



Dietary patterns of elderly persons from the city of São Paulo: evidence from the SABE (Health, Wellbeing and Aging) survey

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Abstract

Objective: to determine the dietary patterns of elderly persons in terms of sociodemographic, lifestyle and clinical aspects. **Method:** a cross-sectional study was conducted using the cohorts of the SABE (Health, Wellbeing and Aging) study. An epidemiological, home-based study representative of the city of São Paulo was carried out. The population of this study included 1,304 elderly persons (≥ 60 years), of both genders, selected by probabilistic stratified sampling, interviewed in 2010. Food intake data were obtained through a qualitative food frequency questionnaire. Dietary patterns were determined by exploratory factorial analysis by principal components. The Wald test was used for complex sampling. **Results:** four dietary patterns were identified: inadequate patterns, consisting of fried and canned food, sausages, sweets, tubers, industrialized sauces and eggs; modified pattern, skimmed milk, whole grain breads and cereals, light/diet/zero foods; beneficial pattern, fruits, vegetables and tubers; and traditional Brazilian pattern, vegetable oils, rice, refined cereals and white bread, meats and legumes (beans). The sociodemographic and lifestyle profile of the elderly persons who adopted each dietary pattern was different. **Conclusion:** healthier dietary patterns were associated with the female gender, older elderly persons, two or more chronic diseases, higher levels of schooling, a better lifestyle and a better self-perception of health. It is important to consider all these aspects as they are determinant in the type of diet adopted by this population.

Key words: Health of the Elderly. Diet. Factor Analysis, Statistical. Social Conditions. Life Style.

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INTRODUCTION

Nutritional epidemiology traditionally focuses on the relationship between the effect of nutrients or a specific food on health outcomes¹⁻³. However, this type of analysis has been considered limited, as the human diet is complex and involves different components (chemicals, the combination of foods, soil characteristics, water, the use of pharmaceuticals, among others) which can alter the bioavailability of a determined nutrient. As a result, many researchers have instead studied dietary patterns, based on the view that food items are not ingested in the diet in isolation^{4,5}.

According to the Dietary Guidelines for Americans, a pattern of food consumption is defined as "the description of the types and quantities of food and beverages consumed, on average, over time". In other words, the description may be of an eating habit or a combination of foods recommended for consumption⁶. Dietary patterns express real food availability situations and involve selections, choices, occasions and rituals, and can vary according to age or ethnic group, socioeconomic status and culture^{3,7}. Food choices do not only involve the most nutritious or accessible foods or those offered by the market, but are also affected by culture, which defines dietary permissions or prohibitions and plays a fundamental role in the formation and maintenance of dietary habits⁸.

The typical Brazilian diet is currently undergoing a process of transformation, especially among younger age groups, although these changes also impact the elderly^{9,10}. Freitas et al.¹⁰ found that there was a decline in the purchasing of basic traditional foods, such as rice, beans and vegetables, and significant increases (up to 400%) in the purchase of processed foods such as biscuits, cookies, processed meats and ready meals, in the dietary patterns of the Brazilian elderly. This may be a reflection of the changes reported in studies that analyzed food purchasing by Brazilian families from the 1970s to the mid-2000s.

Souza et al.¹¹ analyzed the food record data of a sub-sample of 25% of Brazilian households comprising the original sample of the Family Budget Survey 2008-2009, representing a total of 34,003

individuals, aged over ten years, including the elderly. The most consumed food in the Brazilian population was rice (84.0%), coffee (79.0%), beans (72.8%), bread rolls (63.0%) and beef (48.7%). Age stratification revealed that coffee was the most consumed food item among the elderly, while elderly persons were the only individuals with more fruits and vegetables among their most frequently consumed foods (bananas and oranges; salad and lettuce).

Healthy dietary patterns characterized by increased intakes of fruits and vegetables have been linked to lower risks of cancer, diabetes, cardiovascular disease and Alzheimer's disease, while Western dietary patterns (sugar, fat, processed foods and refined grains) may have the opposite effect. Studies have indicated that dietary patterns can be influenced not only by age, but also by gender, socioeconomic status, marital status, household arrangement, lifestyle and clinical conditions such as disease and mastication¹²⁻¹⁵.

