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Fruit and vegetable intake among low income elderly in the city of São Paulo, Southeastern Brazil

ABSTRACT

OBJECTIVE: To estimate the socioeconomic and sociodemographic factors associated with the daily intake of five servings of fruit and vegetables by elderly individuals living in low income areas, identifying the main fruits and vegetables which compose the diet of this population.

METHODS: This is a cross-sectional population-based study with 2,066 low income elderly individuals (≥60 years) living in the city of São Paulo, Southeastern Brazil, in 2003-2005. To assess the fruit and vegetable intake a Food Frequency Questionnaire was administered. The answers were transformed into daily intake and compared with the recommendations of the World Health Organization (five or more servings per day). The relationship between recommended fruit and vegetable intake and socioeconomic variables was analyzed using logistic regression models.

RESULTS: Of the participants, 60.5% were women and 39.5% were men. Approximately one third of the elders (n=723; 35.0%) did not consume any kind of fruit or vegetable on a daily basis and 19.8% reported a daily intake of five or more servings of fruits and vegetables. This intake was positively associated with income and years of schooling.

CONCLUSIONS: The fruit and vegetable intake of low income elderly individuals in the city of São Paulo was insufficient according to the recommendations of the World Health Organization and is associated with unfavorable socioeconomic conditions.

DESCRIPTORS: Elderly Feeding Behavior. Socioeconomic Factors. Fruit and vegetable intake.

INTRODUCTION

The fast ageing of the Brazilian population indicates the current figure of approximately 15 million elderly individuals.[a] It is estimated that in 20 years, this figure will more than double, placing Brazil among the five oldest populations in the world.[1,11,12] This population ageing will result in an increase in the prevalence of non-communicable chronic diseases, which affect predominantly the elderly.[1]

In 2004 the World Health Organization (WHO)[b] proposed recommendations based on lifestyle changes aiming to prevent and minimize the worldwide

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[a] Instituto Brasileiro de Geografia e Estatística. Censo 2000: Brasil. Brasília; 2000 [cited 2007 Jan 01]. Available from: http://www.ibge.gov.br/censo2000

[b] World Health Organization. Global Strategy on diet, physical activity and health. Fifty seventy word health assembly. Geneva; 2004[cited em 2007 nov 01]. Available from: http://www.who.int/dietphysicalactivity/en/

prevalence of non-communicable chronic diseases. One of its main recommendations was the daily intake of five or more servings of fruits and vegetables. The increased intake of these foods would play an important role in reducing the risk for the main chronic diseases, especially due to the greater offer of vitamins, antioxidant minerals, and dietary fibers.[3,20]

Fruit and vegetable intake is partly determined by the socioeconomic conditions of the population. In two recent studies, low family income[7] proved to be independently associated with inadequate dietary practices, especially with low daily intake of fruits and vegetables.[9,12] Other factors have also been associated with the Brazilian elderly individuals' low fruit and vegetable intake, such as: low schooling, inappetence, difficulties in acquiring and preparing the food and presence of chronic diseases.[2,6]

Few Brazilian studies have investigated the dietary patterns of elderly individuals, and research focusing on fruit and vegetable intake is even scarcer. A population-based study which used a food frequency questionnaire with 283 elderly people from three regions of the municipality of São Paulo showed that the fruit and vegetable intake increased as the socioeconomic level of the regions increased.[14] However, the study did not examine the proportion of elderly individuals who met the recommendations of five daily servings of fruits and vegetables. In a Brazilian inquiry that evaluated a national probabilistic sample of more than 5,000 men and women aged 18 years or older, it was found that among the individuals aged 65 or older, only 20.6% of the women and 14.8% of the men consumed five or more servings of fruits and vegetables per day.[9] Nevertheless, such information was obtained only in relation to the frequency of the intake, and it was not possible to identify which fruits and vegetables were more or less consumed.[8]

The present study aimed to estimate the socioeconomic and sociodemographic factors associated with the intake of five servings of fruits and vegetables, recommended by WHO, by elderly people living in low income areas, identifying the main fruits and vegetables that compose the diet of this population.

METHODS

The present study is part of the population-based epidemiological cohort "São Paulo Ageing and Health study" (SPAH),[15-17] which studied the factors associated with the prevalence and incidence of dementia and other mental disorders in low income elderly of the municipality of São Paulo between 2003-2005. In the first phase of SPAH, a cross-sectional study was conducted with elderly individuals living in low income areas of the western region of the municipality of São Paulo.[15] All individuals aged 65 years or older who lived in the districts of Butantã, Rio Pequeno and Raposo Tavares were eligible. These districts included the poorest census tracts, with slums and/or areas covered by the *Programa Saúde da Família* (Family Health Program), representing the regions with the lowest Human Development Index (HDI) of the study's area. The elderly were interviewed and evaluated at their homes, preferably in one single visit.[9] Between the years 2003-2005, 2,072 participants were included, and 2,066 answered the food frequency questionnaire about fruit and vegetable intake, constituting the sample of the present study.

