Frequency of fiber-rich food intake and associated factors in a Southern Brazilian population

Freqüência do consumo de alimentos fontes de fibras e fatores associados em população do Sul do Brasil

Samanta Winck Madruga [1]
Cora Luiza Araújo [1]
Andréa Dâmaso Bertoldi [1,2]

[1] Programa de Pós-graduação em Epidemiologia, Universidade Federal de Pelotas, Pelotas, Brasil.
[2] Universidade do Vale do Rio dos Sinos, Centro de Ciências da Saúde, São Leopoldo, Brasil.

Correspondence
S. W. Madruga
Programa de Pós-graduação em Epidemiologia, Universidade Federal de Pelotas.
Rua Marechal Deodoro 1160, 3º piso, Pelotas, RS 96020-220, Brasil.
samantamadruga@yahoo.com.br

Abstract

The objective of this study was to verify the frequency of fiber-rich food intake and evaluate its association with socioeconomic, demographic and behavioral characteristics. A city representative sample was selected and 3,993 subjects (≥ 10 years) were interviewed. The study used the Block Screening Questionnaire. A majority of subjects – 65.6% (95%CI: 64.2-67.1) – presented an inadequate intake frequency. Adjusted analysis for the overall sample showed an increased risk of inadequate frequency among men, adolescents, people of lower socioeconomic levels, current smokers, those insufficiently active and those having fewer than four daily meals. Age group-stratified analysis showed that among adolescents, living alone was a risk factor; for adults, risk factors were sex (male), current smoker, insufficiently active and fewer than four daily meals and; among the elderly they were male and being a current smoker. A lower socioeconomic level was associated to the outcome in all groups. Although the inadequate frequency of intake is very common in this population, teenagers are at a higher risk, pointing to a need for public health actions targeting this particular age group.

Dietary Fiber; Food Habits; Food Consumption

Introduction

Chronic diseases currently represent a worldwide epidemic and Brazil is no exception. Large portions of the population suffering from such diseases contribute to an increase in mortality and to an aggravation of cardiovascular problems, as population health statistics indicate [1].

Among other factors, a well designed and balanced diet is essential for the prevention and even treatment of some diseases. Dietary fibers, in particular, play a major role in the metabolism, mostly by reducing cholesterol levels and glycemia. Besides, dietary fibers help to keep a healthy bodyweight and are fundamental to stimulate optimal gastrointestinal functions [2,4,5,6].

Few population studies have been carried out to investigate dietary fiber consumption [7,8,9,10].

To obtain information on population food and/or nutrients consumption, food frequency questionnaires are the leading research tools. Specifically, the *Food Frequency Questionnaire* method has been broadly used to study eating habits and/or individuals' usual diets and, is largely employed in epidemiological studies [11,12].

Due to the lack of studies relating to dietary fiber consumption habits, especially in developing countries, the present study aims to investigate the subject in a Southern Brazilian population, in an attempt to improve public health knowledge in the field of nutrition. The interpretation of factors associated with inadequate fiber-rich

food consumption will help to design initiatives to change the situation, preventing chronic diseases derived from inadequate dietary fiber consumption.

Methods

A study was carried out in Pelotas, Rio Grande do Sul State, a mid-sized town in Southern Brazil (~330,000 inhabitants), where the economy is based on rice production, commerce and education. The population age groups and sex distribution in Pelotas is similar to the rest of the country: 20-25% adolescents and 10-15% elderly. In terms of education, the city ranks above the national average, with only 20% of the population having attended three years or less of formal education, while the national Brazilian average is nearly 40%. A cross-sectional population-based design was employed and the target population of the study were individuals 10 years or older, regardless of gender, who reside in the urban area of Pelotas. People living in institutions and those mentally impaired who were unable to respond to the questionnaire were excluded from the sample.

A representative population sample was selected. A two-stage clustered sample was assigned; households were considered the primary sample unit. Cluster definition was based on the census tracts chart from the Brazilian Geography and Statistics Institute census of the year 2000 (IBGE; http://www.ibge.gov.br).

