Dietary patterns are associated with general and central obesity in elderly living in a Brazilian city

Priscila Lucelia Moreira¹, Jose Eduardo Corrente², Paulo Jose Fortes Villas Boas³, Ana Lucia Anjos Ferreira⁴*

¹Dietitian, MSc, Department of Internal Medicine, Botucatu Medical School at Sao Paulo State University (UNESP), Botucatu, SP, Brazil.
²Mathematician, Associate Professor, Department of Biostatistics, Botucatu, Institute of Biosciences at Sao Paulo State University (UNESP), Botucatu, SP, Brazil.
³Professor, Department of Internal Medicine, Botucatu Medical School at Sao Paulo State University (UNESP), Botucatu, SP, Brazil.
⁴Associate Professor, Department of Internal Medicine at Botucatu Medical School, Sao Paulo State University (UNESP), Botucatu, SP, Brazil.

Summary

Objective: dietary pattern evaluation is often used in order to determine whether a diet is healthy, as well as to predict the onset of diseases. This study aimed to identify dietary patterns, and to examine their associations with general (body mass index) and central (waist circumference and waist-to-hip ratio) obesity in community-living elderly in a Brazilian city.

Methods: this cross-sectional study included 126 elderly subjects aged 60 or older (57.1% females and mean age 74.2 ± 6.46 years). Anthropometric variables, weight, height, waist (WC) and hip (HC) circumferences, were measured. Body mass index (BMI) and waist-to-hip ratio (WHR) were calculated. Answers to a Food Frequency Questionnaire were interpreted by Principal Component Analysis in order to identify dietary patterns.

Results: five dietary patterns were identified and named as prudent (fruit, vegetables and meat), sweets and fats (pastries, sugary foods, fatty foods, whole milk), typical Brazilian (fried eggs, cooked beans, beef, candy, string beans, fried cassava), Mediterranean (fruit, vegetables, olive oil and nuts) and traditional meal (rice and beans). Moderate and high adherences to the Mediterranean pattern were protective factors to general and central obesity (WHR). High adherence to prudent was also protective to central obesity (WC).

Conclusion: adherences to the dietary patterns prudent and Mediterranean were protective factors to general and central obesity in elderly.

Keywords: elderly, dietary pattern, obesity, anthropometry, cross-sectional studies.

INTRODUCTION

The elderly population in Brazil has increased rapidly,¹ and by 2025, will rank sixth largest in the world.² The number of elders, in relation to the total Brazilian population, grew from 7.3% in 1991, to 8.56% in 2000³ and to 10.8% in 2010.⁴ Mortality and birth rate reductions correspond to factors associated with the elderly population rising.⁵ The World Health Organization considers ages 60+ or 65+ years when referring to the older population in developing and developed countries, respectively.

Diet is a changeable factor that can help healthy aging. The analysis of nutrient intake does not result in a clear understanding of its quality. Since a daily diet consists of a diversity of foods and a large concentration of nutrients, the analysis of dietary patterns becomes the best alternative to evaluating healthy behaviors.⁶,⁷

Diet and nutrition have been studied as factors for promoting and maintaining health throughout life.⁸ Dietary patterns have been associated with non-communicable chronic diseases,⁹-¹³ mortality,¹⁴,¹⁶ cognitive function,¹⁷ obesity,¹⁰,¹₂,¹₈-¹₉ and the protective effect on being overweight.¹₄,¹₈,²₀-²¹

Unhealthy dietary patterns (sugar, fat, processed foods and refined grains) can be found in overweight younger adults²₀,²² as well as in the elderly.¹⁰,¹₉ Moreover, such patterns can be related to measurements above the recom-
mended waist circumference and waist-to-hip ratio in adults and the elderly.\textsuperscript{12,23} Several studies have shown that healthy food (fruit, vegetable, low fat meat and fiber rich products) may promote a protective effect against general [body mass index, (BMI)\textsuperscript{18,20,24} and central [waist-to-hip ratio (WHR) and waist circumference (WC)] obesity.\textsuperscript{14,18,21,24}

Although it seems obvious that unhealthy dietary patterns may be associated with obesity, this issue may be debatable. In fact, other studies have identified no positive relationship between obesity and unhealthy dietary patterns in both elderly\textsuperscript{14} and younger adults.\textsuperscript{25} Examining children and adults, previous study showed the association between healthy food intake (fruit and vegetables) and obesity reduction (adiposity/overweight) is not clear.\textsuperscript{26} Thus, the current study attempts to characterize the dietary patterns, and verify their association with health-related variables in the elderly population of a Brazilian city.

