

# Obesity, eating habits and nutritional knowledge among school children

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## Keywords

Obesity. Food habits. Nutrition, education. School health. Health knowledge. Attitudes. Practice.

## Abstract

### Objective

To evaluate the association between obesity and eating habits and nutritional knowledge among schoolchildren.

### Methods

Weight and height were measured in 573 schoolchildren of public schools in two cities of State of Rio Grande do Sul, Southern Brazil. Obesity was defined as Body Mass Index above the 95th percentile based on the National Center for Health Statistics (NCHS) criteria. Eating habits and nutrition knowledge were evaluated using a self-administered questionnaire. Simple and adjusted logistic regression models were used to assess associations.

### Results

Obesity among children was found to be associated with limited nutrition knowledge and unhealthy eating and habits. These children were five times more likely to be obese (OR=5.3;1.1-24.9).

### Conclusions

The level of knowledge affects the association between obesity and eating habits, and there's reason to suspect that children who have more nutrition knowledge report habits known to be healthier but not necessarily the ones they actually practice. Taking into account children's level of knowledge, unhealthy habits were strongly associated to obesity.

## INTRODUCTION

In Brazil, the progression of the nutritional transition has been detected. It has been characterized by the reduction of the prevalence of nutritional deficits and the more expressive occurrence of overweight and obesity, not only in the adult population, but also among children and adolescents.<sup>2,3</sup> According to environmental theories, causes of this phenomenon are fundamentally related to changes in life style and eating habits. Confirming these theories, it may be verified that obesity occurs more frequently in the more developed regions of the country (South and Southeast), due to the changes in habits associated with this process.<sup>2</sup>

Food intake has been related to obesity not only in terms of the volume of food ingested, but also in terms of the composition and quality of the diet. Furthermore, eating habits have also changed and current habits - including the low consumption of fruits, greens<sup>5</sup> and milk,<sup>6</sup> increasing consumption of tidbits/goodies (cookies with fillings, salty industrialized snacks, sweets) and soft drinks,<sup>3</sup> as well as not having breakfast<sup>14</sup> - help explain, at least partially, the continuous increase in adiposity among children.<sup>13</sup>

In order to promote healthier eating habits, and, consequently, decrease the rates of obesity, knowledge about food and nutrition is believed to be important. However, studies have not found significant

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differences between obese and eutrophic children and adolescents with respect to their knowledge concerning nutrition.<sup>17,20</sup> On the other hand, studies that utilized nutritional education as an intervention strategy,<sup>11,15</sup> have reported an improvement in nutritional knowledge, attitudes and eating habits, that also influenced the family's eating habits. However, knowledge alone doesn't seem to be enough to change eating habits sufficiently to lead to modifications in the body mass index (BMI).

Given the increasing prevalences of obesity, it has become urgent to study strategies that make it possible to control this tendency. Eating habits are singled out as direct determinants of this pathology and nutritional education has been discussed as a tactic to be employed so that the population may enjoy a healthier diet and, thereby, attain a more appropriate weight. Studies that have evaluated associations between level of knowledge with respect to nutrition and eating habits among Brazilian pre-adolescents are scarce. Therefore, intending to contribute towards knowledge in this area, the objective of the present study was to evaluate the association between obesity, eating habits and nutritional knowledge among children aged eight to 10 years.

## METHODS

This is a cross-sectional study, conducted in the districts of *Dois Irmãos* and *Morro Reuter* (Rio Grande do Sul State) with all the 3<sup>rd</sup> and 4<sup>th</sup> grade students aged eight to 10 in the public municipal schools in the period between March and July, 2003. The population of these districts is of approximately 25,000 and 5,000 inhabitants respectively, most of which are German descendents. There was a total of 607 school children within the age set included in this study and they were distributed among 16 schools. Within this universe, 23 were not present on the day the questionnaire was applied and 11 were not evaluated because they did not have their parent's consent. As a whole, these losses represent 5.6% of the total population. None of the children refused to participate in this study.