To minimize a design effect, 120 census tracts were chosen, with an average of 12 households in each. Since the sampling strategy was proportional to the tract's size, a large tract was included twice, totaling 119 selected census tracts. Based on a chart containing permanent households within 404 census tracts, we ranked tracts by income of the family head to further systematically select the households; this procedure is analogous to a stratification process.

The sample size required in this study was 2,322 subjects. As the estimate of individuals within the age group studied was 2.7/household, 860 households were considered to be enough. However, as the study was carried out as part of a larger study coordinated by a group of eleven researchers, 1,507 households were visited. This number allowed for the detection of a relative risk of at least 1.3 with a confidence level of 95% (95%CI) and statistical power of 80%, for the association study between inadequate frequency fiber-rich food intake and the variable that demanded the largest sample size, "usual place where main meals are eaten".

This study relied only on the fruits, vegetables and fiber section of a complete Block Instrument [13] that includes data collection for screening of fat, fruits/vegetables and fiber consumption. This instrument is based on a self-scoring structure as follows: 30 or more – "*You are doing very well! This is the desirable score on this screener*"; 20-29 – "*You should include more fruits, vegetables and whole grains*"; less than 20 – "*Your diet is probably low in important nutrients. You should find ways to increase the fruits and vegetables and other fiber rich foods you eat every day*". In the present study, the outcome was defined as "inadequate frequency of fiber-rich food intake" and then individuals with scores lower than 20 were considered positive for the outcome.

Food categories included in the food frequency questionnaire were: orange juice, fruits (but not juices), beans, bread (white), whole wheat bread, raw salad, other vegetables, fiber rich cereals/oats and potato. Food consumption frequencies and respective scores were: less than once a week – 0; once a week – 1; two to three times a week – 2; four to six times a week – 3; and daily – 4 . The instrument evaluated the frequency of consumption during the twelve months prior to the interview.

Independent variables were collected through a standardized and pre-coded questionnaire. We coded information as follows: sex (male/female); age (adolescents: 10-19 years old; adults: 20-59 years old; and elderly: 60 years or older); living alone (yes/no), skin color (white/non-white: observed by the interviewer), smoking (current smoker: at least one cigarette a day for more than 30 days), socioeconomic level (considering individual's purchase power – in five categories where A is the wealthiest, according to the Associação Brasileira de Empresas de Pesquisa – ABEP score) [14]. This criterion for Brazilian economic classification evaluates purchase power of urban families with no interest in "social classes" classification. The score relies on household assets, schooling of the family head and the presence or absence of housekeepers [14]. The variable "number of meals per day" was defined as the number of meals in a day, considering snacks and supper. The variable "main meals at home" was defined for individuals having three main meals (breakfast, lunch and dinner) at home. For adolescents' physical activity, we considered as sufficiently active those performing more than 300 minutes a week [15] and active adults should perform 20 minutes, at least three times a week [16].

Quality control was conducted by telephone interviews and/or by revisiting randomly 10% of previously visited households. The interviews were based on a shorter version of the question-

naire to check the accuracy of answers or unintended mistakes.

The instrument was designed and tested during a pilot-study carried out in a neighborhood not selected for the actual fieldwork.

Data analysis was based on a hierarchical model to study outcome determination, where variables are adjusted for the same level and levels above. This strategy considered two analysis levels. The first level (farthest) encompassed socioeconomic and demographic variables such as age, skin color, sex, socioeconomic level and living alone or not. The second level (nearest) included behavioral variables: smoking, physical activity, daily meals (number) and having (or not) main meals (breakfast, lunch and dinner) at home. The adjusted analysis followed a leveled model and variables kept in the model were those presenting p values < 0.20. The intraclass correlation coefficient and design effect for the outcome were calculated.

Double-entry of data was performed and datasets were validated. The dataset was managed with Epi Info 6.04b (Centers for Disease Control and Prevention, Atlanta, USA) and automatically checked for range and consistency. Agreement was measured by kappa index.

Statistical analysis was carried out with the statistical package Stata 9.0 (Stata Corp., College Station, USA). Results were obtained by Wald's test (Poisson regression) and 95%CI.