**Methods**

**Subjects**

The study was conducted in Botucatu, which is a city with 130,201 inhabitants\textsuperscript{27} and is located (22°53'09" south latitude, 48°26'42" west longitude) in the state of Sao Paulo, Brazil. Data were collected at the participants’ houses from May to November 2008. The sample consisted of 126 individuals older than ≥ 60 years. Inclusion criteria were pre-defined as follows: residing in a community (city of Botucatu, SP, Brazil),\textsuperscript{3} 60 years and agreeing to participate in the study. The sample (base sample) was sourced from a database obtained in a previous study conducted in Botucatu City.\textsuperscript{28} From the base sample of 365 elderly, 185 subjects were randomly selected to be part of a database of the current study. The initial contact was made by telephone, followed by a household interview, anthropometric measurements and a dietary record. Fifty-nine subjects were excluded due to several reasons (refusal to participate in the study, 34; unanswered phone, 13; death, 3; use of vitamins, 3; absence of records of their primary health, 3; hospitalization, 2; absence, 1), with 126 subjects remaining. All procedures were in accordance with the Helsinki Declaration for human rights, and the study was approved by the Research Ethics Committee of the Botucatu School of Medicine (UNESP). All patients or their legal guardians signed a Free-Consent form.

**Anthropometric measures**

Weight and height were measured according to Lohman (1988).\textsuperscript{29} Subjects were weighted dressed in light clothing and barefoot in a digital scale (Toledo®), with 150 kg capacity and 0.1 kg accuracy. Height was recorded using a portable stadiometer (Sanny®) with the subjects standing erect without shoes and with the feet together. For bedridden elderly persons, the weight and height were estimated by the Chumlea formula.\textsuperscript{30-31}

Body mass index (BMI) was calculated by dividing the weight by height squared (kilograms/meters\textsuperscript{2}). The classification of nutrition status by BMI was performed according to cutoff points established by the Pan American Health Organization\textsuperscript{32} [low weight (≤ 23 kg/m\textsuperscript{2}), normal weight for height (23 < BMI < 28 kg/m\textsuperscript{2}) and overweight (≥ 28 kg/m\textsuperscript{2} overweight and obese ≥ 30 kg/m\textsuperscript{2})].

Waist (WC) and hip (HC) circumferences were measured using a non-elastic tape. WC was measured with the subject standing up, at the end of normal expiration, by using the tape at a point midway between the inferior margin of the lowest rib and the iliac crest, whereas HC was recorded at maximum posterior extension of the hip.\textsuperscript{29} The waist-to-hip ratio (WHR) was calculated by dividing WC by HC. Waist circumference was considered high when its values were above 88 cm for women and 102 cm for men.\textsuperscript{33} WHR was considered elevated when its values were above 0.85 for women and 1 for men.\textsuperscript{33} All measurements were performed by the same investigator (1\textsuperscript{st} author of this study), with the same tape, stadiometer and scale.

**Dietary intakes**

The evaluation of the estimated daily intake was performed by using a food frequency questionnaire (FFQ)\textsuperscript{34} with adaptation (inclusion of cooked sweet potatoes, chicory, pepper, lime, mango, beets, green beans, poached eggs and nuts). Besides daily intake, the FFQ was used to evaluate the individuals’ frequency of consumption (from 0-10 times a day, week, month or year).\textsuperscript{35}

**Statistical analysis**

The dietary intake information obtained by FFQ was analyzed and interpreted for identification of the dietary patterns by exploratory factor analysis (Principal Component Analysis, PCA). In this method, data are summarized, and correlated variables are grouped. Some food items were excluded from the analysis because they displayed low intake frequency. One hundred and twenty-one food items were included in the PCA.

Kaiser-Mayer-Olkin (KMO) measurement and Bartlett’s Test of Sphericity (BTS) were applied to evaluate PCA applicability. In order to obtain the dietary patterns, varimax rotation was used, and based on the correlation...
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matrix. The number of factors was determined by taking into account loading values greater than or equal to 0.3, and the percentage of explained variation. Food items with negative loadings were excluded from each pattern.

