram coletados dados socioeconômicos e medidas antropométricas autorreferidas dos pais, e medidas antropométricas diretas e de consumo alimentar do dia anterior dos escolares. O diagnóstico nutricional dos escolares foi definido a partir do Índice de Massa Corporal (IMC) para idade e sexo de acordo com dados de referência da Organização Mundial de Saúde (2007) e o dos pais segundo os pontos de corte do IMC também da Organização Mundial de Saúde (1995). Realizou-se análise bivariada e multivariada por meio da regressão de Poisson. **Resultados:** Prevalência de sobrepeso/obesidade de 36,2% nos meninos e 32,7% nas meninas. Nos pais e mães a prevalência foi de, respectivamente, 56,3% e 27,5%. Dos fatores investigados, no modelo final permaneceram associados ao sobrepeso/obesidade nos escolares o estado nutricional das mães ($p = 0,001$) e dos pais ($p = 0,050$). A prevalência de sobrepeso/obesidade foi 1,58 vezes maior em escolares com mães e 1,41 vezes maior em escolares com pais com sobrepeso/obesidade, quando comparados a mães e pais sem o problema. **Conclusão:** Observou-se elevada prevalência de sobrepeso/obesidade nos escolares, e esta se associou ao estado nutricional de pais e mães. Isso evidencia a necessidade de ações de prevenção do ganho excessivo de peso ainda na infância que atuem também no ambiente familiar do escolar, a fim de reduzir a obesidade neste grupo populacional.

Palavras-chaves: Avaliação nutricional. Sobrepeso. Obesidade. Relações pais-filho. Estudantes. Consumo alimentar.

Introduction

In the last decades there has been a growing interest in the investigation of the prevalence and factors associated with overweight and obesity in 7-10 year-old schoolchildren.¹⁻¹² Some of the key factors associated with overweight and obesity in schoolchildren, such as inappropriate diets, physical inactivity, parental overweight and obesity, as well as socio-economic and environmental conditions are widely discussed in the literature in an attempt to understand the genesis of the problem, which has a multi-causal origin.^{11,12,13,14}

Regarding the socioeconomic factors, according to the Latin American Consensus on Obesity the emerging obesity issue in developing countries is particularly critical and affects not only the economically privileged groups but also the less favored¹³. In middle-income countries like Brazil, overweight and obesity are more prevalent among the wealthier population, unlike other high-income countries where most of the overweight or obese children and adolescents belong to poorer families.^{15,16}

Literature has shown that one of the most important risk factors for the development of overweight/obesity in children is parental overweight or obesity.^{1,2,10} It also highlights that the genetic factors are not the only ones to influence its high prevalence because there are sound evidences that the family lifestyle and the development of eating habits and preferences affect the children's nutritional status^{3,17}

Regarding the relationship between inappropriate diets and the prevalence of overweight/obesity, not only the amount of food intake but also the diet composition and quality are factors that have been evidenced. The trends seen in the population's dietary patterns, particularly among children and adolescents, which have been marked by low consumption of fruits and vegetables and an increased consumption of sandwich biscuits, snacks, sweets and sodas, have often been associated with the overweight/obesity in this age range.^{9,11}

Considering the current worldwide interest in studying the factors linked to schoolchildren overweight/obesity, and observing the literature findings about the relationship between overweight/obesity and socio-economic and demographic variables, this study was performed with a differential focus on the analysis of the schoolchildren's eating patterns too. Therefore, the study aims to estimate the overweight/obesity prevalence in 7 to 10 year-old schoolchildren in the city of Florianópolis, SC, and investigating its connection with the parents' nutritional status, socio-economic factors and eating habits.

Methods

Design and sampling

This is a cross-sectional study. We used a probabilistic sample of the schoolchildren population at the age of 7 to 10 years old, enrolled at public and private primary schools in Florianópolis, SC. According to the city's Municipal Health Secretariat (MSH), in 2006 the number of students in this age range was 25,619.

To calculate the sample size, we considered 10% of prevalence of obesity for children aged 7 to 10 years¹⁸, with error margin of 2 percentage points and design effect of 1.3. We added 10% for possible sample losses, resulting in a total final sample of 1230 schoolchildren.