The Research and Ethics Committee of the Federal University of Pelotas Medical School approved the study protocol. Subjects were asked to sign an informed consent form.

Results

From the 119 sampled census tracts, 1,507 households were visited. A total of 4,226 people were included, refusal rate was 5.5% (n = 233), resulting in a sample size of 3,993 subjects. Agreement was measured by repeating 10% of the interviews for the following variables: schooling, eye color and smoking. The lowest value for the kappa score (0.72) was obtained for schooling information.

Design effect for the outcome "inadequate frequency of fiber-rich food intake" in the sample was equal to 2.7. This parameter was considered during statistical analysis. The intraclass correlation coefficient was 0.07 (95%CI: 0.02-0.12).

Our sample was predominantly composed of females, adults, people with white skin color, and nearly 70% belonged to socioeconomic level C or lower. Most people do not live alone, do not currently smoke, do not practice physical activity, eat four or more meals a day, and have breakfast, lunch and dinner at home (Table 1). Among the elderly, the oldest person was 104 years old, however only 10 (1.7%) were older than 90.

The inadequate frequency of fiber-rich food intake was 65.6% (95%CI: 64.2-67.1). A higher prevalence was observed among men. Age-group stratified analyses revealed a significantly higher prevalence among teenagers (77.8%), and lower among the elderly (54.6%). Higher prevalence were also found in the following groups: non-white skin color, lower socioeconomic level, smokers, insufficiently active individuals, those who eat fewer than four meals a day and those who do not have main meals at home (Table 1).

Table 2 displays a crude and adjusted analysis of the association between independent covariates and inadequate frequency of fiber-rich food intake. Crude analysis showed that men, younger individuals, those with non-white skin color, with lower socioeconomic levels, smokers, the insufficiently active, those who eat less than four times a day and those who do not have main meals at home present a higher risk for inadequate frequency of fiber-rich food intake. When adjusting for confounders, the variables sex, age group, socioeconomic level, smoking, physical activity and number of daily meals remained associated with the inadequate fiber-rich food intake frequency.

Table 3 shows a crude and adjusted analysis of the association between independent variables and inadequate fiber-rich food intake frequency, by age group. Comparing men and women, apart from adolescents, men were at a higher risk of having inadequate frequency when compared to women. The socioeconomic level was inversely associated with the outcome across all age groups. Among adolescents, living alone was also a risk of inadequate fiber-rich food intake frequency. Adult and elderly smokers were at a higher risk for the outcome (prevalence ratio – PR = 1.14; 95%CI: 1.07-1.21 and PR = 1.26; CI95%: 1.06-1.49, respectively). Physical activity engagement was protective against the inadequate fiber-rich food intake frequency but only among adults (PR = 0.80; 95%CI: 0.74-0.86). Having fewer than four meals a day increased the risk of inadequate frequency intake among adults. The variables skin color and having main meals at home were not associated with the outcome regardless of age group.

Figure 1 shows the inverse relation between socioeconomic level and inadequate fiber-rich food intake frequency for all age groups.

An interaction analysis between inadequate frequency of fiber-rich food intake and age in three groups revealed a significant effect modification for the variables living alone, smoking and

Table 1

Sample description and inadequate frequency of fiber-rich food intake according to demographic, socioeconomic and behavioral characteristics (N = 3,993). Pelotas, Rio Grande do Sul State, Brazil, 2008.