Cronbach’s $\alpha$ coefficient was obtained for each factor by evaluating the consistency and the characteristics of each food and the effect of its exclusion on the final coefficient value.

The scores of individual intake were obtained from the dietary patterns and categorized into tertiles, i.e. the 1st as low, the 2nd as moderate and 3rd as high adherence to the pattern.

The variables BMI [(presence (BMI $\geq 28$ kg/m$^2$) or absence (BMI $\leq 28$ kg/m$^2$) of overweight)] and WC [(presence (≥ 88cm, women; ≥ 102cm, men) or absence (<88cm, women; <102cm, men) of increased values] were categorized dichotomously. For the waist-hip ratio, the elevated values were considered when they were above 0.85 for women and 1 for men.

Logistic regression models were fitted by considering general or central obesity as an outcome and the variables of interest (low, moderate and high adherence to dietary patterns) as an explanatory control for age and sex.

All analyses were performed by software SAS (Statistical Analysis System, Cary, North Caroline) and SPSS (Statistical Package for Social Sciences, Armonk, New York) for Windows, versions 9.2 and 19.0, respectively.

**Results**

One hundred and twenty-six elderly individuals were evaluated. Of these, 72 (57.1%) were females aged 65 to 95 years (74.2 ± 6.46). By using the Kaiser-Mayer-Olkin (KMO) coefficient and the Barlett Test of Sphericity (BTS), appropriate conditions were verified for application of Principal Component Analysis (PCA) and patterns (factors) were extracted. By factor analysis, it was possible to identify 5 dietary patterns in this population, which explained 21.11% of the total variance of food intake. In our study, the pattern labeled as prudent presented the highest variance percentage (5.64%), followed by sweets and fats (4.48%), typical Brazilian pattern (4.05%), Mediterranean (3.72%) and traditional meal (3.22%).

Table 1 shows the anthropometrics characteristics of participants.

<table>
<thead>
<tr>
<th>All</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of subjects$^2$</td>
<td>126</td>
<td>54</td>
</tr>
<tr>
<td>Age (y)$^1$</td>
<td>74.1 (6.6)</td>
<td>73.4 (6.3)</td>
</tr>
<tr>
<td>BMI (kg/m$^2$)</td>
<td>27.2 (4.7)</td>
<td>26.3 (4.2)</td>
</tr>
<tr>
<td>Overweight (BMI 28 – 30 kg/m$^2$)$^2$</td>
<td>20 (15.9)</td>
<td>8 (14.8)</td>
</tr>
<tr>
<td>Obese (BMI ≥ 30 kg/m$^2$)$^2$</td>
<td>29 (23)</td>
<td>9 (16.7)</td>
</tr>
<tr>
<td>WC (cm)$^1$</td>
<td>94 (12.4)</td>
<td>97.4 (11.4)</td>
</tr>
<tr>
<td>HC (cm)$^1$</td>
<td>104.8 (10.6)</td>
<td>101.1 (6.7)</td>
</tr>
<tr>
<td>WHR</td>
<td>0.9 (0.09)</td>
<td>0.96 (0.08)</td>
</tr>
</tbody>
</table>

BMI, body mass index; WC, waist circumference; HC, hip circumference; WHR, waist to hip ratio. $^1$ data are mean (± standard deviation). $^2$ data are number (%).

Table 2 shows the factor loading for the five dietary patterns identified.

