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Socioeconomic predictors of child diet quality

ABSTRACT

OBJECTIVE: To develop a diet quality index and to analyze socioeconomic factors associated with low child diet quality.

METHODS: A cross-sectional study was performed with a representative sample of 1,282 children aged between seven and ten years, living in the city of Vitória, Southeastern Brazil, in 2007. Children were randomly selected from 26 public schools and six private schools. Data on socioeconomic characteristics and life habits of children were obtained from a structured questionnaire, sent to homes and preferably completed by mothers. A food frequency questionnaire was created from studies performed with Brazilian children and tested in a public school. An index entitled *Índice de Alimentação do Escolar* (ALES – School Child Diet Index) was designed to assess diet quality, taking in consideration the nutritional recommendations for the Brazilian population and the habit of having breakfast. The association between diet quality and socioeconomic factors was analyzed using multinomial logistic regression. Adjusted odds ratios and 95% confidence intervals were estimated for the variables that remained in the model.

RESULTS: According to the ALES index, approximately 41% of the children studied had low diet quality (boys= 37.7%, girls= 42.7%, p= 0.179). There were no significant differences between sex, age, maternal employment status and living with the mother and diet quality. The variables that remained associated with low diet quality were low maternal level of education (OR= 3.93; 95% CI: 2.58;5.99), father not present in the household (OR= 2.03; 95% CI: 1.68;2.99) and not having lunch at the table (OR= 1.47; 95% CI: 1.12;1.93).

CONCLUSIONS: Low maternal level of education increased the probability of a child not consuming a good quality diet, whether due to lack of access to healthy foods and adequate information or poorer ability to discern what is healthy.

DESCRIPTORS: Child Nutrition. Indicators. Feeding. School Feeding. Socioeconomic Factors. Cross-Sectional Studies.

INTRODUCTION

Different assessment methods are used to study the relationship between diet and diseases.[23] Indices are recommended to evaluate diet quality, because they are based on specific nutritional recommendations[8,19] and also enable a single measure to provide a global assessment and knowledge about characteristics.[7] Thus, indices allow a faster and more adequate diagnosis of the conditions that predispose the early appearance and development of chronic diseases in a certain context. In Brazil, although food intake questionnaires[1] have been developed and validated, no indices have been proposed to evaluate child diet quality, as already performed in other countries.[19]

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Socioeconomic, demographic and cultural factors associated with diet quality have also been the object of studies, in addition to those related to feeding practices. Household income and maternal level of education are among the socioeconomic factors used to determine diet quality.[9,22] With regard to feeding practices, studies indicate a positive association between the habit of having breakfast (first morning meal) and general health, especially in terms of preventing weight excess and child obesity,[10] in view of the importance of this meal in regulating food intake throughout the day.[24] Although the relationship between not having breakfast and the risk of weight excess is well-known, there is evidence that this practice has decreased in Western children.[20] In the Spanish population, Serra et al[18] showed that obesity is higher in children who do not have breakfast, regardless of the caloric intake. In this study, the habit of having breakfast was incorporated into an index to evaluate child diet quality.

The present study aimed to develop an index of child diet quality and analyze the socioeconomic factors associated with poor diet quality.

METHODS

A cross-sectional study was performed with 1,282 school children aged between seven and ten years (538 boys and 744 girls), enrolled in grades one through four of elementary education in 26 public schools and six private schools (99% coverage) during the Projeto Saúde e Nutrição de Escolares (Saúdes – School Children Nutrition and Health Project) in the city of Vitória, Southeastern Brazil, in 2007. In Vitória, approximately 20% of children enrolled in the first grade of primary education are in private schools. Two-stage cluster sampling was performed, where the school was the primary unit and the class was the secondary unit. Data were stratified according to type of school (public or private), sex (male and female) and age (seven, eight, nine and ten years). A total of 40 children per school was defined using the optimum number criterion,[21] which reduces costs of direct child access, compared to school access, and considers the intraclass correlation of students of the same school.

Socioeconomic data and life habits were obtained from a structured questionnaire sent to the child's home and preferably completed by the mother or possible caregivers, when the former is absent. Information about child diet was obtained from a food frequency questionnaire (FFQ) with 18 food items, based on studies performed with children[14] or adolescents[4] in Brazil. Fish consumption frequency was included into the FFQ, because this is a typical food in this region and because it is part of the recommendations for the Brazilian population.[a] Concomitantly with the data collection, a study of reproducibility of the FFQ was performed with a sub-sample, similar to the Projeto Saúdes in terms of child sex and age group (n=91). A moderate (kappa between 0.6 and 0.8) or very good agreement (kappa >0.8) was obtained for practically all FFQ foods. According to Willet,[23] corresponding values of about 0.6 and 0.8 are considered good dietary assessment instruments. Foods that did not achieve an agreement equal to or higher than 0.6 were not included in the analysis, such as "cold cuts" and "cooked tubers". In addition, "rice" and "beef/chicken" were not included because they do not discriminate this group's regular diet.