Variables	n (%) *	Prevalence (%)	p value
Gender			< 0.001 #
Female	2,204 (55.2)	61.7	
Male	1,789 (44.8)	70.5	
Age group			< 0.001 ##
Adolescents	8,57 (21.5)	77.8	
Adults	2,539 (63.6)	64.1	
Elderly	597 (14.9)	54.6	
Skin color			0.049 #
White	3,310 (82.9)	64.8	
Other	683 (17.1)	69.8	
Socioeconomic level **			< 0.001 ##
A	202 (5.1)	55.0	
B	999 (25.2)	56.6	
C	1,621 (40.9)	66.8	
D	1,040 (26.2)	73.2	
E	104 (2.6)	82.7	
Living alone			0.5 #
No	3,779 (95.3)	65.8	
Yes	187 (4.7)	63.1	
Smoking			< 0.001 #
No	3,084 (77.2)	63.3	
Yes	909 (22.8)	73.5	
Sufficiently active			0.005 #
No	2,481 (62.1)	67.5	
Yes	1,512 (37.9)	62.6	
Number of daily meals			0.001 #
≥ 4	2,710 (67.9)	63.7	
< 4	1,283 (32.1)	69.8	
Eating main meals at home ***			0.007 #
No	1,786 (44.7)	68.3	
Yes	2,207 (55.3)	63.5	

* Maximum of 27 missing values for variables socioeconomic level and living alone. No missing values for remainder variables;

** According to the Associação Brasileira de Empresas de Pesquisa – ABEP score [14];

*** Breakfast, lunch and dinner;

Chi-squared test;

Linear trend test.

Table 2

Crude and adjusted analyses of the association between inadequate frequency of fiber-rich food intake and independent variables (N = 3,993). Pelotas, Rio Grande do Sul State, Brazil, 2008.

Level	Variable	Crude		Adjusted *	
		PR (95%CI)	p value	PR (95%CI)	p value
1	Gender		< 0.001 #		< 0.001 #
	Female	1.00		1.00	
	Male	1.14 (1.10-1.19)		1.14 (1.10-1.18)	
	Age group		< 0.001 ##		< 0.001 ##
	Adolescents	1.00		1.00	
	Adults	0.82 (0.78-0.87)		0.84 (0.80-0.89)	
	Elderly	0.70 (0.63-0.78)		0.72 (0.65-0.79)	
	Skin color		0.04 #		0.9 #
	White	1.00		1.00	
	Other	1.08 (1.00-1.16)		1.00 (0.94-1.08)	
	Socioeconomic level **		< 0.001 ##		< 0.001 ##
	A/B	1.00		1.00	
	C	1.19 (1.09-1.29)		1.18 (1.09-1.28)	
	D/E	1.32 (1.21-1.43)		1.30 (1.20-1.41)	
	Living alone		0.5 #		0.8 #
	No	1.00		1.00	
	Yes	0.96 (0.84-1.10)		1.02 (0.89-1.17)	
2	Smoking		< 0.001 #		< 0.001 #
	No	1.00		1.00	
	Yes	1.16 (1.10-1.22)		1.14 (1.08-1.20)	
	Sufficiently active		0.007 #		< 0.001 #
	No	1.00		1.00	
	Yes	0.93 (0.88-0.98)		0.87 (0.82-0.92)	
	Number of daily meals		0.001 #		< 0.001 #
	≥ 4	1.00		1.00	
	< 4	1.10 (1.04-1.16)		1.11 (1.06-1.17)	
	Eating main meals at home ***		0.007 #		0.3 #
	No	1.00		1.00	
	Yes	0.93 (0.88-0.98)		0.97 (0.92-1.02)	

PR: prevalence ratio; 95%CI: 95% confidence interval.

* The adjusted analysis followed a leveled model and variables that remained in the model were those that presented p value < 0.20;

** According to the Associação Brasileira de Empresas de Pesquisa – ABEP score [14];

*** Breakfast, lunch and dinner;

Wald's test for heterogeneity;

Wald's test for linear trend.

Table 3

Crude and adjusted analysis of the association between inadequate frequency of fiber-rich food intake and independent variables, stratified by age group (N = 3,993). Pelotas, Rio Grande do Sul State, Brazil, 2008.