<table>
<thead>
<tr>
<th>Foods</th>
<th>Pattern 1</th>
<th>Pattern 2</th>
<th>Pattern 3</th>
<th>Pattern 4</th>
<th>Pattern 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooked rice</td>
<td>-0.206</td>
<td>0.142</td>
<td>0.287</td>
<td>-0.029</td>
<td>0.367</td>
</tr>
<tr>
<td>Sweet biscuits</td>
<td>0.134</td>
<td>0.385</td>
<td>0.082</td>
<td>-0.135</td>
<td>0.113</td>
</tr>
<tr>
<td>French fries</td>
<td>-0.055</td>
<td>0.323</td>
<td>0.223</td>
<td>-0.180</td>
<td>-0.066</td>
</tr>
<tr>
<td>Boiled potato</td>
<td>0.424</td>
<td>-0.113</td>
<td>0.116</td>
<td>0.060</td>
<td>0.163</td>
</tr>
<tr>
<td>Boiled cassava</td>
<td>0.488</td>
<td>-0.166</td>
<td>0.193</td>
<td>-0.443</td>
<td>-0.098</td>
</tr>
<tr>
<td>Fried cassava</td>
<td>0.148</td>
<td>0.127</td>
<td>0.329</td>
<td>-0.245</td>
<td>-0.067</td>
</tr>
<tr>
<td>Baked sweet potatoes</td>
<td>-0.010</td>
<td>0.400</td>
<td>0.040</td>
<td>-0.011</td>
<td>0.135</td>
</tr>
<tr>
<td>Sugar</td>
<td>-0.180</td>
<td>0.420</td>
<td>0.214</td>
<td>-0.278</td>
<td>0.165</td>
</tr>
<tr>
<td>Ice cream</td>
<td>0.051</td>
<td>0.337</td>
<td>0.126</td>
<td>0.175</td>
<td>0.025</td>
</tr>
<tr>
<td>Cooked beans</td>
<td>-0.350</td>
<td>0.025</td>
<td>0.384</td>
<td>0.028</td>
<td>0.330</td>
</tr>
<tr>
<td>Chard</td>
<td>0.372</td>
<td>-0.217</td>
<td>0.201</td>
<td>0.448</td>
<td>0.204</td>
</tr>
<tr>
<td>Watercress</td>
<td>0.423</td>
<td>0.161</td>
<td>-0.031</td>
<td>0.049</td>
<td>0.035</td>
</tr>
<tr>
<td>Chicory</td>
<td>0.458</td>
<td>-0.106</td>
<td>0.137</td>
<td>-0.338</td>
<td>0.057</td>
</tr>
<tr>
<td>Escarole</td>
<td>0.425</td>
<td>-0.274</td>
<td>0.104</td>
<td>-0.262</td>
<td>0.174</td>
</tr>
<tr>
<td>Broccoli</td>
<td>0.706</td>
<td>-0.299</td>
<td>0.247</td>
<td>0.152</td>
<td>0.025</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>0.506</td>
<td>-0.036</td>
<td>0.216</td>
<td>0.356</td>
<td>0.085</td>
</tr>
<tr>
<td>Spinach</td>
<td>0.415</td>
<td>0.218</td>
<td>-0.225</td>
<td>-0.020</td>
<td>0.142</td>
</tr>
<tr>
<td>Courgette</td>
<td>0.663</td>
<td>-0.199</td>
<td>0.074</td>
<td>-0.303</td>
<td>0.108</td>
</tr>
<tr>
<td>Eggplant</td>
<td>0.695</td>
<td>-0.228</td>
<td>-0.030</td>
<td>-0.121</td>
<td>-0.081</td>
</tr>
<tr>
<td>Chayote</td>
<td>0.556</td>
<td>-0.184</td>
<td>0.274</td>
<td>-0.201</td>
<td>-0.074</td>
</tr>
<tr>
<td>Pepper</td>
<td>0.230</td>
<td>0.002</td>
<td>0.296</td>
<td>0.335</td>
<td>0.105</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>0.315</td>
<td>0.171</td>
<td>0.136</td>
<td>0.328</td>
<td>0.030</td>
</tr>
<tr>
<td>String beans</td>
<td>0.609</td>
<td>-0.233</td>
<td>0.335</td>
<td>-0.050</td>
<td>0.109</td>
</tr>
</tbody>
</table>

(continue)
used in the preparation of Brazilian people’s meals, and was called the typical Brazilian pattern. Pattern 4 was rich in fruits, vegetables, monounsaturated fats (olive oil, avocado and nuts), low amounts of foods from animal sources, and was designated the Mediterranean. Pattern 5 contained cooked rice and beans, which represented the basis of Brazilian meals, and was labeled the traditional meal.

Table 3 shows the five patterns identified. Dietary pattern 1 was mainly loaded with fruit, vegetables and low fat meat and was labeled as prudent. Pattern 2 was mainly rich in foods with high energy, such as, sweets, pork, and french fries and was named the sweets and fats. Pattern 3 contained legumes, meat, vegetables, fried eggs and fried carbohydrates (cassava, in this case), which are foods usually

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The current study conducted in community-living elderly identified five dietary patterns named as prudent, sweets and fats, typical Brazilian pattern, Mediterranean and traditional meal. Our results showed that moderate and high adherences to the Mediterranean pattern are protective factors to general (BMI) and central obesity (WHR), respectively; whereas high adherence to prudent may have a beneficial effect on central obesity (WC). To our knowledge, this is the first time that dietary patterns and their effects on general and central obesity in Brazilian elderly have been evaluated.