It has been suggested in literature that factor analysis can be used to determine dietary patterns, as this technique examines the overall diet as well as the interactive effects of foods and their nutrients, and does not focus solely on a specific food or nutrient. This type of approach can improve our understanding of current dietary practices, provide a means of evaluating the health outcomes of people who adhere to a particular pattern, and produce more directly applicable results, as recommendations for population groups based on foods are easier to understand than guidelines based on nutrients^{4,16}.

While it seems obvious that less suitable dietary patterns may be negatively associated with health, this relationship can still be better understood among the elderly, as an inadequate diet at this age seems to be related to fewer chronic diseases and complications. The follow-up monitoring of elderly persons is therefore required to identify the determinants and timing of dietary changes. The present study aimed to identify the dietary patterns of the elderly population of the city of São Paulo through a survey of participants of the SABE (Health, Welfare and Aging) cohort study of elderly persons, and to verify the association with sociodemographic, lifestyle and clinical variables.

METHOD

Study design

A cross-sectional study of elderly persons from three cohorts of the SABE study, Brazil was carried out.

The SABE study aimed to identify the life and health conditions of elderly persons (≥ 60 years) in Latin America and the Caribbean. The Pan American Health Organization (PAHO) coordinated a multicenter, epidemiological, home-based study from 2000 to 2001 in seven countries: Argentina (Buenos Aires); Barbados (Bridgetown); Brasil (São Paulo); Chile (Santiago); Cuba (Havana); Mexico (Mexico City) and Uruguay (Montevideo)¹⁷.

In Brazil, the study was conducted in the city of São Paulo in the state of the same name, and was coordinated by the Faculdade de Saúde Pública (FSP) of the Universidade de São Paulo (USP), supported by PAHO and funded by the São Paulo State Research Support Foundation (FAPESP) and the Ministry of Health¹⁷.

All the procedures of the sampling process (elderly and domicile-based), data collection, and elaboration of the database have been previously published^{17,18}. The questionnaire used for the study was that proposed by PAHO, translated and adapted for use in Brazil.

The procedures for data collection and the questionnaire used to record the data were the same in the three cohorts considered in this study. Elderly survivors from 2000 and 2006 were interviewed in

2010, excluding those who had died, moved, could not be located, were hospitalized/institutionalized or refused to participate.

Study population

The population of the present study was composed of 1,304 individuals obtained by combining the data of elderly persons (≥ 60 years) of both genders who participated in the SABE Study in 2010, belonging to three cohorts: **cohort A** - started in 2000, with elderly persons ≥ 60 years ($n=738$); **cohort B** - started in 2006, with 60-64 year olds ($n=239$); and **cohort C** - started in 2010, with elderly individuals aged 60 to 64 years ($n=327$).

All the individuals interviewed in 2010 with complete study variable data were included, while individuals who did not know or did not answer some of the questions were excluded from the analysis.

Study variables

The study variables were subdivided into:

- *Food intake*

The usual diet of the individuals was investigated through a qualitative food frequency questionnaire (FFQ) validated by a committee of experts in the area of diet and aging and which considered usual intake during the previous month. It was composed of 107 foods, subdivided into 18 food groups as shown in chart 1.

Chart 1. List of foods belonging to each food group of the food frequency questionnaire used in the SABE Study. City of São Paulo, 2010.

Food Group	Foods
Fruits	banana, orange, apple, papaya, watermelon, grape.
Vegetables and legumes	zucchini, carrot, <i>chayote</i> , cucumber, tomato, lettuce, watercress, kale, cabbage, arugula.
Nonfat dairy products	skimmed or semi-skimmed milk, nonfat yogurt, white cheeses and light cheeses.
Whole Dairy Products	whole milk, whole yogurt, mozzarella and <i>prato</i> cheese.
Meat	beef, chicken, fish or pork.
eggs	chicken and quails eggs.
Legumes	beans (white, black, <i>carioca</i>), lentils, chickpeas, dried peas and soybeans.
Sausages	sausages, salami, mortadella, ham, turkey breast, <i>blanquet</i> .
Rice, bread and refined pasta	bread, white rice, pasta, cake, oatmeal, cookies without filling, cornmeal, corn flour and cassava flour.
Whole grains and breads	bread, rice, cake, pasta, biscuits.
Tubers	potatoes, yams, manioc, cassava, sweet potatoes.
Sweets	boiled sweets, candies, lollipops, chocolate, filled wafers, jam, pudding, mousse, ice cream, milk pudding, pumpkin pudding, coconut, cane juice and non-diet soda.
Light, diet or zero foods	soft drinks, juices, gelatin, candies and chocolates.
Vegetable oils and derivatives	Soybean oil, corn oil, sunflower oil, canola oil, olive oil, margarine and mayonnaise.
Animal fat	butter, full cream, butterfat, lard and pork belly.
Fried food	<i>pastels</i> , French fries, chicken patties, kibbes and rissoles.
Canned	peas, corn, olive, pasta or tomato sauce.
Processed seasonings or sauces	saucers for salads, stock in tablets or powder, processed soup, instant noodles and packaged snacks.