Level	Variable	Adolescents (N = 857)		Adults (N = 2,539)		Elderly (N = 597)	
		Crude	Adjusted *	Crude	Adjusted *	Crude	Adjusted *
		PR (95%CI)	PR (95%CI)	PR (95%CI)	PR (95%CI)	PR (95%CI)	PR (95%CI)
1	Gender	0.1 #	0.09 #	< 0.001 #	< 0.001 #	0.06 #	0.04 #
	Female	1.00	1.00	1.00	1.00	1.00	1.00
	Male	1.06 (0.99-1.13)	1.06 (0.99-1.14)	1.16 (1.11-1.22)	1.17 (1.11-1.22)	1.15 (0.99-1.32)	1.16 (1.01-1.33)
	Skin color	0.6 #	0.4 #	0.05 #	0.6 #	0.4 #	0.5 #
	White	1.00	1.00	1.00	1.00	1.00	1.00
	Other	0.97 (0.88-1.07)	0.95 (0.86-1.06)	1.10 (1.00-1.20)	1.02 (0.93-1.12)	1.09 (0.90-1.32)	1.06 (0.88-1.28)
	Socioeconomic level **	0.04 ##	< 0.05 ##	< 0.001 ##	< 0.001 ##	0.001 ##	0.001 ##
	A/B	1.00	1.00	1.00	1.00	1.00	1.00
	C	1.06 (0.94-1.19)	1.06 (0.94-1.19)	1.22 (1.10-1.34)	1.22 (1.11-1.34)	1.21 (0.97-1.50)	1.20 (0.97-1.50)
	D/E	1.12 (1.00-1.25)	1.12 (1.00-1.25)	1.34 (1.22-1.48)	1.35 (1.22-1.49)	1.44 (1.16-1.78)	1.45 (1.17-1.80)
	Living alone	< 0.001 #	< 0.001 #	0.9 #	0.6 #	0.2 #	0.5 #
	No	1.00	1.00	1.00	1.00	1.00	1.00
	Yes	1.28 (1.22-1.34)	1.26 (1.16-1.37)	1.01 (0.86-1.19)	0.96 (0.82-1.13)	1.13 (0.92-1.39)	1.08 (0.88-1.34)
2	Smoking	0.6 #	0.5 #	< 0.001 #	< 0.001 #	0.001 #	0.008 #
	No	1.00	1.00	1.00	1.00	1.00	1.00
	Yes	0.96 (0.82-1.11)	0.94 (0.81-1.11)	1.23 (1.15-1.31)	1.14 (1.07-1.21)	1.34 (1.13-1.59)	1.26 (1.06-1.49)
	Sufficiently active	0.2 #	0.08 #	< 0.001 #	< 0.001 #	0.04 #	0.07 #
	No	1.00	1.00	1.00	1.00	1.00	1.00
	Yes	0.94 (0.86-1.03)	0.92 (0.84-1.01)	0.77 (0.71-0.84)	0.80 (0.74-0.86)	0.78 (0.62-0.99)	0.81 (0.65-1.02)
	Number of daily meals	0.4 #	0.2 #	0.001 #	< 0.001 #	0.02 #	0.7 #
	≥ 4	1.00	1.00	1.00	1.00	1.00	1.00
	< 4	1.04 (0.95-1.14)	1.07 (0.97-1.17)	1.12 (1.05-1.20)	1.11 (1.04-1.18)	1.20 (1.04-1.39)	1.02 (0.89-1.18)
	Eating main meals at home ***	0.5 #	0.3 #	0.01 #	0.3 #	0.06 #	0.07 #
	No	1.00	1.00	1.00	1.00	1.00	1.00
	Yes	1.03 (0.94-1.12)	1.05 (0.96-1.16)	0.92 (0.87-0.98)	0.97 (0.91-1.03)	0.82 (0.67-1.0)	0.84 (0.70-1.01)

PR: prevalence ratio; 95%CI: 95% confidence interval.