The study applied sampling design in two stages. In the first stage, the schools in Florianópolis were stratified into four strata according to two geographic areas (downtown/continental and beaches) and the school category (public or private). In each stratum the schools were selected randomly for a total of 17 schools (11 public and 6 private). In the second stage, in each school the children were selected randomly to reach the total necessary sample of 1230 individuals. In the analyses to estimate the prevalence and the associated factors, the design effect and the sampling plan were considered.

The study included schoolchildren in the age range of 7-10 years who were enrolled in the public and private primary schools in Florianópolis, SC, and whose parents signed the Term of Free and Informed Consent. Orphans or adopted children were also included in the study, and in this case we considered the age, weight and stature of their respective guardians.

Data collection

The study protocol included the children's anthropometric data (weight and height) and information on their typical diet. A questionnaire was sent to the students' houses with questions on socio-economic (education, total monthly income, number of persons living at the domicile), demographic (age and sex) and anthropometric (weight and height) data of their parents and it was returned when data were collected from the children.

Ten measurers duly trained to ensure standardized and reliable measurements collected the anthropometric and dietary data in 2007.¹⁹ The children's anthropometric measures were taken at school, in accordance with Lohman, Roche and Martorell²⁰ standardized procedures and as recommended by the World Health Organization.²¹

The children's weight was taken in kilograms, using a Marte digital scale of up to 180 kg, precision of 100 grams, and the schoolchildren were barefoot, wearing light clothes, and positioned at the center of the scale platform.

The stature was measured (in centimeters) by a Altuxata anthropometer, precision of 1 mm, and the children were still barefoot, in orthostatic position, with the body mass distributed on both legs, arms hanging freely, heels together, straight knees and the head orientated in the Frankfurt plane.

The schoolchildren's nutritional diagnosis was defined based on the BMI curves for the age and sex, according to the World Health Organization's reference data (2007)²², and the rating defined for

overweight diagnosis was $> \text{score-z} + 1$ and $\leq \text{score-z} + 2$, and for obesity it was $> \text{score-z} + 2$. For the analyses of this study, grouped overweight/obesity was considered ($> \text{score-z} + 1$).

To obtain the dietary data related to the consumption of foods that protect against risks to health, we used the third version of the Previous Day Food Questionnaire (PDFQ), an illustrated and structured questionnaire designed for schoolchildren.²³ The instrument had its second version validated by comparing the schoolchildren's responses with direct observation of school lunch consumption²⁴, and to consider the changes suggested in the validation study and in order to better suit the dietary pattern of the students to the age range under study, we developed PDFQ-3²³, which was used in this study. The changes for the third version included adjustments of the figures to represent the body image of older children and adolescents, and the addition of five foods and one meal after dinner. Thus, PDFQ-3 has six chronologically arranged meals (breakfast, morning snack, lunch, afternoon snack, dinner and evening snack), and each meal was illustrated with 21 foods or food groups. The foods were selected considering the foods availability, the menus offered in the public schools and the Food Guide for the Brazilian Population²⁵, besides the dietary patterns of the children in the age range under study. To introduce the questionnaire to the children, four posters (90x120cm) were built, each one showing two meals, identical to those contained in the questionnaire. After delivering the questionnaires, the researchers explained all meals and foods in the figures, and the children were then instructed to draw a circle around the foods illustrated in the questionnaire corresponding to those that they ate at each meal in the day before. To accomplish it, for each meal presented in the poster, the researcher reminded all foods that might be available and at which time of the day the children probably had each meal. If a child did not have one of the meals, he/she should leave blank the

respective part relating to that meal, without underlining any food.

For the study, we considered as protective foods those belonging to the group of fruits, natural fruit juices, vegetables and soups of vegetables. As risk foods we considered those of the group of packaged chocolate-flavored milk, soda drinks, candies, packaged snacks, potato chips, pizza and hamburgers.