Possible responses for frequencies of intake were: 1. does not eat or eats from time to time; 2. eats once a week; 3. eats two to three times a week, 4. eats four to six times a week; 5. eats once a day; 6. eats two to three times a day; 7. does not know; 8. did not respond. Individuals who did not know or did not respond to the FFQ were excluded from this analysis.

- *Sociodemographic:*

Gender (male and female); age group (60 to 74 years and ≥ 75 years in 2010). Schooling, classified into years of study (illiterate, one to four years, five to eight years, > eight years). Lives alone or with others (alone, with others). Marital status (married, widowed and unmarried – single or divorced). Currently

working (yes, no). Considers income sufficient for household expenses (yes, no).

- *Lifestyle*

Alcohol consumption, obtained by the answer to the following question: "in the last three months, on average, how many days a week did you drink alcohol?" This was categorized as never or between one and seven days (no, yes). Smoking (currently smokes, has smoked or never smoked). Level of physical activity, identified by the International Physical Activity Questionnaire (IPAQ), short version, classified as active (individuals who performed ≥ 150 minutes of moderate physical activity per week in different domains (leisure, transportation, work and household

chores)), and non-active (individuals who performed <150 minutes per week in different domains (leisure, transportation, work and household chores).

- Clinical data

Difficulty chewing hard foods like meat or apples in the last 12 months, categorized as frequently (three to seven times a week), sometimes (once or twice a week), and never (never occurs). Self-perception of health, categorized as good (good and excellent), fair, and poor (poor and very poor); and non-communicable chronic diseases (CNCD) - self-reports of the following diseases: systemic arterial hypertension, diabetes mellitus, cancer, chronic lung disease, heart disease, strokes, osteoarticular disease and osteoporosis, categorized as zero, one, two or more CNCD.

Statistical analysis

The study variables were presented as means of absolute and relative frequency. The latter was weighted by the sample weight of the census sector to which the individual belonged, based on the 2010 census.

Dietary patterns were obtained by exploratory factor analysis by major component. The adequacy of the sample was verified by the Kaiser-Meyer-Olkin Test (KMO). Additionally, the adequacy of the applicability of factor analysis was evaluated by Bartlett's Sphericity Test. In order to identify the number of factors (patterns) to be retained, the Kaiser latent root was used as the initial criterion, according to which eigenvalues greater than 1.0 would be extracted. Analysis by Cattell Graph (scree test) was subsequently performed.

Varimax orthogonal rotation was performed and the groups of foods with rotated factor loads greater than 0.30 were considered significant. Scores were derived from each of the patterns obtained; the mean score of each pattern was calculated and analyzed according to the independent variables. The differences between the means of scores were estimated using the Wald Generalized Test of Equality between Means, and those with the highest positive

means were considered adherent to the dietary pattern. Variables with $p < 0.05$ were considered significant. The effect of the sample design was considered in all the analyzes. The STATA 13.1 statistical program was used for statistical calculations.

All the elderly participants signed a Free and Informed Consent Form. The present study was approved via the *Plataforma Brasil* (Brazil Platform), under number 128,945.

RESULTS

Of the 1,304 elderly persons evaluated, 60.2% were women, and 71.4% were aged between 60 and 74 years old, 51.0% had one to four years of schooling, and 13.1% were illiterate. Regarding living arrangements, the majority lived with another person or other persons (84.6%), were married (54.9%), did not currently work (67.5%) and considered their monthly income sufficient for all household expenses (56, 9%). In terms of the lifestyle variables studied, 67.5% were inactive, 51.6% had never smoked and 78.9% did not drink alcoholic beverages. Regarding mastication in the previous year, only 53.1% did not have difficulty chewing hard foods, while 49.6% reported having good or excellent health and 52.7% had two or more CNCDs (Table 1).

The present study found four dietary patterns through exploratory factor analysis, which together accounted for 38.5% of the total consumption variance (Table 2).