Anthropometric measures (weight and height) were taken in order to calculate BMI when verifying current nutritional status. The reference population utilized was the one proposed by Must et al,<sup>12</sup> utilizing data from the *National Health and Nutrition Examination Survey* (NHANES). Thus, children with BMI over the 85<sup>th</sup> percentile were considered overweight and those with BMI over the 95<sup>th</sup> percentile were considered obese.

The anthropometric measure were collected at the

school, in what is considered a standardized procedure, according to Jelliffe.<sup>7</sup> Children were weighed in light clothes and barefoot, on a digital balance with a carrying capacity of 150 kg and 100 g precision. Height was obtained by means of a 200 cm tapeline with 0.1 cm precision. Both these measures were collected by a single evaluator, who always utilized the same routinely calibrated equipment.

Information on eating habits and knowledge concerning nutrition were obtained by utilizing a standardized self-administered questionnaire. Each question was read out loud to the entire class. The questions were formulated on the basis of existing questionnaires,<sup>16,19</sup> which were adapted to the context of the population being investigated. Professionals from the field of nutrition collaborated in formulating the questions and pedagogues verified the discourse utilized. The pretest was conducted in three classes of approximately 20 students (two classes in *Dois Irmãos* and one in *Morro Reuter*) in other schools, being applied in different manners so as to verify which was the best way to collect data. In its final version, the instrument contained seven multiple-choice questions concerning eating habits, among the age set being studied. Each question had the following options as replies: 'consumes it (this product) every day', 'almost every day'; 'once in a while' or 'does not consume it'. The more frequent the habit of eating breakfast, consuming milk, fruits and greens and the less frequent the habit of consuming soft drinks and snacks, the higher the eating practice scores would be and the better the eating habits (results could vary from 6 to 23 points). The level of knowledge in nutrition was qualified by means of 12 illustrated questions on knowledge concerning foods which are sources of fibers, fats, vitamins, minerals and energy, as well as on knowledge concerning healthier foods. In reply to these questions, aside from the alternative "I don't know", only one of two options was correct. Each question answered correctly was equivalent to one point. Wrong answers and "I don't know" did not receive scores. The scores varied from zero to 12.

Parents' total number of years of schooling was a variable collected by means of a questionnaire sent to the child's mother or guardian. The variables residential zone and age were gathered from each child's school records.

Version 10.0 of the SPSS Program was utilized in all the statistical analysis undertaken in this study. In order to verify associations between obesity and sociodemographic variables, eating habits and nutritional knowledge, odds ratio and their respective con-

fidence intervals were calculated by means of simple logistic regression. In order to identify the specific eating habits associated with obesity, replies classified as frequent were “consumes every day or almost every day” and as infrequent were “consumes once in awhile or does not consume”. When scores were higher than the median (>12), eating habits were considered healthier and when scores were lower than or equal to this value ( $\leq 12$ ), eating habits were considered less healthy. The variable level of nutritional knowledge was categorized in “is more knowledgeable” when the score was equal to or above the 75<sup>th</sup> percentile ( $\geq 8$  correct replies) and “less knowledgeable” when the score was below the 75<sup>th</sup> percentile (<8 correct replies). In order to verify the associations and interactions between variables simple and adjusted logistic regression were utilized. Differences of  $p \leq 0,05$  were considered significant.

The project was approved by the *Comissão Científica e Comissão de Pesquisa e Ética em Saúde do Hospital de Clínicas de Porto Alegre* [Scientific Committee and the Ethics and Research Committee of the Porto Alegre Clinics Hospital], by the municipal governments and school directors in which the study took place. Informed consent was signed by the parents and guardians. When data was collected, children were also asked for their consent orally.

## RESULTS

Table 1 summarizes the characteristics of the population. The predominance of girls (52,5%) may be verified as well as the concentration of students residing in the urban area (86,7%). The majority (84%) of the parents only had primary school education (complete or incomplete). The prevalence of overweight was 16.% and of obesity was 7.5%.

**Table 1** - Socio-demographic characteristics of children from public schools (n=573). Dois Irmãos and Morro Reuter, RS, 2003.