The variables age, weigh, height and the parents' education level, besides total monthly income and the number of people leaving in the house (to calculate the monthly per capita income) were obtained from the socio-demographic and anthropometric questionnaire administered to the parents. The parents' BMI variable was calculated based on the weight and height informed on the questionnaires. Thus, according to the World Health Organization²¹, we considered as underweight those with $\text{BMI} < 18.5 \text{ kg/m}^2$, as eutrophic or with normal weigh those with $18.5 \leq \text{BMI} < 25 \text{ kg/m}^2$, as pre-obese those with $25 \leq \text{BMI} < 30 \text{ kg/m}^2$ and obese those with $\text{BMI} \geq 30 \text{ kg/m}^2$

Data Analysis

The dependent variable was the schoolchildren's nutritional status, categorized as overweight/obese and not overweight/obese. The independent variable studied were: sex, age, the schoolchildren's consumption of protective foods and consumption of risk foods; parents' education level and nutritional status; monthly per capita income.

Regarding the protective foods consumption, we classified as: appropriate (if the child consumes foods of this category five or six times a day) and inappropriate (if he/she consumes it up to four times a day), according to the World Health Organization¹⁴, which recommends approximately five portions of fruits and vegetables every day. Regarding the consumption of health risk foods, we classified as: appropriate (if the child consumes it no more than once a day) and inappropriate

(if consumed twice or more times a day), since the recommended limit for this type of foods, rich in sugars, fats and salt, is one serving per day.²⁵

The schoolchildren's age was classified as 7, 8, 9 or 10 years. With respect to the parents, the age ranges were: 20 to 29 years, 30 to 39 years and ≥ 40 years, and education level as: never been to school; complete primary education; incomplete/complete secondary education; complete/incomplete higher education. Regarding the nutritional status of the schoolchildren and their parents they were classified into two groups: pre-obese/obese and not pre-obese/obese. The monthly per capita income was subdivided into three tertiles: 1st (\leq R\$166.67); 2nd (R\$166.68 to R\$375.00) and 3rd (\geq R\$375.01).

After checking for data consistency, we performed statistical analyses with the software *STATA 10.0*, adjusted for the effect of design and sampling methods of the study by using the SVY command. We decided for the Poisson²⁶ bivariate and multivariate regression because the overweight/obesity prevalence among the schoolchildren was higher than 20%.

At first, bivariate analysis was performed to determine the relation between the dependent variable (prevalence of overweight/obesity) and each independent variable, thus obtaining the prevalence ratios and respective confidence intervals of 95%. Then, multivariate analysis was performed. To select the variables, we used the forward method, remaining in the model only those with value $p \leq 0.20$. In the final model, we maintained the variables with statistical significance ($p \leq 0.05$). The results were presented in prevalence ratios and respective confidence intervals of 95%.

The study was approved by the Ethics Committee for Human Research of the Federal University of Santa Catarina/Center of Health Sciences on April 24, 2006 (under no. 028/06), according to the rules established by Resolution 196/96 of the National Health Council. There was no conflict of interests in the study.

Results

For the study 1232 schoolchildren were selected, and of this total 9 (0.07%) were excluded for not agreeing to participate in the anthropometric measurements, resulting in a total final sample of 1223 individuals (99.4%), 602 (49.2%) males and 621 (50.8%) females. With respect to the participation of the schoolchildren's parents, the response rates were 94.4% for mothers and 82.0% for fathers.

Figure 1 shows the schoolchildren average BMI, per sex, for each age under analysis. The averages between boys and girls were similar, except at 9 years old, where the mean BMI of boys, 18.39kg/m² (CI95%:17.9-18.9) was significantly higher than of girls, 17.58kg/m² (CI95%:17.2-17.9). In spite of that, there was no statistically significant difference between the prevalence of overweight/obesity between boys and girls at different ages (data not presented).

Table 1 presents the sample distribution and prevalence of overweight/obesity in schoolchildren according to the socio-economic, demographic and anthropometric variables.

We can see that the ratio between genders was similar and most of the investigated individuals were 9 years old. With respect to the schoolchildren's parents, the predominant age range was 30-39 years. The education level of fathers and mothers was very similar in all categories. Monthly per capita income was also similar in ranges, from the poorest to the richest.

Concerning the mothers' nutritional status, we found that nearly one third of them (27.5%) were pre-obese/obese, and in this group the prevalence of overweight/obese schoolchildren was significantly higher than in the group of mothers without the problem ($p < 0.001$). A similar relationship was observed in the fathers' nutritional status, and the higher prevalence of overweight/obesity was found in the group of schoolchildren with pre-obese/obese fathers ($p = 0.038$).