An indicator known as Índice de Alimentação do Escolar (ALES – School Child Diet Index) was developed to evaluate diet quality, based on the frequency of consumption of 15 food items and that of having breakfast. This proposal was developed based on a similar study performed with children and adolescents in Spain,[19] which was not reproduced in Brazil. A score was given to each specific frequency, according to the FFQ structure (Table 1). Scoring (positive or negative) was based on the healthy diet directives recommended by the Brazilian Ministry of Health.[a] For foods/food groups recommended to be eaten daily, one point was added when foods such as fruits, vegetables, beans and milk were consumed daily. In the case of consumption lower than seven times a week (two to four times a week, depending on the food/food group), one point was subtracted. In addition, one point was added for consumption of items considered to be of low nutritional quality, such as candies, soft drinks, fried foods, instant noodles, hamburgers and mayonnaise, two times a week or less; while one point was subtracted when such were consumed daily. No value was given to frequencies not shown in Table 1.

Individual frequency values were added and distributed into tertiles, thus comprising three food quality categories: < 3, poor quality; between $3 \geq$ and < 6, average quality; ≥ 6, good quality.

The following variables were analyzed to study the socioeconomic factors associated with the ALES Index: socioeconomic class (A, B, C, D and E), based on the level of education of the head of family and ownership of assets;[b] maternal level of education (illiterate and/or incomplete primary education, secondary education and higher education); maternal employment status (working out of home, unemployed or housewife); child ethnicity (white and non-white); child age (seven,

[a] Ministério da Saúde. Guia alimentar para a população brasileira. Brasília, DF; 2006.
[b] Associação Nacional das Empresas de Pesquisa de Mercado / Associação Brasileira dos Institutos de Pesquisa de Mercado. Critério de Classificação Socioeconômica Brasil (CCSEB). São Paulo; 1997.

eight, nine and ten years); child sex (male and female); whether the child lives with the father (yes or no) and place where meals are eaten (at the table or not).

Socioeconomic class was regrouped into three categories: A/B, C and D/E, due to the small number of families in socioeconomic classes A (n= 34) and E (n= 18). Interviewers were trained to identify ethnicity and thus classify children into white and non-white. Children were assessed during anthropometric tests, performed in the school environment and classified by two different evaluators. In the case of disagreement, classification was made by a third evaluator and agreement between two assessments was recorded.

Qualitative variables were shown in percentages and the chi-square test (χ^2) was used to test the hypothesis of homogeneity of proportions. Next, multivariate analysis was made, with the use of multinomial logistic regression procedures. The dependent variable was diet quality (ALES Index), whose condition identified as "good quality" was the reference category. Variables were included when having a 5% significance level, used for any of the response-variable categories. Data were analyzed using the SPSS statistical package, version 17.0.

Of all the 1,637 families who authorized their children to participate in this study, 336 (20.5%) were not present in its second stage (completion of questionnaire sent to homes) and 19 questionnaires were excluded in the quality control stage. Thus, data from 1,282 children were obtained and evaluated, and the outcomes of the Projeto Saúdes were assessed according to such. The present study was approved by the Research Ethics Committee of the Centro de Ciências da Saúde da Universidade Federal do Espírito Santo (Process 089/06, approved on 26/10/2006). Parents authorized their children's participation by signing an informed consent form, sent to their homes before data were collected in the school.

RESULTS

A mean value of ALES Index equal to 4.3, (SD= 3.5), minimum and maximum values of -9 and 14, were found, respectively. Table 2 shows the relationship between the socioeconomic variables studied and diet quality. Significant differences were observed between diet quality and the following variables: ethnicity, socioeconomic class, head of family, maternal level of education, whether child lives with father and whether child eats at the table ($p<0.001$).

It could be observed that 521 (40.6%) children consumed a diet of poor quality; 311 (24.3%), one of average quality; and 450 (35.1%), one of good quality. There were no statistically significant differences between child sex, child age, maternal employment status and whether the child lived with the mother in the same home and diet quality.

Table 3 shows the results of multinomial logistic regression. The variables that remained associated with poor diet quality were as follows: low maternal level of education (OR=3.93; 95% CI: 2.58;5.99), father absent from home (OR=2.03; 95% CI 1.68;2.99), and not eating lunch at the table (OR=1.47; 95% CI: 1.12;1.93). It should be emphasized that the mother being illiterate or not having completed primary education increases the probability of a child having a poor diet quality by approximately four times and this risk decreases with the increase in level of education.