The first pattern to be extracted was entitled *inadequate*, as it consisted of foods such as fried foods, sausages, canned foods, sweets, seasonings and processed sauces, tubers and eggs. The second pattern found was described as *modified*, as it is comprised foods that are traditionally indicated for consumption in the dietary treatment of the main CNCDs that affect this population (skimmed milk, rice, bread, cereals and whole grains and light, diet or zero foods). The third pattern, which was composed mainly of *in natura* foods (vegetables, fruits, and tubers), was entitled *beneficial*, while the fourth pattern was characterized by foods that make up the typical Brazilian diet (vegetable oils, margarine, rice, bread, refined pastas, meats and legumes - beans) and so was denominated *traditional Brazilian* (Table 2).

Table 1. Characteristics of study population. SABE Study*. City of São Paulo, 2010.

Variables	n (%)
Gender	
Male	463 (39.8)
Female	841 (60.2)
Age	
60 to 74 years	783 (71.4)
≥ 75 years	521 (28.6)
Schooling	
Illiterate	200(13.1)
1 to 4 years	696 (51.0)
5 to 8 years	179 (15.3)
> 8 years	229 (20.6)
Living arrangements	
Lives alone	218 (15.4)
Lives with others	1.086 (84.6)
Marital status	
Married	644 (54.9)
Unmarried	163 (13.2)
Widowed	485 (31.9)
Current job	
Yes	360 (32.5)
No	938 (67.5)
Income sufficient for expenses	
Yes	728 (56.9)
No	547 (43.1)
Physical activity	
Active	421 (32.5)
Non-active	883 (67.5)
Smoking	
Never smoked	694 (51.6)
Has smoked	473 (36.6)
Current smoker	136 (11.8)
Consumes alcohol	
Yes	270 (21.1)
No	1.033 (78.9)
Difficulty chewing hard foods	
Never	645 (53.2)
Sometimes	298 (23.1)
Frequently	329 (23.7)
Difficulty eating alone	
Yes	51 (2.7)
No	1.253 (97.3)
Self-perception of health	
Good and excellent	584 (49.6)
Fair	566 (42.6)
Poor and very poor	108 (7.8)
Number of chronic diseases reported	
None	209 (16.3)
1	390 (31.0)
≥ 2	705 (52.7)

*Health, Well-being and Aging.

Table 2. Distribution of factor loads of components of food patterns, according to food groups, of elderly persons of the SABE Study, City of São Paulo, 2010.

Food groups	Dietary patterns			
	Inadequate	Modified	Beneficial	Traditional*
Light, diet or zero fat foods	0.113	0.499	0.105	-0.065
Rice, breads and whole grains	-0.029	0.585	0.229	-0.173
Rice, breads and refined pasta	0.031	-0.207	-0.009	0.655
Meat	-0.019	0.093	0.005	0.576
Sweets	0.491	-0.145	0.182	0.096
Sausages	0.594	-0.059	-0.007	0.140
Canned	0.557	0.115	0.023	0.102
Fried food	0.644	-0.052	-0.260	0.028
Fruits	-0.074	0.079	0.741	-0.028
Animal fats	0.259	-0.123	0.099	-0.117
Nonfat dairy products	0.007	0.754	0.173	0.060
Whole dairy Products	0.122	-0.689	0.186	0.032
Legumes	0.043	-0.089	0.015	0.465
Processed sauces/seasonings	0.383	0.069	-0.228	0.115
Vegetable oils	0.125	0.065	0.108	0.681
Eggs	0.396	-0.129	0.133	-0.155
Tubers and roots	0.400	-0.039	0.445	-0.155
Legumes and vegetables	-0.035	0.085	0.742	0.147
% Variance explained	12.1	10.3	8.4	7.7
% Accumulated	12.1	22.4	30.8	38.5
<i>Eigenvalue</i>	2.18	1.86	1.50	1.38

*Traditional Brazilian; bold: significant factor load; *Kaiser-Meyer-Olkin* test = 0.61.

Comparison between mean adherence to dietary pattern scores and sociodemographic, lifestyle and clinical variables showed that the *inadequate pattern* was related to male individuals, those with a higher education, who were not physically active, who consumed alcoholic beverages, who sometimes had

difficulty chewing hard foods, who considered their health to be good and reported none or only one CNCND ($p > 0.05$). The *modified pattern*, meanwhile, was statistically associated with the female gender, elderly persons with more years of schooling, who had or currently smoked and who had a greater number of CNCNDs (Table 3).