The 5 patterns found represented 21.11% of the total variance. This value was similar (21%) to that found in a previous study conducted on Italian elderly, which identified 4 dietary patterns. The FFQ currently applied has been used in previous studies. The good reproducibility for associations currently observed by applying FFQ and PCA was also identified by another author. In fact, FFQ can be applied in epidemiological studies, since it is able to associate the frequency of intake of certain dietary factors with variables of interest.

The named Mediterranean pattern included health foods from a plant source, olive oil, avocados and nuts, although also comprised some kind of cheeses with high fat amount (mozzarella, parmesan and prato cheese). Since it contains foods that are rich in monounsaturated fatty acids, it is considered to be a cardioprotective diet. The inverse association between adherence to the Mediterranean diet and cardiovascular disease has been shown in a study that examined event occurrences (myocardial infarction, stroke, or death from cardiovascular causes) in the 4.8 years of follow-up in a population aged 55-80 years, and by meta-analysis that evaluated mortality risk. This diet pattern also has been associated with lower general mortality in Europe.

Our results showed that moderate and high adherences to Mediterranean pattern are protective factors to general (BMI) and central obesity (WHR), respectively. Previous study identified the Mediterranean pattern and WHR as factors independently associated with the ischemic stroke occurrence in elderly and other adults. Spanish researchers found an inverse association between obesity (BMI and WC) and a healthy life style, including adherence to the Mediterranean diet by the elderly. Examining adults, prospective studies also have shown that adherence to the Mediterranean diet was negatively associated with WC and with weight gain (≥ 5 kg). On the other hand, some studies found no protective effect of the Mediterranean diet on weight gain in adults and elderly.

Also found in other studies, the prudent dietary pattern has been associated with the reduction of all-cause mortality and hypertension. In the current study,

**TABLE 4 Dietary patterns and overweight (BMI), WHR and WC association in 126 elderly**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Adherence to patterns</th>
<th>BMI</th>
<th></th>
<th>WHR</th>
<th></th>
<th>WC</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>p-value</td>
<td>OR (95% CI)</td>
<td>p-value</td>
<td>OR (95% CI)</td>
<td>p-value</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>Pattern 1</td>
<td>High</td>
<td>0.22</td>
<td>0.626 (0.250-1.567)</td>
<td>0.36</td>
<td>1.015 (0.402-2.561)</td>
<td>0.01</td>
<td>0.160 (0.031-0.835)</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>0.47</td>
<td>1.051 (0.433-2.554)</td>
<td>0.05</td>
<td>2.158 (0.870-5.356)</td>
<td>0.03</td>
<td>1.390 (0.455-4.241)</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Pattern 2</td>
<td>High</td>
<td>0.77</td>
<td>0.679 (0.265-1.735)</td>
<td>0.28</td>
<td>0.595 (0.227-1.557)</td>
<td>0.09</td>
<td>0.249 (0.061-1.025)</td>
</tr>
<tr>
<td>Sweets and fats</td>
<td>Moderate</td>
<td>0.39</td>
<td>0.585 (0.233-1.473)</td>
<td>0.76</td>
<td>0.869 (0.348-2.172)</td>
<td>0.75</td>
<td>0.596 (0.190-1.872)</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Pattern 3</td>
<td>High</td>
<td>0.57</td>
<td>0.497 (0.202-1.226)</td>
<td>0.77</td>
<td>1.026 (0.414-2.544)</td>
<td>0.20</td>
<td>1.451 (0.429-4.907)</td>
</tr>
<tr>
<td>Typical Brazilian</td>
<td>Moderate</td>
<td>0.15</td>
<td>0.386 (0.151-0.991)</td>
<td>0.51</td>
<td>1.318 (0.522-3.328)</td>
<td>0.18</td>
<td>0.558 (0.145-2.153)</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Pattern 4</td>
<td>High</td>
<td>0.33</td>
<td>0.332 (0.133-0.830)</td>
<td>0.02</td>
<td>0.027 (0.109-0.706)</td>
<td>0.29</td>
<td>0.357 (0.104-1.222)</td>
</tr>
<tr>
<td>Mediterranean</td>
<td>Moderate</td>
<td>0.04</td>
<td>0.243 (0.093-0.635)</td>
<td>0.94</td>
<td>0.513 (0.207-1.269)</td>
<td>0.48</td>
<td>0.402 (0.114-1.419)</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Pattern 5</td>
<td>High</td>
<td>0.94</td>
<td>0.860 (0.346-2.139)</td>
<td>0.10</td>
<td>0.586 (0.229-1.494)</td>
<td>0.98</td>
<td>0.995 (0.297-3.341)</td>
</tr>
<tr>
<td>Traditional meal</td>
<td>Moderate</td>
<td>0.68</td>
<td>0.785 (0.313-1.969)</td>
<td>0.18</td>
<td>1.316 (0.530-3.269)</td>
<td>0.98</td>
<td>1.009 (0.300-3.391)</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