About 84.9% of the schoolchildren consumed protective foods less than five times

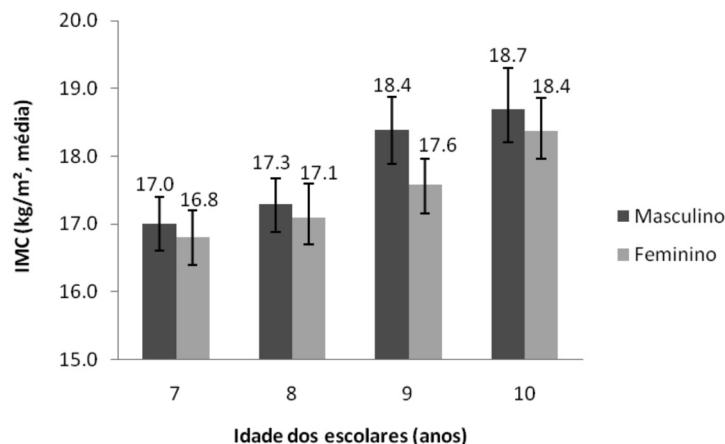


Figure 1 - Distribution of the mean BMI in schoolchildren by age and sex. Florianópolis, Brazil, 2007.

Figura 1 - Distribuição da média de IMC dos escolares investigados segundo sexo e idade. Florianópolis, Brasil, 2007.

a day, whereas 67.6% of the schoolchildren consumed risk foods twice or more times a day, indicating habits contrary to a healthy diet.

The bivariate analysis showed a p -value <0.20 , and the following variables were selected for the final model: the mother's nutritional status, the father's nutritional status and health risk diet (data not shown). In the multivariate analysis, the prevalence of overweight/obesity in schoolchildren was associated with the mother's nutritional status (PR:1.58; CI95%:1.26-1.98) and the father's nutritional status (PR:1.41; CI 95%:1.00-1.99), but less intensive with the other socio-demographic variables added to the model. According to Table 2, we can see that children having pre-obese/obese mothers have 58% more risks of being overweight/obese than the reference category, whereas schoolchildren whose parents have the problem have 41% more risks than those not having pre-obese/obese parents.

Discussion

According to this study, the prevalence of overweight/obesity (34.5%) among schoolchildren is very high, i.e., 36.2% for boys and 32.7% for girls, without significant statistical difference between gender ($p=0.431$). By comparing this prevalence with that of

the latest survey conducted on household budgets in 2008/2009, a similar result was found: 34.8% of boys and 32.0% of girls aged 5 to 9 years were overweight/obese. It is known that within the studied age range, the prevalence of overweight/obesity has increased significantly in Brazil over the past decades¹⁵, especially among the high-income population, and in this aspect the Southern region stands out for having the highest Human Development Index (HDI) in relation to the other Brazilian regions²⁸.

Compared with surveys carried out in the state of Santa Catarina, the result is almost identical to the one found by Bertin et al.²⁹ with 259 schoolchildren aged 8 to 10 years in the city of Indaial, which was 33.9% of overweight/obesity.

The prevalence of overweight/obesity found in our study was 1.48 times higher among the schoolchildren having pre-obese/obese mothers and 1.32 times higher in children with pre-obese/obese fathers, if compared to mothers and fathers without the problem. The findings followed an expected pattern, since other studies conducted in other countries and also in Brazil, in different regions, showed a relationship between parental pre-obesity/obesity and overweight/obesity in children.^{2,6,7} We can see then that the pre-obesity/obesity condition in parents seems to be a likely

Table 1 - Sample distribution and prevalence of overweight / obesity in schoolchildren aged 7 to 10 years, according to the independent variables. Florianópolis, Brazil, 2007.

Tabela 1 - Distribuição da amostra e prevalência de sobrepeso/obesidade nos escolares de 7 a 10 anos, segundo as variáveis independentes. Florianópolis, Brasil, 2007.