Characteristics	N (%)	%
Age (years)		
8	93	16.2
9	264	46.1
10	216	37.7
Sex		
Male	272	47.5
Female	301	52.5
Grade		
3 <sup>rd</sup> grade	299	52.2
4 <sup>th</sup> grade	274	47.8
Residential zone		
Urban	497	86.7
Rural	76	13.3
Years of schooling - mother		
$\leq 4$	173	30.2
5 to 8	312	54.5
>8	86	15.0
Nutritional state		
<85 <sup>th</sup> Percentile	476	83.1
$\geq 85^{\text{th}}$ Percentile (overweight)	97	16.9
$\geq 95^{\text{th}}$ Percentile (obesity)	43	7.5

Table 2 describes the results of the simple logistic regression of the associations between obesity and selected variables. Eating habits was the only variable significantly ( $p < 0.05$ ) associated to obesity. Younger age presented an increased risk of obesity, but it was not significant ( $p = 0.20$ ). The same occurred for residents in the urban area, that had twice as many chances of presenting obesity than those in the rural area ( $p = 0.21$ ). The prevalence of overweight and obesity for the female sex was, respectively, 16.6% and 7.6%, and for the male sex, 17.3% and 7.4%, indicating many similarities. Knowledge that children had concerning nutrition was not directly related to overweight or obesity.

Table 3 indicates the results of bivariate analysis to test the associations between obesity and specific eating habits. Low frequency in the habit of eating breakfast and low consumption of milk were significantly associated to obesity.

**Table 2** - Results of the simple logistic regression between obesity and variables. Dois Irmãos and Morro Reuter, RS, 2003.

Variables	Non obese (530) N (%)	Obese (43) N (%)	OR (CI 95%)	P
Sex				
Male	553 (92.6)	20 (7.4)	1.0 (0.5-1.8)	0.90
Female	550 (92.4)	23 (7.6)	1.0	
Age (years)				
8	563 (89.2)	10 (10.8)	1.7 (0.7-4.1)	0.20
9	554 (92.8)	19 (7.2)	1.1 (0.6-2.3)	0.76
10	559 (93.5)	14 (6.5)	1.0	
Residential zone				
Urban	533 (92)	40 (8.0)	2.1 (0.6-7.1)	0.21
Rural	570 (96.1)	3 (3.9)	1.0	
Years of schooling - mother				
$\leq 8$	545 (91.8)	28 (8.2)	1.3 (0.7-2.4)	0.47
>8	558 (93.5)	15 (6.5)	1.0	
Eating habits				
Healthier	560 (95)	13 (5.0)	1.0	0.04
Less healthy	543 (90.5)	30 (9.5)	2.0 (1.0-3.9)	
Knowledge in nutrition				
More knowledge	554 (91.2)	19 (8.8)	1.0	0.38
Less knowledge	549 (93.3)	24 (6.7)	0.8 (0.4-1.4)	

OR: Odds ratio

**Table 3** - Results of the simple logistic regression between frequency of specific eating habits and obesity. Dois Irmãos and Morro Reuter, RS, 2003.

Frequency of eating habits*	Non obese (530) N (%)	Obese (43) N (%)	OR (CI 95%)	p
Breakfast				
Frequent	470 (94.0)	30 (6.0)	1.0	=0.01
Infrequent	60 (82.2)	13 (17.8)	3.4 (1.7-6.9)	
Greens and vegetables				
Frequent	259 (92.8)	20 (7.2)	1.0	0.77
Infrequent	271 (92.2)	13 (17.8)	1.1 (0.6-2.0)	
Fruits				
Frequent	365 (92.6)	29 (7.4)	1.0	0.85
Infrequent	165 (92.2)	23 (7.8)	1.1 (0.6-2.1)	
Milk				
Frequent	330 (95.1)	17 (4.9)	1.0	=0.05
Infrequent	200 (88.5)	26 (11.5)	2.5 (1.3-4.8)	
Soft drinks				
Frequent	145 (92.9)	11 (7.1)	0.9 (0.5-1.9)	0.80
Infrequent	385 (92.3)	32 (7.7)	1.0	
Goodies				
Frequent	123 (93.2)	9 (6.8)	0.9 (0.4-1.9)	0.73
Infrequent	407 (92.3)	34 (7.7)	1.0	

\*Frequent = reply "consumes every day or almost every day" e Infrequent = reply "consumes once in awhile or does not consume"

As to knowledge concerning aspects of nutrition, 90.8% of the children correctly responded to the questions concerning foods that were sources of vitamins and minerals, 23.4% to the questions concerning healthier foods, 19% to the questions concerning foods rich in fats, 25.8% to the questions on food sources of fibers, and 4.9% to the questions on foods that supply the body with more energy.