BMI, body mass index; WHR, waist to hip ratio; WC, waist circumference. Odds ratio adjusted for age and sex.

**DISCUSSION**

The current study conducted in community-living elderly identified five dietary patterns named as prudent, sweets and fats, typical Brazilian pattern, Mediterranean and traditional meal. Our results showed that moderate and high adherences to the Mediterranean pattern are protective factors to general (BMI) and central obesity (WHR), respectively; whereas high adherence to prudent may have a beneficial effect on central obesity (WC). To our knowledge, this is the first time that dietary patterns and their effects on general and central obesity in Brazilian elderly have been evaluated. The 5 patterns found represented 21.11% of the total variance. This value was similar (21%) to that found in a previous study conducted on Italians elderly, which identified 4 dietary patterns. The FFQ currently applied has been used in previous studies. The good reproducibility for associations currently observed by applying FFQ and PCA was also identified by another author. In fact, FFQ can be applied in epidemiological studies, since it is able to associate the frequency of intake of certain dietary factors with variables of interest.

The named Mediterranean pattern included health foods from a plant source, olive oil, avocados and nuts, although also comprised some kind of cheeses with high fat amount (mozzarella, parmesan and prato cheese). Since it contains foods that are rich in monounsaturated fatty acids, it is considered to be a cardioprotective diet. The inverse association between adherence to the Mediterranean diet and cardiovascular disease has been shown in a study that examined event occurrences (myocardial infarction, stroke, or death from cardiovascular causes) in the 4.8 years of follow-up in a population aged 55-80 years, and by meta-analysis that evaluated mortality risk. This diet pattern also has been associated with lower general mortality in Europe.

Our results showed that moderate and high adherences to Mediterranean pattern are protective factors to general (BMI) and central obesity (WHR), respectively. Previous study identified the Mediterranean pattern and WHR as factors independently associated with the ischemic stroke occurrence in elderly and other adults. Spanish researchers found an inverse association between obesity (BMI and WC) and a healthy life style, including adherence to the Mediterranean diet by the elderly. Examining adults, prospective studies also have shown that adherence to the Mediterranean diet was negatively associated with WC and with weight gain (≥ 5 kg). On the other hand, some studies found no protective effect of the Mediterranean diet on weight gain in adults and elderly.

Also found in other studies, the prudent dietary pattern has been associated with the reduction of all-cause mortality and hypertension. In the current study,
high adherence to this dietary pattern was a protective factor for central obesity (WC). Similar results were identified in the elderly and adults.

The sweets and fats pattern has been found in several researches. It represents a concerning dietary pattern since it contains foods that are associated with the high prevalence of chronic diseases. In fact, elderly people tend to show a high percentage of non-communicable chronic diseases, such as hypertension, cardiovascular diseases and diabetes. However, it is important to note that other factors are associated with chronic diseases, such as genetic ones. Absence of the association between obesity and this dietary pattern was currently found. Conversely, the dietary pattern containing sweets and fats was associated with a high BMI in the elderly and adults, elevated WC in adults and high mortality in elderly men.

Another dietary pattern, typical Brazilian, represents the standard Brazilian meal which contains a type of meat, a legume (beans, in this case), a fried carbohydrate (cassava), a vegetable, and fried eggs. Examining results from the Family Budget Study (children, adults and elderly individuals), a study found that the typical Brazilian pattern contains foods that were noteworthy in the dietary representation from all Brazilian regions. The absence of the association with this dietary pattern and obesity was evident in our study. To the best of our knowledge, no studies have addressed this issue. Therefore, comparisons cannot be made.