* The adjusted analysis followed a leveled model and variables that remained in the model were those that presented p value < 0.20;

** According to the Associação Brasileira de Empresas de Pesquisa – ABEP score [14];

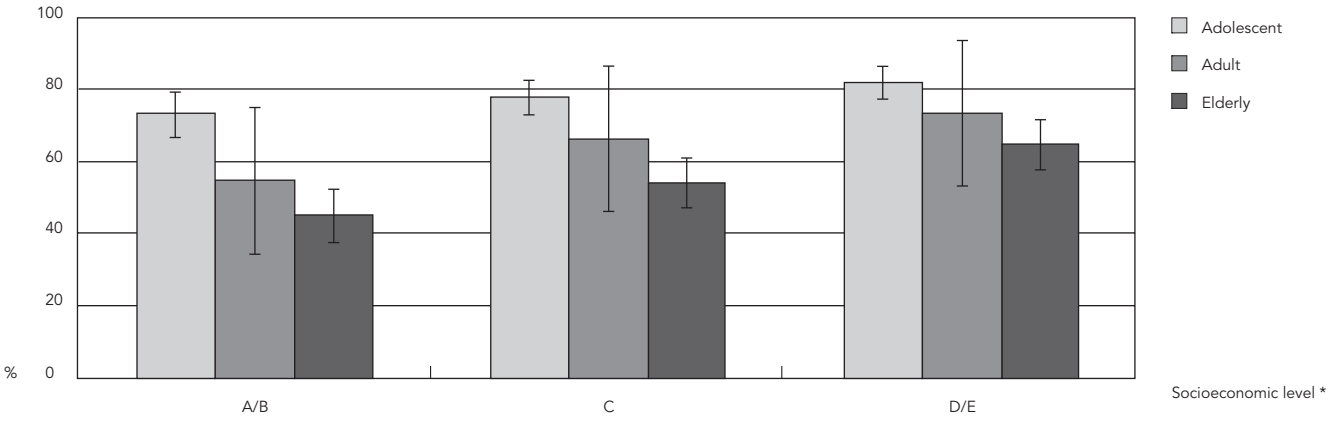
*** Breakfast, lunch and dinner;

Wald's test for heterogeneity;

Wald's test for linear trend.

Figura 1

Age groups for inadequate frequency of fiber-rich food intake according to socioeconomic level. Pelotas, Rio Grande do Sul State, Brazil, 2008.



* According to the Associação Brasileira de Empresas de Pesquisa – ABEP score [14].

physical activity, thus supporting our age group-stratified analysis.

A sex-stratified analysis was also carried out and, even though men's inadequate frequency of fiber intake was higher, variables associated with the outcome and association direction were all the same for both genders.

Discussion

Inadequate dietary habits and low consumption of fruits, vegetables and fiber have been extensively discussed in the literature, regardless of methods employed in the evaluation of such parameters [17,18,19]. The World Health Organization (WHO) & the Food and Agriculture Organization (FAO) [1] have published results on the issue, revealing that only 5-25% of the population follows current guidelines on dietary fiber intake. The same report emphasizes that, in 1998, only six out of fourteen regions evaluated by WHO presented a satisfactory consumption of fruits and vegetables, equal to or above the current recommendation of 400 daily grams per capita.

Although the instrument employed here to evaluate inadequate fiber-rich food intake frequency (frequency questionnaire) is the most appropriate method for estimating dietary habits on population level, it is worth mentioning that it has limitations since it does not consider specific foods, but food groups. In addition, the instrument has not been validated in Brazil. One must consider, however, that because information is collected about food groups, making it less specific, chances are that the instrument is suitable to collect information in different settings and not only in North America. Besides, this instrument aims to screen individuals at higher risk of inadequate fiber intake. On the other hand, the advantages of the instrument, such as ease of use, brief data collection and the ability to grasp seasonal changes in dietary habits throughout the year (as the recall period includes the last twelve months) must be considered.

The present study shows an inadequate fiber-rich food intake frequency of almost 66%. The literature presents inadequate fiber consumption prevalence ranging from 55-100%, with data obtained either by quantitative or qualitative methods. Lopes et al. [19] studied nutrient intake in a population-based sample of adults and the elderly (≥ 18 years). Results proved that 100% of subjects have inadequate fiber intakes. The dietary assessment methods employed were a semi-quantitative food frequency questionnaire coupled with pictures and 24-hour recall, employing the cut-off point proposed by WHO and the Brazilian Health Department. A study carried out among teenagers from Costa Rica, using a 3-day record food questionnaire, found an adequate fiber intake of 45% [20]. Volkert et al. [21] found, with the same 3-day record food questionnaire, studying an elderly German population of 4,020 individuals, that 38% could not achieve two thirds of the recommended dietary fiber intake.