Standardized questionnaires were administered by a team of eight interviewers who were trained to obtain information on sociodemographic, socioeconomic characteristics and on fruit and vegetable intake.[15-17] For 89 elderly individuals who presented serious physical or mental disability, close informants answered the interview. Details on the evaluation of physical or mental disability were already published.[15]

To assess the fruit and vegetable intake, the corresponding section of a Food Frequency Questionnaire (FFQ) was used. This semi-quantitative questionnaire was developed to obtain information on the diet of the general adult population residing in the Metropolitan Region of São Paulo.[7]

In the FFQ there are nine possible consumption responses for each food item in the list: never or less than once a month, one to three times a month, once a week, two to four times a week, five to six times a week, once a day, one to three times a day, four to five times a day, and six or more times a day. These categories of responses are based on standardized servings for each food item in the list. For example, the standard serving for bananas is one unit; if the participant reports that he consumed an average of three bananas per day, he will be classified in the category "one to three times a day". In the present study, we administered the part of the FFQ that represented the groups of "vegetables", with ten items, and "fruits and natural juices", with 17 food items.

To calculate how many elderly individuals met the WHO recommendations[a] for fruit and vegetable intake, the responses of each individual that indicated the daily intake of each food item were selected, corresponding to the following frequency categories: one, two to three, four to five and six or more times a day. The sum of all the FFQ responses referring to each food item was calculated and thus, the number of daily servings of

[a] World Health Organization. Global Strategy on diet, physical activity and health. Fifty-seventh world health assembly. Geneva; 2004[cited 2007 Nov 01]. Available from: http://www.who.int/dietphysicalactivity/en/

fruits, vegetables, and fruits and vegetables (combined) per individual were obtained. Therefore, the total daily fruit and vegetable intake resulted in a continuous variable, equivalent to the total number of daily servings of fruits and vegetables (combined) consumed by the elderly. This final continuous variable was categorized as: "non-daily fruit and vegetable intake", "daily fruit and vegetable intake", and "recommended fruit and vegetable intake" (five or more servings/day).

The statistical analyses were carried out with the software Stata 9.0. First, the socioeconomic and demographic characteristics were analyzed in a descriptive way, using measures of central tendency and percentage distribution. The analyzed characteristics included sex, age group (65-69, 70-74, 75-79, 80 years of age or older), years of residence in the city of São Paulo, schooling (literacy and years at school) and per capita monthly income (in minimum salaries at the time of the study).

The intensity of the associations between socioeconomic and sociodemographic characteristics and adequate daily fruit and vegetable intake was estimated by odds ratios (OR), with their respective 95% confidence intervals using logistic regression models adjusted for age and sex. Statistical significance was evaluated through Wald tests and for ordered categorical variables the test for linear trend was used. Then, multivariate logistic regression models were used to identify the independent associations. Thus, if one or more variables were associated with $p > 0.15$, the one that had the highest p value was removed from the model. A new model was estimated and the significance of the variables was examined again. This iterative process continued until only the variables with a value of $p < 0.15$ remained in the model. The effect of potential confounding variables was examined by including each variable sequentially into the multivariate logistic regression models and observing if the estimated ORs varied by more than 10%.[13]

The study was approved by the Ethics Committee for the Analysis of Research Projects of the Board of Clinical Directors of the *Hospital das Clínicas da Faculdade de Medicina da USP* (Clinical Hospital of the School of Medicine of USP) (Process no. 0361/07). The participants signed a consent document and the consent of the participants with cognitive deficit was provided by the informants.

RESULTS

Table 1 presents the participants' sociodemographic characteristics. Out of 2,066 participants, the majority (1,250; 60.5%) were women, and 370 (45.3%) men and 518 (41.4%) women were in the age group 65 – 69. Only 97 (11.9%) men and 99 (7.9%) women had more than four years of schooling. Median per capita monthly income was R$ 346.67 and 8% reported not having any individual source of income. Four hundred and fifty two (55.4%) men and 585 (47.2%) women had been living in São Paulo for at least 40 years.

Table 2 shows the consumption of different fruits and vegetables according to the response categories of the FFQ.