Table 1. Frequency and respective score of food consumption and the habit of having breakfast in children. City of Vitória, Southeastern Brazil, 2007.

Eats fruits daily	+1
Eats raw vegetables daily	+1
Eats cooked vegetables daily	+1
Eats beans daily	+1
Drinks milk daily	+1
Eats fish at least once a week	+1
Eats candies two times a week or less	+1
Eats cookies two times a week or less	+1
Drinks soft drinks two times a week or less	+1
Does not eat hamburgers or rarely eats them	+1
Eats fried snacks two times a week or less	+1
Eats French fries, fried cassava or fried bananas one time a week or less	+1
Does not eat mayonnaise or rarely eats it	+1
Does not eat instant noodles or eats it rarely	+1
Eats breakfast daily	+1
Drinks natural juice daily	+1
Eats fruits two times a week or less	-1
Eats raw vegetables less than four times a week	-1
Eats cooked vegetables less than four times a week	-1
Eats beans less than two times a week	-1
Drinks milk less than four times a week	-1
Eats fish less than once a week	-1
Eats candies daily	-1
Eats cookies daily	-1
Drinks soft drinks daily	-1
Eats hamburgers daily	-1
Eats fried snacks daily	-1
Eats French fries, fried cassava and fried bananas daily	-1
Eats mayonnaise daily	-1
Eats instant noodles daily	-1
Does not usually have breakfast	-1

DISCUSSION

In the present study, socioeconomic factors such as maternal level of education, father present in the home and child not eating at the table increase the risk of a child consuming a diet of poor quality. Such factors are associated with family structure and the modern urban way of life.

With regard to the variables associated with child diet quality, it could be inferred that the socioeconomic conditions of families greatly determine the diet

Table 2. Characterization of the sample studied, according to child diet quality (ALES Index). City of Vitória, Southeastern Brazil, 2007.

Variable	Total		Diet quality (ALES Index)						p-value
			Poor		Average		Good		
	n	%	n	%	n	%	n	%	
Sex									0.179
Male	538	42.0	203	37.7	134	24.9	201	37.4	
Female	744	58.0	318	42.7	177	23.8	249	33.5	
Age (years)									0.568
7	252	19.7	103	40.9	69	27.4	80	31.7	
8	359	28.0	141	39.3	82	22.8	136	37.9	
9	360	28.1	142	39.5	85	23.6	133	36.9	
10	311	24.3	135	43.4	75	24.1	101	32.5	
Ethnicity									0.001
White	419	33.5	129	30.8	104	24.8	186	44.4	
Non-white	832	66.5	376	45.2	201	24.2	255	30.6	
Socioeconomic class									0.001
A / B	262	23.3	68	26.0	66	25.2	128	48.8	
C	394	35.1	148	37.5	100	25.4	146	37.1	
D / E	467	41.6	224	48.0	113	24.2	130	27.8	
Head of family									0.001
Father	487	38.0	177	36.3	107	22	203	41.7	
Mother	431	33.6	190	36.5	102	32.8	139	32.2	
Grandparent	33	2.6	13	39.4	14	42.4	6	18.2	
Others/undefined	331	25.8	141	42.6	88	26.6	102	30.8	
Maternal level of education									0.001
Incomplete primary education	356	27.8	197	55.4	67	18.8	92	25.8	
Complete primary education	251	19.6	114	45.4	58	23.1	79	31.5	
Secondary education	456	35.6	155	34.0	137	30.0	164	36.0	
Higher education	219	17.1	55	25.1	49	22.4	115	52.5	
Lives with the father									0.001
Yes	869	68.4	320	36.8	201	23.1	348	40.1	
No	401	31.6	198	49.4	107	26.7	96	23.9	
Lives with the mother									0.066
Yes	1196	93.3	479	40.1	285	23.8	432	36.1	
No	86	6.7	40	46.5	25	29.1	21	24.4	
Maternal employment status									0.068
Employed/self-employed	782	62.4	303	38.7	183	23.4	296	37.9	
Unemployed/temporary job	232	18.5	108	46.5	60	25.9	64	27.6	
Housewife	240	19.1	97	40.4	61	25.4	82	34.2	
Has lunch at the table									0.001
Yes	509	39.8	176	34.6	114	22.4	219	43.0	
No	769	60.2	343	44.6	197	25.6	229	29.8	
Total	1,282	100	521	40.6	311	24.3	450	35.1	

Table 3. Crude and adjusted odds ratios and confidence intervals of factors associated with child diet quality. City of Vitória, Southeastern Brazil, 2007.