In Brazil, two studies were carried out among teenagers: the first one used a 24-hour recall and frequency survey, showing a prevalence of insufficient dietary fiber intake of 69% among girls and almost 50% for boys. The factors associated with insufficient consumption in both sexes were non-habitual consumption of beans and excessive fat intake [22]. The second, in the same city that was carried out the present study, using the same questionnaire among adolescents of a birth cohort, Neutzling et al. [10] showed a prevalence of 83.9%. This difference may be related to the age range analyzed.

Most epidemiologic studies explore contrasts in inadequate fiber consumption according to sex. Nevertheless, there is controversy relating to this issue in the literature. The present study revealed that among women the inadequate fiber-rich food intake frequency is lower than among men. In addition, Rust & Elmadfa [23], using 24-hour recall, indicated a more adequate eating pattern among Australian women, although 53% of that country's populations consume less than half of the daily recommended amount. Shelton [24] evaluated healthy eating patterns in a Scottish population encompassing all age groups except for children, collecting data about fruit, vegetable and fiber consumption through a *Food Frequency Questionnaire* (FFQ). Similar to what we have found, results showed that male Scots present a higher risk of inadequate eating pattern. Conversely, Thompson et al. [25], in an attempt to estimate fruit, vegetable and fiber consumption in an adult American population, using FFQ, found that men present more adequate consumption regarding the amount of such foods, as estimated by number of servings.

Research shows that eating patterns change throughout life and that during adolescence habits are formed that are carried through into adult life [26]. The present study found a linear inverse association between age and inadequate fiber-rich food intake frequency, meaning that the older the person, the more adequate the frequency of fiber intake. Similarly, Gary et al. [27], using a modified version of Block's questionnaire to evaluate dietary habits of Afro-Americans, showed that the elderly make better food choices. Ajani et al. [28], using data from an American study (the National Health and Nutrition Examination Survey – NHANES), carried out between 1999 and 2000, with 3,920 people older than 20, observed, using 24-hour recall, a higher dietary fiber intake among the elderly. Two aspects involved in the relation between aging and eating patterns must be mentioned. First, the age effect: as people age, they might develop better dietary habits. The second aspect is the possibility of reverse causality where, with aging, developing diseases are responsible for the dietary behavior modification observed.

Socioeconomic levels are known to be a population risk factor for several health problems [29], especially among people from developing countries. As with other studies, our results proved that lower socioeconomic levels were a strong risk factor for the outcome [9,24,27]. Gary et al. [27] showed that high socioeconomic levels are associated with healthier habits and food choices. In agreement with that, Shelton [24] found unhealthy eating patterns to be more common among people from lower socioeconomic strata and that there is room for interventions targeting poorer people. Giskes et al. [9], using 24-hour recall, evaluated fruit and vegetable intake according to socioeconomic levels. Results showed that adult individuals from high socioeconomic level were more likely to eat fruits and vegetables properly. However, this association was not observed among adolescents from the same socioeconomic level.

Some barriers to adequate fruit, vegetable and fiber consumption are discussed in the literature. One of the obstacles could be food price, a reasonable explanation for the differences between socioeconomic strata, since fiber-rich foods are usually more expensive [30]. However, even among richer people consumption was low, meaning that socioeconomic status is not a guarantee of significant improvements in consumption.

The present study observed an inverse relation between inadequate fiber-rich food intake frequency, age and socioeconomic level (Figure 1). Jaime & Monteiro [7] similarly found that adequate fiber and fruit intake improves according to age and household assets.

Smoking was associated to inadequate fiber-rich food intake frequency among adults, the elderly and both genders, as noted in previous publications [25,31]. Elizondo et al. [31] conducted research among adults from Pamplona (Spain) to evaluate differences in intake nutrients according to smoking status. Results showed that smokers (men and women) usually consume smaller amounts of fruit and vegetables, presenting supposedly unhealthy eating habits.