The most consumed vegetables by the elderly on a daily basis were tomato (21.0%), lettuce (14.4%) and carrot (8.8%). The other vegetables were daily consumed only by 2% of the studied population. The most consumed fruits were banana (41.0%), orange and tangerine (30.4%). Apple, pear, papaya and orange juice were consumed by 8% of the participants. The other fruits were daily consumed by 3.7% of the participants (Table 2). High proportions of the elderly reported that they never consumed vegetables like: chard (89.6%); watercress (78.1%); pumpkin (77.5%); broccoli/cauliflower (66.4%); and cabbage (63.5%). In the case of fruits, of the 17 items contained in the FFQ, 11 were never consumed by more than 75% of the elderly: cashew (98.0%); acerola (96.9%); avocado (94.5%); strawberry (94.4%); peach/fig (93.0%); pineapple (87.0%); grapes (83.5%); and melon/watermelon (82.0%). Significant differences were found between sexes, with greater consumption by women, in relation to the intake of the following items: lettuce ($p<0.001$), orange/tangerine ($p<0.001$), vegetables in general ($p<0.001$), carrot ($p<0.001$), apple/pear ($p=0.03$), garlic and onion ($p=0.005$).

The elderly who reported consuming five or more daily servings of fruits and vegetables were 19.8% (CI 95%: 18.1; 21.5). Another 45.2% presented daily fruit and vegetable intake but they did not reach the recommendations, and 35% did not consume fruits and vegetables on a daily basis. The eight most consumed fruits and vegetables were: tomato, lettuce, carrot, banana, orange/tangerine, apple/pear (Table 2), and they represented 82% of the fruit and vegetable intake of the participants who met the daily recommendations of the WHO.[a]

Table 3 shows the crude and adjusted associations between the socioeconomic and sociodemographic variables and the recommended fruit and vegetable intake. In the multivariate analysis, the recommended fruit and vegetable intake was independently associated with level of schooling and per capita income. The recommended fruit and vegetable intake increased significantly according to years of schooling. The association between the recommended fruit and vegetable

[a] World Health Organization. Global Strategy on diet, physical activity and health. Fifty-seventh world health assembly. Geneva; 2004[cited 2007 Nov 01]. Available from: http://www.who.int/dietphysicalactivity/en/

Table 1. Sociodemographic and socioeconomic characteristics of the sample according to sex. Municipality of São Paulo, Southeastern Brazil, 2003-2005. (N=2,066)

Variable	Men (816)		Women (1.250)		Total (2.066)	
	n	(%)	n	(%)	n	(%)
Age (years)						
65-69	370	(45.3)	518	(41.4)	888	(42.9)
70-74	217	(26.6)	338	(27.0)	555	(26.8)
75-79	126	(15.4)	219	(17.5)	345	(16.7)
80 or more	104	(12.7)	174	(14.1)	280	(13.5)
Schooling (years at school)						
0	266	(32.6)	523	(41.9)	789	(38.2)
1-3	453	(55.5)	628	(50.2)	1081	(52.3)
4 or more	97	(11.9)	99	(7.9)	196	(9.5)
Per capita monthly income (in reais)						
Up to R$240.00	167	(20.5)	473	(37.9)	640	(31.0)
R$241.00 – R$480.00	113	(13.8)	288	(23.0)	401	(19.4)
R$481.00 – R$720.00	229	(28.1)	285	(22.8)	514	(24.9)
Above R$721.00	307	(37.6)	204	(16.3)	511	(24.7)
Years of residence in São Paulo (years)						
Up to 20	85	(10.4)	172	(13.8)	257	(12.4)
20 ├ 40	239	(29.3)	433	(34.6)	672	(32.5)
40 ├ 60	376	(46.1)	447	(35.8)	823	(39.8)
60 or more	76	(9.3)	138	(11.4)	214	(10.4)
Does not remember	1	(0.1)	10	(0.8)	11	(0.5)
Unknown	39	(4.8)	50	(4.0)	89	(4.4)

intake and participants' income was also statistically significant, although with no clear linear trend.

DISCUSSION

In the present study, one fifth of the participants achieved the WHO[a] recommendations regarding daily servings of fruits and vegetables, while 35% did not consume any type of fruit or vegetable daily. The fruit and vegetable intake increased significantly as the level of schooling and per capita income increased. However, although there is a great offer and diversity of fruits and vegetables in Brazil, we found a limited variability of consumption among the people who reached the WHO recommendations.