Variable	Diet quality			
	Poor		Average	
	Crude OR (95% CI)	Adjusted OR (95% CI)	Crude OR (95% CI)	Adjusted OR (95% CI)
Lives with the father				
No	2.24 (1.68;2.99)	2.03 (1.68;2.99)	1.93 (1.39;2.67)	1.85 (1.33;2.58)
Maternal level of education				
Incomplete primary education	4.48 (2.98;6.71)	3.93 (2.58;5.99)	1.71 (1.08;2.70)	1.49 (0.93;2.39)
Complete primary education	3.02 (1.96;4.64)	2.62 (1.68;4.08)	1.72 (1.07;2.77)	1.47 (0.09;2.39)
Secondary education	1.98 (1.34;2.92)	1.85 (1.24;2.75)	1.96 (1.31;2.94)	1.78 (1.18;2.68)
Has lunch at the table				
No	1.86 (1.43;2.41)	1.47 (1.12;1.93)	1.64 (1.22;2.20)	1.48 (1.09;2.01)

consumed by the child, as observed in other studies.[9,16] In the present study, low maternal level of education increased the probability of a child having a diet of poor quality, probably because their level of education determines the ability to purchase healthier foods, in addition to access to adequate information. Moreover, mothers with more years of education are more likely to discern between what is in fact considered healthy food and what is not, in view of food companies' mass use of direct marketing of their products in all means of communication. There is evidence that the marketing of food products influences child dietary habits and choices,[3] which could lead to excessive weight gain.[26]

In addition, it has been observed that maternal level of education influences the perception that mothers have of their children's nutritional status. As a result, women with a lower level of education show a higher percentage of disagreement between their perception and the nutritional status measured,[13] which could be considered as another risk of obesity in children and future adults.[2,11] By not recognizing that their children are overweight or obese, mothers may not perform important actions to prevent excessive weight gain in preadolescence, which could result in greater problems in the short and medium terms, not only from a physical, but also psychological point of view. Probably, mothers who recognize their children's nutritional status more adequately can contribute to the maintenance of a healthy weight, even though, in certain situations, other risk factors may be present, such as genetic factors or other diseases. A study performed with mothers of children in this stage of life showed that those most concerned about their children's weight were the ones who least forced them to eat and most restricted the consumption of foods,[12] among which low nutritional quality ones could be present.

On the other hand, the variables associated with family structure and way of life, such as the child living with the father in the same home and the child having a specific time and place to eat their meals, lead to lower probability of their having a low quality diet, in addition to the fact that watching television during meals changes caloric intake[6] and exposes children to a large amount of food marketing,[17] which could increase the risk of development of nutritional problems.

Although the absence of the father is a risk factor for a good quality diet, not subject to technical or political interventions, food choices also depend on how the family is structured and their values, regardless of the family make-up.[5] This, in its turn, reflects not only the access to healthier foods, which have a higher cost in Brazil, but also how certain traditional habits, considered to be healthier, change when exposed to other conditions, independently from income.

Thus, knowledge about child diet quality and the factors associated with it is very important to subsidize actions that promote a healthy life for both the parents/family members and the children, as the latter find themselves in a stage when they are easily influenced in a negative (television, friends, advertisements in school cafeterias) and positive way.[15] Childhood seems to be a stage of the life cycle when there are ideal conditions to change dietary habits and lifestyles, which, in their turn, can have repercussions on future healthier choices.

It is essential that the need of a child to have a specific time for meals, in an adequate place, be present, in addition to correct information about the diet, because eating in front of the television is probably unhealthier. Moreover, by doing this, children are more exposed to advertising at times when they could be in contact with other people, probably experiencing other practices. It should be emphasized that the length of time children are exposed to television is excessive, especially in Western societies.

One possible limitation to this study refers to the method of dietary assessment itself. If on the one hand the use of a short food frequency questionnaire

has advantages over long versions, on the other hand this could lead to an underestimation of consumption of certain foods, once it is necessary to group several foods that are frequently consumed into a single item. In the case of children, this choice can be an advantage, in view of the protocol that can be followed with children, in the age group studied. In the present study, the mother or caregiver received written instructions on how to complete the FFQ, something that could reduce information bias. Nonetheless, the results of the study of reproducibility showed low agreement of two FFQ items, which were excluded from the proposed index.

Another limitation is the use of a questionnaire that only aims to provide information about the frequency of food items, not enabling food portions or food groups consumed throughout a certain period of time to be quantified. Thus, the instrument itself prevents the comparison with recommendations that also consider the number of portions that should be consumed daily.

In addition, the results of the present study show the need to improve child diet quality, because, according to the ALES Index, the majority of these children consume a diet of poor or average quality, making it necessary to further promote the daily consumption of protective foods and healthy dietary habits. According to the World Health Organization (WHO),[25] low consumption of fruits and vegetables is one of the main factors that cause diseases worldwide.

Aiming to monitor child diet quality, the ALES Index could be used by health professionals and services, in addition to children's families, in view of the practicality and adequacy of this instrument in the Brazilian context.

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