Variables	Sample		Overweight/Obesity		p*
	N	%	%	CI 95%	
Schoolchildren sex (n=1223)					0.431
Male	624	51.0	36.2	33.4-38.9	
Female	599	49.0	32.7	30.1-35.4	
Schoolchildren age (years) (n=1223)					0.456
7	276	22.5	36.6	33.8-39.3	
8	286	23.4	33.4	30.8-36.2	
9	346	28.3	37.5	34.8-40.3	
10	315	25.8	30.2	27.7-32.9	
Mother's age (years) (n=1194)					0.251
20 – 29	235	19.7	37.3	34.6-40.2	
30 – 39	631	52.8	31.9	29.2-34.6	
≥ 40	328	27.5	37.5	34.8-40.3	
Fathers age (years) (n=1112)					0.558
20 – 29'	93	8.4	38.7	35.9-41.7	
30 – 39	546	49.1	32.2	29.5-35.0	
≥ 40	473	42.5	35.3	32.5-38.2	
Mother's education level (n=1177)					0.707
Never been to school	13	1.1	33.3	30.5-36.0	
Complete primary education	297	25.2	37.6	34.9-40.5	
Complete or incomplete secondary education	363	30.9	33.4	30.7-36.2	
Complete or incomplete higher education	504	42.8	33.8	31.0-36.5	
Father's education level (n=1095)					0.448
Never been to school	15	1.4	50.5	47.5-53.5	
Complete primary education	290	26.5	33.2	30.4-36.0	
Complete or incomplete secondary education	305	27.9	32.5	29.7-35.4	
Complete or incomplete higher education	484	44.2	36.7	33.9-39.6	
Monthly per capita income (n=1214)					0.473
1st tertile (lower income)	396	32.7	32.1	29.5-34.8	
2nd tertile (intermediate income)	350	28.8	35.4	32.6-38.1	
3rd tertile (higher income)	468	38.5	36.1	33.4-38.9	
Mother's nutritional status (n=1154)					<0.001
Overweight/ obese	317	27.5	46.8	43.9-49.7	
Not overweight /obese	837	72.5	30.5	27.9-33.2	
Father's nutritional status (n=1003)					0.038
Overweight/ obese	564	56.3	40.4	37.3-43.5	
Not overweight /obese	439	43.7	27.9	25.1-30.8	
Protective Foods (n=1223)					0.583
Appropriate	184	15.1	36.9	34.2-39.7	
Inappropriate	1039	84.9	34.0	31.3-36.7	
Risk Foods (n=1223)					0.097
Appropriate	396	32.4	41.6	38.8-44.4	
Inappropriate	827	67.6	31.0	28.4-33.7	
Total	1223	100.0	34.5	31.4-36.7	

* teste qui-quadrado. / * *chi-square test.*

Table 2 - Multiple regression analysis for association of the prevalence of overweight / obesity in schoolchildren with the variables in the model. Florianópolis, 2007.

Tabela 2 - Análise múltipla para associação da prevalência de sobrepeso/obesidade nos escolares com as variáveis incluídas no modelo. Florianópolis, SC, 2007.

Variables	PR (CI95%)	p value*
Mother's nutritional status		0.001**
Overweight/obese	1.0	
Not overweight/obese	1.58 (1.26 – 1.98)	
Father's nutritional status		0.050**
Overweight/obese	1.0	
Not overweight/obese	1.41 (1.00 – 1.99)	
Consumption of risk foods		0.068
Appropriate	1.0	
Inappropriate	0.71 (0.50-1.03)	

* valor de p teste de Wald. / * value of p - Wald test.

** Valor de p estatisticamente significante. / ** Value of statistically significant p.

predisposing factor to the same problem in their children, indicating the family's influence in creating habits and lifestyles in their children, inclusive eating habits and physical activity, key factors to define the individual's nutritional status.

The research did not show a significant relation between the household income and overweight/obesity, which corroborates the findings of Alves, Siqueira and Figueiroa³⁰ in a study conducted with 733 children in the city of Recife, PE, but is in disagreement with other surveys, such as of Campos, Leite and Almeida⁸, conducted with 1158 schoolchildren, in which the prevalence of overweight/obesity was higher in children aged 10-14 year and better socio-economic conditions. An opposite result was observed by Moschonis et al,³¹ with 9 to 13 year-old schoolchildren, since the prevalence of overweight/obesity was higher among low/middle income children. These findings show that there still are controversies regarding the influence of the socio-economic condition on the schoolchildren's nutritional status, differently from the association already shown in adults.¹⁵