Table 3. Distribution of mean food pattern scores according to sociodemographic, lifestyle and clinical variables. SABE study. Municipality of São Paulo, 2010.

Variables	Dietary Patterns			
	Inadequate Mean (SD*)	Modified Mean (SD)	Beneficial Mean (SD)	Traditional Brazilian Mean (SD)
Gender				
Female	-0.05 (0.04) [‡]	0.13 (0.04) [§]	0.06 (0.04) [§]	-0.02 (0.04) [‡]
Male	0.09 (0.05)	-0.07 (0.05)	-0.14 (0.06)	0.10 (0.05)
Age				
60 to 74 years	-0.01 (0.04)	0.12 (0.04) [§]	-0.09 (0.04) [§]	0.10 (0.04) [§]
≥ 75 years	0.05 (0.07)	-0.12 (0.05)	0.15(0.04)	-0.16 (0.05)

to be continued

Continuation of Table 3

Variables	Dietary Patterns			
	Inadequate	Modified	Beneficial	Traditional Brazilian
	Mean (SD)*	Mean (SD)	Mean (SD)	Mean (SD)
Education				
Illiterate	-0.08 (0.08) [§]	-0.26 (0.07) [§]	-0.28 (0.08) [§]	0.04 (0.07) [‡]
1 to 4 years	-0.07 (0.04) [§]	-0.06 (0.04) [§]	-0.11 (0.04) [§]	0.12 (0.04) [§]
5-8 years	0.04 (0.08)	0.19 (0.08) [‡]	0.09 (0.08)	-0.05 (0.09)
> 8 years	0.22 (0.07)	0.41 (0.07)	0.28 (0.08)	-0.15 (0.07)
Living arrangements				
Alone	-0.11 (0.07)	0.10 (0.07)	-0.07 (0.08)	-0.20 (0.08) [§]
With other(s)	0.03 (0.03)	0.04 (0.03)	-0.01 (0.04)	0.07 (0.03)
Marital status				
Married	0.01 (0.04)	0.06 (0.04)	-0.06 (0.05)	0.09 (0.04)
Unmarried	-0.01 (0.08)	0.08 (0.08)	0.01 (0.09)	-0.07 (0.09)
Widower	0.02 (0.05)	0.02 (0.05)	0.06 (0.05)	-0.04 (0.05) [‡]
Currently working				
Yes	0.06 (0.06)	0.09 (0.06)	-0.09 (0.06)	0.07 (0.06)
No	-0.02 (0.03)	0.03 (0.04)	0.01 (0.04)	0.01 (0.03)
Sufficient current income				
Yes	0.05 (0.04)	0.09 (0.04)	0.09 (0.04) [§]	-0.12 (0.04) [§]
No	-0.04 (0.04)	-0.01 (0.04)	-0.18 (0.05)	0.24 (0.04)
Physical activity				
Active	-0.20 (0.05) [§]	0.03 (0.05)	0.07 (0.05) [‡]	-0.01 (0.05)
Inactive	0.10 (0.04)	0.06 (0.04)	-0.07 (0.04)	0.04 (0.04)
Smoking				
Never smoked	-0.04 (0.04)	0.10 (0.04)	0.12 (0.04) [§]	-0.03 (0.04) [‡]
Has smoked	0.03 (0.05)	0.05 (0.05) [‡]	-0.08 (0.06) [§]	0.10 (0.05)
Currently smokes	0.12 (0.09)	-0.15 (0.09) [‡]	-0.47 (0.11) [§]	0.05 (0.10)
Consumes alcohol				
Yes	0.27 (0.07) [§]	0.02 (0.03)	0.18 (0.06) [§]	-0.06 (0.06)
No	-0.07 (0.03)	0.16 (0.07)	-0.08 (0.04)	0.05 (0.03)
Difficulty chewing				
Never	-0.06 (0.04) [§]	0.10 (0.04)	0.04 (0.04)	0.11 (0.04) [§]
Sometimes	0.27 (0.06) [§]	0.00 (0.06)	-0.09 (0.06)	-0.17 (0.05) [§]
Often	-0.12 (0.05)	0.02 (0.06)	-0.13 (0.06) [‡]	0.06 (0.06)
Self-perception of health				
Good and excellent	0.08 (0.05) [‡]	0.12 (0.05)	0.04 (0.05)	-0.01 (0.04) [‡]
Fair	-0.06 (0.04)	-0.00 (0.04)	-0.07 (0.05) [‡]	0.11 (0.04) [‡]
Poor and very poor	-0.07 (0.10)	0.06 (0.11)	-0.32 (0.11) [§]	-0.18 (0.11)
Number of CNCD **				
None	0.15 (0.07)	-0.23 (0.06) [§]	0.04 (0.07)	0.12 (0.06)
One	0.07 (0.06) [‡]	0.07 (0.06)	-0.01(0.06)	0.08 (0.05)
Two or more	-0.08 (0.04) [§]	0.12 (0.04) [§]	-0.05 (0.04)	-0.03 (0.04) [‡]