In the tests conducted in order to evaluate possible interactions between variables, it was observed that there was an association between healthier eating habits and greater nutritional knowledge (OR=1.6; CI 95%: 1.1-2.2;  $p < 0.01$ ). The adjusted logistic regression analysis was modeled adding/including the following variables: eating practice, level of nutritional knowledge and the interaction between both these variables, as well as the number of years of schooling of the mother and the age of the child (see Table 4). These last two variables were included, although they have not shown significance in the bivariate analysis, for they are confounding factors given their possible relationship with eating habits and children's level of knowledge. In this model, eating habits have lost their significance and greater knowledge with respect to nutrition was associated to obesity. The interaction between eating habits and level of knowledge in nutrition proved to be highly associated to obesity, indicating that children with less knowledge and less healthy eating habits were 5 times more likely to be obese (OR=5.3; 1.1-24.9).

## DISCUSSION

Corroborating a tendency that has been reported in the literature, the present study indicates an association between eating habits that are less healthy and obesity.

Not having breakfast in the morning and low frequency of milk consumption were the specific practices associated to obesity, which could possibly signify a mistaken attempt to reduce calorie intake. Niklas et al<sup>13</sup> argue that the regular consumption of breakfast may control body weight due to the decrease in the consumption of fats in the diet because of the role it plays in minimizing the intake of high energy snacks. Children that eat breakfast would have a greater intake of grains, fruits and dairy products. As to dairy products, this study reinforced the above hypothesis, since milk consumption, as reported by the obese school children, was less frequent when compared to children who were not obese. According to Harnack et al,<sup>6</sup> the intake of soft drinks is preferred to that of more nourishing beverages such as milk and juices, which could partially explain the lower consumption of milk among the obese. This fact, however, did not occur in the present population, since there was no difference between obese and non-obese children with respect to the self-reported consumption of soft drinks. Another factor implied in the increase in the prevalence of obesity is the recent and excessive commercialization of several foods rich in energy and fats, at the disposal of school children. On the other hand, foods such as greens and fruits are increasingly lacking in children's diet.

Although other studies conducted with children and adolescents have not shown the relation between knowledge of nutrition and obesity, the present research indicates that the level of knowledge in nutrition is greater among obese children. They possibly are more interested and/or more likely to receive information on this subject than their classmates, due to their condition. However, this greater knowledge in nutrition had no effect on their BMI. According to

**Table 4** - Results of the multiple logistic regression between obesity and selected variables. Dois Irmãos and Morro Reuter, RS, 2003.

Variable	Total OR Adjusted (CI 95%)
Eating habits	
Healthier	1.0
Less healthy	1.0 (0.4-2.6)
Level of knowledge	
More knowledge	1.0
Less knowledge	0.2 (0.1-0.8)
Interaction between eating habits and level of nutritional knowledge	5.3 (1.1-24.9)
Age (in months)	1.0 (0.9-1.0)
Years of schooling - mother	1.0 (0.9-1.1)

intervention studies<sup>11,15</sup> that utilized nutritional education in schools as one of their strategies, this resulted merely in an increase in knowledge and in improvements in some attitudes and eating habits. Muller et al<sup>11</sup> point out that it is improbable that isolated interventions in a single area will solve the problem of obesity. These authors affirm that parents' influence, peer pressure, publicity and self-image among other factors should also be taken into consideration when developing strategies to confront the complexity of causes involved. Furthermore, the children showed limited knowledge concerning aspects of nutrition. Brazilian studies<sup>4,8</sup> confirmed that the concepts of eating habits and nutrition provide out-of-date and incomplete information concerning the role of diet in the prevention of chronic illnesses and that there are great gaps in this area of education. As to the few correct replies with respect to foods that are sources of energy, it is possible that they had difficulty understanding the question. The latter was, "which of the foods mentioned below provide more energy to the body?" and may have resulted in two different connotations, giving rise to confusion in the replies. In other words, the objective of the question was unclear, whether it was to verify the student's knowledge concerning the function of the foods, or, their caloric value.