Regarding the parents education background, our study did not find a significant relationship with the schoolchildren's nutritional status. A work performed by Troncon

et al.³² with 6 to 14 year-old schoolchildren did not find a link between the mothers education level and the children's nutritional status either, but these results differ from a study on Mexican schoolchildren aged 5 to 10 years, which reported as a risk factor for developing obesity the mothers higher education background.⁴ Based on the data from literature, there is not a consensus about the relationship between the parents' schooling and their children's nutritional status. This is because it is assumed that a higher level represents more knowledge regarding healthy lifestyles and habits and might even become a protective factor against overweight/obesity, but this is fallacious because it predisposes to higher income and, consequently, a larger accessibility to all kinds of foods, including fast foods and sedentary lifestyle, which are considered as risk factors for overweight.

In this study, consumption of protective foods or of risk to health has not been related with overweight/obesity in schoolchildren, thus differing from the results of several other studies. Fagundes et al.¹⁷ observed that a diet poor in fruits and vegetables, and the high intake of sugary foods were related to overweight/obese schoolchildren; Lopes, Prado and Colombo¹² found soda drinks as a risk factor for overweight/obesity in

schoolchildren aged 7 to 10 years, in the same way that Mondini et al.⁷ identified high intake of junk food as a risk factor.

The fact that a health risk diet in this study does not appear to be associated with schoolchildren's overweight/obesity may be due to the PDFQ used for the analyses, since it does not allow to determine the exact amounts of foods consumed, but only the type or the nutritional quality of the foods and the number of meals in which they were eaten in one day²³. Hence, schoolchildren who ate, for example, a whole pack of sandwich biscuits, which offers a large amount of calories, were grouped together with children who ate a single candy. However, the instrument permits to identify the quality of the schoolchildren's diet and if the health risk foods are consumed more than once a day, which already provides the grounds for suggesting changes and improvements in the dietary habits²³.

Another aspect to consider is related to a diet based on fruits and vegetables, in this study considered as the only protective factor in diets. A healthy diet comprises an increased consumption of these foods²⁵, which is quite below the recommended levels for all age groups in Brazil, including the younger population^{33,34}. Diets based on this food group have been investigated for their health protective factor, and findings have been satisfactory even in national surveys.³⁴

It should be noted that other factors seem to be associated with obesity in the studied age range, which were not included in our study, among them birth weight, missing breakfast, hours watching TV, sleeping hours, and parental smoking^{2,4,6,7}. These and other conditions could be investigated in an attempt to better understand obesity in this population, given its complex etiology, which includes biological, genetic and environmental aspects. These aspects, mainly environmental, such as an obesogenic home environment, with inappropriate meal times, place and food choices; unhealthy-foods advertising; increased

consumption of ultra-processed foods; physical inactivity; and the accessibility and the low cost of poorly nutritious foods require further in-depth investigations due to the fact that they have been increasing over the years concurrently with increased overweight/obesity.

The use of anthropometric measures as self-reported by the parents could be considered a limitation in this study, as this is a controversial measurement technique. However, investigations have shown that this technique can be used^{35,36}, because it offers acceptable information validity levels and has also been used in population-based surveys in Brazil.³⁴

Knowing the difficulties of treating overweight/obesity in adulthood, especially because of its association with other non-communicable chronic diseases, prevention started early in childhood appears to be the most efficient form to reduce its prevalence. Given this, this study could be considered as having produced more accurate inferences about the prevalence of overweight/obesity in 7 to 10 year-old schoolchildren from Florianópolis, SC, and factors linked to this problem, which can be useful in interventions promoted by the health care and nutrition services to prevent this public health problem. Such actions could be in the form of an increased supply of fruits and vegetables in school meals, as well as increased efforts to enforce the Regulation for School Canteens in the State of Santa Catarina³⁷ to avoid that inappropriate foods are served in schools, or by encouraging the practice of physical activities also in the period that the children are out of school, by offering proper places for such activities.

We also emphasize the need of additional research on the possible determinants of schoolchildren's overweight/obesity and also on actions focused on the home environment, making it less favorable to the development of overweight/obesity and encouraging the construction of healthier eating habits among the Brazilian families.