*Standard error; **Chronic non-communicable diseases; [‡]Wald Test $p < 0.05$; [§]Wald Test $p < 0.01$.

The *beneficial pattern* had greater adherence among women, elderly persons aged over 75 years, with a higher educational level, who considered their current income sufficient for the expenses of the household, who were physically active, never smoked and who consumed alcoholic beverages, besides not presenting difficulties of chewing hard foods that considered their health as good and very good ($p > 0.05$) (Table 3).

The profile of the adherents to the traditional Brazilian pattern was composed of male subjects, 60 to 74 years of age, with less years of study, who were accompanied and were married, that the income was not enough for the expenses, they smoked, however did not present difficulties to chew hard foods, did not report CNCDS and considered their health as regular ($p > 0.05$) (Table 3).

DISCUSSION

In this study four food patterns were identified among the elderly of the SABE Study, in the city of São Paulo, Brazil. Distinct sociodemographic, lifestyle and clinical variables were associated with the eating patterns of this study, showing that these are frequently the determinants of dietary choices and intake in this stage of life.

The patterns were identified by the use of factorial analysis. This type of analysis integrates multivariate statistical methods, which use information reported in food frequency questionnaires or food records to identify common patterns of food intake. Factor analysis is considered a *posteriori* approach as dietary patterns are derived through statistical modeling of existing dietary data. They generate patterns based on the available data, without any *a priori* hypothesis, and therefore do not necessarily represent optimal or acceptable patterns according to literature, but reflect the reality of the intake of the individuals studied^{19,20}.

Four food patterns were identified and accounted for 38.5% of variability. This proportion, despite being considered below that recommended by Hair et al.²¹ (who suggest 60% as a recommended figure) is acceptable, as studies with food data generally present a large number of groups and/or foods, reducing the possibility of a high explanation of variability in factor composition. Literature describes

variable proportions depending on the size of the sample. Ferreira et al.²², for example, studied 355 elderly persons from Botucatu, and using similar pattern identification methods to the present study, obtained a 25.9% explanation of variability, with six patterns extracted.

Dietary pattern analysis can improve understanding of current dietary practices, offer a way of evaluating the health outcomes of people who adopt a particular pattern, and produce results that may be more directly applicable, as food-based recommendations for populations are easier to understand than those based on nutrients²³.

As dietary standards are culturally determined, national studies are best suited for comparison purposes. International literature, however, contains much discussion of less healthy patterns known as "western or modern" and healthier patterns known as "prudent or Mediterranean-style", often influencing Brazilian literature to use these terms for patterns with similar foods. In the present study the nomenclature of the patterns was based on their effect on health and the composition of the foods that characterized them. Souza et al.⁵ in a representative sample of elderly people from Viçosa (N=402) also identified four patterns, one characterized by the presence of unhealthy foods (fat and sugar pattern) and others characterized by the presence of fruits, leafy vegetables and fish, all associated with socioeconomic variables, showing that those with lower schooling adhere more to less healthy patterns.

In general, studies show that women have a better diet than men, both among adults and among the elderly^{24,25}. Baker and Wardle²⁴ studied 1,054 elderly persons and found that women ingest significantly more fruit and vegetables than men, with a total of 3.5 servings per day for women compared to 2.5 servings for men. Only 16% of men compared to 34% of women consumed the five recommended servings of fruits and vegetables per day. The core of this gender difference may be knowledge, as men have less information about up-to-date dietary recommendations and are less aware of the interrelationship between diet and morbidities.

Higher levels of education are related to higher income and impact the acquisition of food²⁴. In the present study, schooling was associated with healthier

foods (fruits, vegetables, cereals and whole grains, and legumes). The higher the level of education, the higher the frequency of the intake of foods that are high in fiber and low in fat. Similar results were found in a study by Nascimento et al.²⁶ where a higher socioeconomic level had a weak association with foods such as rice and beans, but also had a strong association with vegetables, fruits, oleaginous fruits, etc.