Studies conducted in Brazil have shown that sex, purchasing power and schooling/information are determinant for a balanced diet in these populations.[2,6,9,10,14] Jaime & Monteiro[9] (2005) investigated the fruit and vegetable intake in a national probabilistic sample composed of 5,000 individuals, including elderly people. These authors used short questions to obtain information on the intake of these food items and their results were similar to the ones of the present study, with 20.6% of the women meeting the WHO recommendations, but only 14.8% of the men.[9] The elderly were the ones who most consumed fruits and vegetables according to the WHO recommendations and a clear positive association was observed between the level of schooling and fruit and vegetable intake.[9] A recent study with a sample of adults from the municipality of São Paulo, which examined fruit and vegetable intake using short questions in telephone interviews, showed a significant association between level of schooling and intake of these food items for both sexes. [6]

In the present study, inadequate fruit and vegetable intake was strongly associated with the elderly individuals' low level of schooling and low income ranges. According to Jaime et al[8] (2007), the estimates are that the fruit and vegetable intake in Brazil corresponds to less than half of the nutritional recommendations, mainly in low income families. A study carried out with data from *Pesquisa de Orçamento Familiar* (POF – Family Budget Research) of *Fundação Instituto de Pesquisas Econômicas* of *Universidade de São Paulo* in 1998/1999 about the acquisitions of food and beverages for family consumption during one month showed that the participation of fruits and vegetables in the overall amount

[a] World Health Organization. Global Strategy on diet, physical activity and health. Fifty-seventh world health assembly. Geneva; 2004[cited 2007 Nov 01]. Available from: http://www.who.int/dietphysicalactivity/en/

Table 2. Frequency of fruit and vegetable intake of the sample. Municipality of São Paulo, Southeastern Brazil, 2003-2005. (N=2,066)

Vegetable intake	Frequency Categories							
	Never to 3x/mth		1-4x/week		5-6x/week		Daily (1x or more)	
	n	%	n	%	n	%	n	%
Lettuce	649	31.4	870	42.1	249	12.1	298	14.4
Chard	1851	89.6	193	9.3	8	0.4	14	0.7
Cabbage	1313	63.6	667	32.3	55	2.7	31	1.5
Watercress/chicory	1613	78.1	416	20.1	19	0.9	18	0.9
Broccoli/cauliflower/kale	1372	66.4	652	31.5	20	1.0	22	1.1
Tomato	565	27.3	739	35.8	334	16.2	428	20.7
Carrot	962	46.6	757	36.6	165	8.0	182	8.8
Pumpkin	1600	77.4	410	19.9	26	1.3	30	1.4
Vegetables:[a] scarlet eggplant/ eggplant/horseradish	1303	63.1	651	31.5	52	2.5	60	2.9
Hortaliças:[b] zucchini/chayote	942	45.6	991	48.0	73	3.5	60	2.9
Fruit intake								
Orange/tangerine	698	33.8	536	25.9	204	9.9	628	30.4
Orange juice	1404	68.0	433	21.0	74	3.6	155	7.4
Lime juice	1550	75.0	376	18.2	64	3.1	76	3.7
Bananas	393	19.0	573	27.7	253	12.3	847	41.0
Passion fruit or juice	1627	78.6	347	16.8	38	1.8	54	2.6
Pineapple or juice	1797	87.0	249	12.1	11	0.5	9	0.4
Apple/pear	1286	62.3	536	25.9	89	4.3	155	7.5
Papaya	1283	62.1	527	25.5	83	4.0	173	8.4
Persimmon	1891	91.5	136	6.6	11	0.5	28	1.4
Avocado	1869	94.5	173	8.4	10	0.4	14	0.7
Melon/watermelon or juices	1693	82.0	328	15.9	22	1.0	23	1.1
Cashew or juice	2030	98.3	32	1.5	3	0.2	1	0.1
Grapes	1726	83.5	295	14.3	15	0.7	30	1.5
Mango or juice	1622	78.5	367	17.8	31	1.5	46	2.2
Peach/fig	1921	93.0	126	6.0	10	0.5	9	0.5
Strawberry	1949	94.4	105	5.1	5	0.2	7	0.3
Acerola juice	2002	96.9	54	2.6	3	0.2	7	0.3

[a] Low content of carbohydrates
[b] Medium content of carbohydrates

of calories increases as the family income increases and the price of the fruits and vegetables decreases.[4]

The analysis of data about the acquisition of food items obtained from POF 2002/2003[a] showed that the families with monthly income up to R$ 400.00 allocated only 3.6% of the expenditures on food for the acquisition of fruits and 3.3% for the acquisition of vegetables.[10] On the other hand, the families with monthly income higher than R$ 4,000.00 allocated 23.5% of the expenditures on food for the acquisition of fruits and 12.7% for the purchase of vegetables.[10] Low level of schooling can also influence consumption and the small variability of fruits and vegetables, due to the adoption of inadequate dietary habits and due to the higher frequency of age-related problems (locomotion difficulties, chewing and swallowing problems, diseases such as depression and dementia).[2,4,14,16] The effect of low level of schooling could explain, at least in part, the small variability in fruit intake observed here. We found that among the least consumed fruits were those whose cost is high in the state of São Paulo,[b] like strawberry, fig, peach and