Eating habits that were less healthy, when the level of nutritional knowledge of school children was taken into consideration, were strongly associated with obesity. This fact leads to reflections on the limitations of the instruments that children are asked to fill out, including the questionnaire utilized in this study. Choosing or elaborating an appropriate instrument is not an easy task, since children are influenced by their cognitive abilities, their weight status, and by the way in which the questions are formulated. Furthermore, their eating habits change rapidly and they are less skillful in registering, estimating and cooperating which would be the best method for evaluating children's diet in this age range. Considering the issues mentioned above, Livingstone & Robson<sup>9</sup> state that, from the age of seven or eight, there is a swift increase in children's ability to answer self-adminis-

tered food frequency questionnaires without their parents' assistance, but only with respect to the recent past, not more than a day. These findings have been endorsed by other authors,<sup>10,21</sup> that argue that, within this age range, there is an inability to conceptualize frequencies and averages. Rockett and Colditz,<sup>18</sup> upon comparing the self-administered food frequency questionnaire applied among children with other methods, verified that there were a small number of validation studies in this group and that results were variable, confirming the need to conduct more evaluations. However a simplified food frequency questionnaire was applied in this study because it is considered a method that may be self-administered and is easy to understand, reducing the time and costs involved in its application and analysis. Furthermore, the objective of this study was merely to verify a few eating habits mentioned more frequently in the literature as being related to obesity, without the intention of quantifying nutrients and calories. It must be stressed that the present study is the first to raise the issue that nutritional knowledge among children may result in a bias. It is possible that children with less knowledge report eating habits in a more accurate and trustworthy manner. Those children with greater knowledge may report eating habits that they know are healthier, but that are not necessarily practiced.

Although the objective of this study was not to evaluate the prevalences of overweight and obesity, it must be stressed that the data from this study is very similar to that found in other studies conducted in Brazil among populations of school children. Dos Anjos et al,<sup>1</sup> in a recent study involving a probabilistic sample of school children aged 7 to 10 years old in the city of Rio de Janeiro, the prevalences found for each sex were similar to the ones found among the population of the present study (among the girls, 17.2% were overweight and 5.2% were obese and, among the boys, 15% were overweight and 5.3% were obese), although other criteria were utilized in diagnosis. Furthermore, a higher concentration of obese children were found in the urban area, although not statistically significant, ratifying the idea that habits involving food intake and physical activity were

more propitious to lead to obesity in these residential sites.

Although the study population has its peculiarities due to the fact that they come from small towns in the interior and are predominantly of German origin, the results of the present study may be extrapolated to other populations of Brazilian public school children within the same age group.

Due to the fact that the sample population studied was representative of the age group being evaluated, and because of the few number of losses, it may be stated that the data obtained corresponds to the target population.

In search of new strategies to combat obesity, nutritional education has been addressed as a new binomial to be followed – education/nutrition, besides the already indexed income/nutrition. Children have little knowledge concerning nutrition and eating habits,

indicating that the schools, parents and the media have disseminated insufficient and ineffective messages concerning healthier eating habits. The relation between nutritional knowledge and nutritional state suggest that other factors, such as a favorable environment for putting intentions to improve the quality of the diet into practice, are essential for modifying nutritional state or preventing obesity. Therefore, interventions must go much further than simply promoting nutritional knowledge. Integrated actions directed towards children's health involving families, schools, communities, and the food industry are necessary as well as a health system in which prevention is a priority. New studies conducting in-depth investigations of the nutritional deviations in communities and testing strategies to control obesity are necessary in order to impede the dissemination of this epidemic. The findings indicated that it is also necessary to evaluate more carefully and to improve the instruments utilized to investigate eating habits among children, so as to minimize as much as possible the potential biases.

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