Active individuals reported a lower frequency of intake of ultra-processed and sodium-rich foods than did non-active subjects. Chan et al.²⁷ studied Chinese elderly persons (N=3,707) in a home-based study and found that more active elderly persons were more associated with a dietary pattern with fruits and vegetables and less associated with a pattern of meats and processed foods. Those with two or more CNCs have a lower frequency of high-carbohydrate and low-fiber foods. This may be due to the fact that the diagnosis of diseases, in parallel with the advancement of age, tends to modify and improve the quality of diet due to the nutritional guidelines and care advice delivered by health professionals.

Many physiological and psychosocial changes which impact the quality and quantity of food intake occur during the aging process. The most common are related to changes in peripheral hormones, control of the central nervous system and the organs directly involved in digestion, such as slow gastric emptying, xerostomia and reduced sensitivity of the senses, such as the palate^{5,14}. Depression, mood disorders, loneliness, widowhood, lack of social support, isolation and poverty complete the factors that must be considered in the holistic approach of this population²⁸. All of these conditions are associated with health-related consequences, including declining functional status, impaired muscle function, decreased bone mass, micronutrient deficiencies, reduced cognitive functions, increased hospitalization, and premature death²⁸.

Similarly, Gomes et al.²⁹ investigated difficulty with mastication and found that individuals with greater chewing difficulties presented a lower quality of food intake. This is often seen as being due to a reduced consumption of foods such as raw meats, fruits and vegetables, considered important to health, and can lead to the inadequate supply of proteins and micronutrients³⁰.

International literature emphasizes the importance of the Mediterranean dietary pattern for the prevention of CNCs in this age group^{31,32}. However, despite this scientific evidence, it should be noted that the dietary pattern of a population is the result of multiple aspects, including individual, cultural and social factors. Adopting a dietary pattern from another geographic region means the foods involved will be more expensive and less available. The economic factor makes it difficult or impossible for elderly persons to apply a healthy diet that includes the daily intake of fruits, vegetables, whole grains, oleaginous fruit, legumes, meat, milk and dairy products, as these represent a significant expenditure in comparison with other expenses and individual and family needs. The challenge is therefore to adapt the dietary pattern of the region in which the individual resides, with achievable and feasible changes to the social and health reality of each person, always seeking the best dietary arrangement combined with the pleasure that only good food provides^{31,32}.

The limitations of the present study include its cross-sectional design, which does not allow changes in dietary pattern during the aging process to be identified. However, it was not the purpose of this study to analyze these changes over time, although other studies have shown that the dietary pattern of the elderly can be influenced by age, reduced food intake, difficulties in chewing and swallowing, insufficient income, the abusive use of medications and the presence of diseases, among other factors²⁸.

The main strengths of the present study are that it is a population-based study with a representative sample of elderly people from the city of São Paulo, based on the last census (2010), and applies methodological rigor in data collection and processing, with extensive training, standardization and the supervision of different interviewers and data input staff.

CONCLUSION

The results of the present study contribute to the understanding of the association between the dietary intake of today's elderly persons and social, clinical and lifestyle aspects in a population that is progressively growing in Brazil. Four predominant dietary patterns were identified in the study: inadequate, modified,

beneficial and traditional Brazilian, named according to the foods that make up each one.

The *inadequate* dietary pattern was adopted by elderly men, with a higher education, favorable clinical conditions, but with a precarious lifestyle. On the other hand, the *modified* pattern was characteristic of younger elderly women, who were more educated, with a more life style, but with greater clinical complications. The profile of the elderly who adopted the *beneficial* pattern was composed of longer-lived women, with a better economic status, schooling and lifestyle. Finally, the *Brazilian* pattern was adopted by younger men, who did not live alone with good

clinical conditions, but had lower levels of schooling and income sufficiency.

This evidence should be considered as support for the holistic nutritional approach of the elderly, as it is understood that the current socioeconomic and clinical situation of this population directly affects the food and lifestyle choices adopted. National longitudinal studies are needed in Brazil to elucidate the motivation for adopting a particular food pattern and identifying when it is modified; and thus, help guide effective public policies for dietary change and the promotion of healthy lifestyles for the Brazilian elderly.

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