References

- Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med* 1997; 337: 869-73.
- Giugliano R, Carneiro EC. Fatores associados à obesidade em escolares. *J Pediatr* 2004; 80: 17-22.
- Assis MAA, Rolland-Cachera MF, Grosseman S, Vasconcelos FAG, Luna MEP, Calvo MCM. Obesity, overweight and thinness in schoolchildren of the city of Florianópolis, Southern Brazil. *Eur J Clin Nutr* 2005; 59(9): 1015-21.
- Moraes AS, Rosas JB, Mondini L, Freitas ICM. Prevalência de sobrepeso e obesidade e fatores associados em escolares de área urbana de Chilpancingo, Guerrero, México, 2004. *Cad Saúde Pública* 2006; 22(6): 1289-301.
- Costa RF, Cintra, IP, Fisberg, M. Prevalência de sobrepeso e obesidade em escolares da cidade de Santos, SP. *Arq Bras Endocrinol Metab* 2006; 50: 60-7.
- Guimarães LV, Barros MBA, Martins MSAS, Duarte EC. Fatores associados ao sobrepeso em escolares. *Rev Nutr* 2006; 19(1): 5-17.
- Mondini L, Levy RB, Saldiva SRDM, Venâncio SI, Aguiar JA, Stefanini MLR. Prevalência de sobrepeso e fatores associados em crianças ingressantes no ensino fundamental em um município da região metropolitana de São Paulo, Brasil. *Cad. Saúde Pública* 2007; 23: 1825-34.
- Campos LA, Leite AJM, Almeida PC. Prevalência de sobrepeso e obesidade em adolescentes escolares do município de Fortaleza, Brasil. *Rev Bras Saúde Matern Infant* 2007; 7: 183-90.
- Hanley AJG, Harris SB, Gittelsohn J, Wolever TMS, Saksvig B, Zinman B. Overweight among children and adolescents in a Native Canadian community: prevalence and associated factors. *Am J Clin Nutr* 2000; 71: 693-700.
- Bernardo CO, Fernandes PS, Campos RMMB, Adami F, Vasconcelos FAG. Associação entre o índice de massa corporal de pais e de escolares de 7 a 14 anos de Florianópolis, SC, Brasil. *Rev Bras Saúde Matern Infant* 2010; 10(2): 183-90.
- Enes CC, Slater B. Obesidade na adolescência e seus principais fatores determinantes. *Rev Bras Epidemiol* 2010; 13(1): 163-71.
- Lopes PCS, Prado SRLA, Colombo P. Fatores de risco associados à obesidade e sobrepeso em crianças em idade escolar. *Rev Bras Enferm* 2010; 63: 73-8.
- Coutinho W, ed. Documento do consenso latino-americano sobre obesidade [monografia na internet] Rio de Janeiro: ABESO; 1998. Disponível em <http://www.abeso.org.br/pdf/consenso.pdf> [Acessado em 5 de agosto de 2010]
- WHO (World Health Organization). *Diet, nutrition and the prevention of chronic diseases*. Geneva; 2003. (Technical Report Series, 916).
- IBGE - Instituto Brasileiro de Geografia e Estatística. Ministério do Planejamento, Orçamento e Gestão – Pesquisa de Orçamentos Familiares 2008-2009. *Antropometria e análise do estado nutricional de crianças, adolescentes e adultos no Brasil*. Rio de Janeiro; 2010.
- Cardoso LO, Engstrom EM, Leite IC, Castro IRR. Fatores socioeconômicos, demográficos, ambientais e comportamentais associados ao excesso de peso em adolescentes: uma revisão sistemática da literatura. *Rev Bras Epidemiol* 2009; 12(3): 378-403.
- Fagundes ALN, Ribeiro DC, Naspitz L, Garbelini LEB, Vieira JKP, Silva, AP. Prevalência de sobrepeso e obesidade em escolares da região de Parelheiros do município de São Paulo. *Rev Paul Pediatr* 2008; 26(3): 212-7.
- Abrantes MM, Lamounier JA, Colosimo EA. Comparison of body mass index values proposed by Cole et al. (2000) and Must et al. (1991) for identifying children with weight-for-height index recommended by the World Health Organization. *Public Health Nutr* 2003; 6(3): 307-11.
- Frainer DES, Adami F, Vasconcelos FAG, Assis MAA, Calvo MCM, Kerpel R. Padronização e confiabilidade das medidas antropométricas para pesquisa populacional. *Arch Latinoam Nutr* 2007; 57: 335-42.
- Lohman TG, Roche AF, Martorell R. *Anthropometric standardization reference manual*. Illinois: Human Kinetics Books; 1988.
- WHO (World Health Organization). *Physical status: the use and interpretation of anthropometry*. Geneva; 1995. 452 p. (Technical Report Series, 854).
- Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. *Bull World Health Organ* 2007; 85(9): Falta inserir números de páginas
- Assis MAA, Benedet J, Kerpel R, Vasconcelos FAG, Di Pietro PF, Kupek E. Validação da terceira versão do Questionário Alimentar do Dia Anterior (QUADA-3) para escolares de 6 a 11 anos. *Cad Saúde Pública* 2009; 25(8): 1816-26.
- Assis MAA, Kupek E, Guimaraes D, Calvo MC, Andrade DF, Bellisle F. Test-retest reliability and external validity of the previous day food questionnaire for 7-10-year-old school children. *Appetite* 2008; 51(1): 187-93.
- BRASIL. Ministério da Saúde. Secretaria de Política de Saúde, Departamento de Atenção Básica. *Guia alimentar para a população brasileira*. Brasília - DF: Ministério da Saúde; 2004.

26. Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Med Res Methodol* 2003; 3: 21.
27. Pelegrini A, Silva DAS, Petroski EL, Gaya ACA. Sobrepeso e obesidade em escolares brasileiros de sete a nove anos: dados do projeto Esporte Brasil. *Rev Paul Pediatr* 2010; 28(3): 290-5.
28. Programa das Nações Unidas para o Desenvolvimento. Instituto de Pesquisa Econômica Aplicada. Fundação João Pinheiro. Fundação Instituto Brasileiro de Geografia e Estatística. Atlas do Desenvolvimento Humano no Brasil. Brasília: PNUD; 2003.
29. Bertin RL, Malkowski IL, Zutter LCL, Ulbrich AZ. Estado nutricional, hábitos alimentares e conhecimentos de nutrição em escolares. *Rev Paul Pediatr* 2010; 28(3): 303-8.
30. Alves JGB, Siqueira PP, Figueiroa JN. Overweight and physical inactivity in children living in favelas in the metropolitan region of Recife, Brazil. *J Pediatr* 2009; 85: 67-71.
31. Moschonis G, Tanagra S, Vandorou A, Kyriakou AE, Dede V, Siatitsa PE et al. Social, economic and demographic correlates of overweight and obesity in primary-school children: preliminary data from the Healthy Growth Study. *Public Health Nutr* 2010; 13(10A): 1693-700.
32. Troncon JK, Gomes JP, Guerra-Júnior G, Lalli CA. Prevalência de obesidade em crianças de uma escola pública e de um ambulatório geral de Pediatria de hospital universitário. *Rev Paul Pediatr* 2007; 25: 305-10.
33. Toral N, Slater B, Cintra IdP, Fisberg M. Comportamento alimentar de adolescentes em relação ao consumo de frutas e verduras. *Rev Nutr* 2006; 19: 331-40.
34. Moura EC, Morais Neto OL, Malta DC, Moura L, Silva NN, Bernal R, et al. Vigilância de Fatores de Risco para Doenças Crônicas por Inquérito Telefônico nas capitais dos 26 estados brasileiros e no Distrito Federal (2006). *Rev Bras Epidemiol* 2008; 11: 20-37. 35.
35. Neto GAB, Polito MD, Lira VA. Fidedignidade entre peso e estatura reportados e medidos e a influência do histórico de atividade física em indivíduos que procuram a prática supervisionada de exercícios. *Rev Bras Med Esporte* 2005; 11: 141-5.
36. Fonseca MJM, Faerstein E, Chor D, Lopes CS. Validade de peso e estatura informados e índice de massa corporal: estudo pró-saúde. *Rev Saúde Pública* 2004; 38: 392-8.
37. Santa Catarina. Lei nº 12.061, de 18 de dezembro de 2001. Dispõe sobre critérios de concessão de serviços de lanches e bebidas nas unidades educacionais, localizadas no Estado de Santa Catarina. Lex: Diário Oficial do Estado de Santa Catarina, p.1, 20 de dezembro de 2001.

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