The connection between physical activity and eating patterns has been widely researched. A study by Shelton [24] found that sedentary individuals are less likely to present healthy food habits than their active counterparts. Our results are similar, since in our sample, sufficiently active people were less likely to present the outcome – inadequate fiber-rich food intake frequency.

Kerver et al. [32], using data from the NHANES-III tested the hypothesis that eating routines are

associated with the intake of specific foodstuffs in American adults. After adjusting for confounders they found that the more often meals and snacks are eaten throughout the day, the higher the chance of consuming fiber and other foodstuffs. Our results support this idea, because in our sample individuals eating less than four daily meals, including snacks, were at higher risk (10%) of inadequate fiber-rich food intake frequency compared to people eating four or more times a day. When the analysis was stratified by age group, this association remained only among adults.

In the present study, we did not observe an association between skin color and inadequate fiber-rich food intake frequency. The available Brazilian studies were not designed to explore this relation [8,19]. However, studies from other countries have observed that white-skin people usually present healthier eating patterns [25].

The variable "to live alone" was studied based on the supposed concept that, people living by themselves were more likely to present inadequate frequency fiber intake due to some hypothetical reasons: lack of time and/or diverse priorities buying fruits and vegetables, lack of time and/or willingness to prepare meals, eating mostly out of their homes, among others. This association was not significant in the overall sample, but was significant specifically in adolescents. This association might be explained by the fact that living alone usually means eating out or takeaways. Satia et al. [33] observed an inverse association between eating in restaurants and vegetable intake. However, our study did not find an association between the outcome and eating main meals out of home.

Furthermore, inadequate fiber-rich food intake frequency is a common problem in the population. It must be noticed that, although the population as a whole eats fibers inadequately, teenagers are at an even higher risk of this unhealthy behavior, suggesting the need for strong public health measures to address this age group. A good thing that might help to fight the problem is that most people within this age range go to school, and school facilities could be used by awareness programs aimed at improving food habits, especially fiber intake. Public health initiatives to improve eating patterns, concerning fiber consumption habits, must consider these contrasts in associated factors.

Aging is believed to improve eating behaviors, although half of the elderly in this study presented inadequate fiber-rich food intake frequency. Hence, interventions focusing on teenagers might result in benefits for all age groups in the long run.

Adequate fiber consumption habits seem to belong to a set of "healthy lifestyles" such as avoiding smoking, taking regular physically exercise and adequate consumption of dietary fiber. Evaluating eating habits and food consumption is no easy task, particularly because of the range of instruments and dietary evaluation methods. Therefore, screening tools, such as those used in the present study, can be useful to identify population changes in eating habits.

Resumo

Verificar a freqüência do consumo de alimentos fontes de fibras e avaliar sua associação com características sócio-econômicas, demográficas e comportamentais. Foi selecionada amostra representativa da cidade e 3.993 indivíduos (≥ 10 anos) foram entrevistados. Foi utilizado o instrumento Block Screening. A maioria da amostra, 65,6% (IC95%: 64,2-67,1), mostrou freqüência inadequada de consumo. A análise ajustada para amostra global mostrou risco aumentado de freqüência inadequada entre homens, adolescentes, de menor nível sócio-econômico, fumante atual, insuficientemente ativo e aqueles que faziam menos de 4 refeições/dia. A análise por faixa etária mostrou que entre adolescentes, morar sozinho foi um fator de risco; entre adultos, homens, fumantes, insuficientemente ativos e que realizavam menos de 4 refeições/dia; e, entre idosos, somente homens e fumantes. O menor nível sócio-econômico associou-se ao desfecho em todos os grupos. Ressalta-se que embora a população apresente alto porcentual do desfecho, chama atenção os adolescentes, sugerindo medidas prioritárias nesta faixa etária.

Fibras na Dieta; Hábitos Alimentares; Consumo de Alimentos

Contributors

S. W. Madruga was responsible for data collection, the literature review and writing up the article. C. L. Araújo gave guidance on data analysis, literature review and write up. A. D. Bertoldi was responsible for guidance in the analysis and write up.

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