The traditional meal pattern is incorporated into the population’s habits from the North to the South of Brazil and in all age ranges. The comparison of this pattern with international studies is not actually feasible since this combination of rice and beans is typically Brazilian. We did not identify the association of this dietary pattern with obesity in the elderly. Some national studies performed in adult populations showed that this pattern was inversely associated with WC and was associated with lower risk factors for weight gain.

It is important to emphasize that the metabolic syndrome is a frequent condition among elderly and that central obesity is a risk factor for this disorder. In the present study, we showed central obesity may have been protected by high adherence to the Mediterranean and prudent patterns, and general obesity may have been protected by moderated adherence to the Mediterranean dietary pattern. Recent systematic review identified evidences of adherence to the Mediterranean diet and protective effects in adults and elderly subjects with metabolic syndrome. Thus, the adherence to those dietary patterns may contribute to diminishing the metabolic syndrome prevalence.

It is worth mentioning that the current population cannot be considered representative of the whole Brazilian community-living elderly, since they came from a Brazilian small city. Other limiting factors should also be mentioned, such as the sample size, study design (cross-sectional) and method for identifying the dietary patterns, which is not defined as a gold standard.

Although longitudinal studies with larger numbers of elderly are needed, health programs, including the formulation of policies for dietary education and health care, should be adopted to prevent obesity in older people.

CONCLUSION

In summary, our study identified that moderate and high adherences to the Mediterranean pattern are protective factors to general (BMI) and central obesity (WHR), whereas high adherence to the prudent pattern is a protective factor to central obesity (WC) in the elderly.

In spite of the limitations discussed, the outcomes of this study contribute to the literature by furthering the knowledge of the relationship between dietary patterns and obesity in the elderly. Longitudinal studies using a larger sample size are needed to test the hypothesis of the possible obesity protecting effect of the Mediterranean and prudent dietary patterns on community-living elders.

AUTHOR’S CONTRIBUTIONS

PLM performed the data collection. JEC and PLM worked on data analysis and interpretation, and statistical analysis. PJFVB, PLM, JEC and ALAF wrote the final version of the manuscript. All authors evaluated the results, contributed with their comments, and approved the final version of the manuscript before submission for publication.

ACKNOWLEDGEMENTS

We thank São Paulo’s State Research Support Foundation (FAPESP # 2007/57545-8; # 2007/07455-2), which supported this study in part, and the Research Support Group at Botucatu School of Medicine at Sao Paulo State University (UNESP), which helped in the statistical analysis. We appreciate Barbara B. Golner’s editing of the English grammar.

Supported by FAPESP (#2007/57545-8, Master’s Scholarship; #2007/07455-2, Research Financial Support).
Padrões alimentares associados com obesidade geral e central em idosos residentes em uma cidade brasileira.

Objetivo: a avaliação do padrão alimentar é muitas vezes usada para determinar se uma dieta é saudável, bem como para predizer o aparecimento de doenças. Este estudo teve como objetivo identificar padrões alimentares e analisar as suas associações com obesidade geral (indice de massa corporal) e central (circunferência da cintura e relação cintura-quadril) em idosos residentes em comunidade em uma cidade brasileira.

Métodos: este estudo transversal incluiu 126 idosos com 60 anos ou mais de idade (57,1% do sexo feminino e média de idade 74,2 ± 6,46 anos). As variáveis antropométricas [peso, altura, circunferências da cintura (CC) e do quadril (CQ)] foram mensuradas. Foram calculados o índice de massa corporal (IMC) e relação cintura-quadril (RCQ). As respostas a um questionário de frequência alimentar foram interpretadas por Análise de Componentes Principais, a fim de identificar os padrões alimentares.

Resultados: cinco padrões alimentares foram identificados e nomeados como prudente (frutas, legumes e carne), doces e gorduras (alimentos de pastelaria, doces, adereços), Mediterrâneo (frutas, legumes, azeite de oliva e nozes) e tradicional (arroz e feijoá). Adesões moderada e alta ao padrão Mediterrâneo foram fatores de proteção para obesidade geral e central (RCQ). Alta adesão ao padrão prudente também foi protetora contra obesidade central (CC).

Conclusão: adesões aos padrões alimentares prudente e Mediterrâneo foram fatores de proteção para obesidade geral e central em idosos.

Palavras-chave: idoso, padrão alimentar, obesidade, antropometria, estudos transversais.

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