[a] Instituto Brasileiro de Geografia e Estatística. Pesquisa de orçamentos familiares 2002-2003: análise da disponibilidade domiciliar de alimentos e estado nutricional no Brasil. Rio de Janeiro; 2004.
[b] Instituto de Economia Agrícola. Preços médios mensais no varejo. São Paulo; 2007 [cited 2007 Dec 01]. Available from: http://www.iea.sp.gov.br/out/banco/menu.php

Table 3. Crude and adjusted analyses of the associations between recommended fruit and vegetable intake (≥ 5 daily servings) and socioeconomic and sociodemographic variables. Municipality of São Paulo, Southeastern Brazil, 2003-2005. (N=2.066)

Variable	Fruit and vegetable intake				
	Crude OR (CI 95%)		Adjusted OR (CI 95%)		p
Sex					
Female	1		1		0.41[a]
Male	0.99	(0.80;1.24)	0.95	(0.72;1.15)	
Age (years)					
65-69	1		1		0.88[b]
70-74	0.93	(0.72;1.22)	0,97	(0.74;1.29)	
75-79	0.94	(0.69;1.30)	1.09	(0.78;1.51)	
80 or more	1.07	(0.77; 1.49)	1.19	(0.82;1.74)	
Level of schooling (years at school)					
0	1		1		<0,001[b]
1 - 3	1.48	(1.15;1.89)	1.40	(0.89; 1.59)	
4 or more	3.26	(2.30; 4.64)	2.99	(2.02;4.40)	
Per capita monthly income (in reais/minimum salaries)					
Up to 240.00	1		1		<0.001[b]
241.00 – 480.00	1.53	(1.16;2.00)	1.38	(1.04;1.84)	
481.00 – 720.00	1.61	(1.04;2.50)	1.46	(0.93;2.29)	
≥721.00	1.58	(1.01;2.47)	1.23	(0.77;1.97)	
Years of residence in São Paulo					
up to 20	1		1		0.17[b]
20 ├ 40	1.25	(0.84;1.86)	1.20	(0.80;1.79)	
40 ├ 60	1.63	(1.11; 2.39)	1.38	(0.93;2.05)	
60 or more	1.71	(1.07;2.73)	1.28	(0.79;2.09)	

[a] Test for linear trend

[b] Wald test

grapes. However, some fruits with lower cost, such as lime, avocado, watermelon and melon, were little consumed by the elderly. In the case of vegetables, we observed a similar pattern, with some vegetables whose cost is low and which can be easily purchased, like cabbage, chayote, cucumber and chard, being little consumed by the study's participants.

Measuring fruit and vegetable intake in populations is not a simple task and there is no consensus in the literature concerning the best method to do it. [5,7,13,18-20] Our study used FFQ to assess the fruit and vegetable intake and the results were consistent with those obtained by Brazilian investigations that used short questions.[6,9] Therefore, we believe that the use of the FFQ in the present work did not influence the assessment of the level of fruit and vegetable intake and allowed a more accurate identification of the consumed food items. A positive aspect of the present study is the fact that, for the 89 participants who could not answer the questionnaires due to serious mental disability, the information on fruit and vegetable intake was provided by their informants, increasing the sample's representativeness regarding the participants' health condition.

The results of the present work should be generalized with some caution to other populations of elderly people in Brazil, as there are areas where the access to this kind of food is more restricted and the per capita income is lower. Nevertheless, we believe that elderly individuals in other low income areas of other urban centers in Brazil do not present a better situation than the one observed here in relation to daily fruit and vegetable intake.

To conclude, the fruit and vegetable intake by low income elderly individuals was well below the current WHO recommendations.[a] This inadequacy was associated with unfavorable socioeconomic conditions, low level of schooling and low purchasing power, even in a relatively homogeneous population group. The most consumed fruits and vegetables on a daily basis are in accordance with the most consumed food items by the

[a] World Health Organization. Global Strategy on diet, physical activity and health. Fifty-seventh world health assembly. Geneva; 2004[cited 2007 Nov 01]. Available from: http://www.who.int/dietphysicalactivity/en/

population of the state of São Paulo, but the variety in the consumption of these food items is limited. Public policies and health promotion programs must incorporate forms of increasing the consumption of these food items by the elderly population in Brazil.

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