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Regular consumption of foods rich in bioactive compounds and antioxidant nutrients and its relation with the elderly cognitive state

Consumo regular de alimentos ricos em compostos bioativos e nutrientes antioxidantes e estado cognitivo de idosos

Abstract

Introduction: The prevalence of aging-related pathologies has increased considerably. Nutrition is an important modifiable risk factor. **Objective:** Evaluate the elderly cognitive status and consumption frequency of foods rich in bioactive compounds and antioxidant nutrients. **Methods:** Elderly people from the Paraná southwest region participated in the research. Sociodemographic and clinical data were collected. Cognitive status was assessed using the Mini Mental State Examination (MMSE); the consumption of fruits, vegetables, legumes and oilseeds was assessed using a food consumption frequency questionnaire. Data were analyzed using descriptive statistics and logistic regression. Sample composed of 82 elderlies, predominantly female, with low education and income. The assessment of cognitive status and independence in performing daily activities indicated that 20.7% of the sample presented cognitive decline and 13.4% were dependent on performing daily activities. **Results:** The elderly evaluated presented low regular consumption of fruits (75.6%), vegetables (65.9%), legumes (67.1%) and especially oilseeds (8.5%). In the logistic regression analysis model adjusted for sex, age, living arrangements, income and education, the elderly who presented irregular consumption of vegetables were 5.04 times more probable to develop cognitive decline, while in the model that included, in addition to the aforementioned variables, physical activity and clinical risk factors for cognitive decline, they were 6.19 times more probable. **Conclusion:** The present study revealed that the sample presented significant percentage of cognitive decline, low regular consumption of varied foods from the groups of fruits, vegetables, legumes and oilseeds, as well as irregular consumption of vegetables influenced greater chances of elderly people presenting cognitive impairment.

Keywords: Aging. Dementia. Food Consumption.

Resumo

Introdução: A prevalência das patologias relacionadas ao envelhecimento aumentou consideravelmente, e a nutrição constitui um importante fator de risco modificável. **Objetivo:** Avaliar o estado cognitivo e a frequência de consumo de alimentos ricos em compostos bioativos e nutrientes antioxidantes em idosos. **Métodos:** Participaram da pesquisa idosos da região sudoeste do Paraná. Coletaram-se dados sociodemográficos e clínicos. Avaliou-se o estado cognitivo através do Miniexame do Estado Mental (MEEM), e o consumo de frutas, legumes, leguminosas e oleaginosas foi avaliado por meio de um questionário de frequência de consumo alimentar. Analisaram-se os dados utilizando estatística descritiva e regressão logística. Amostra composta por 82 idosos, predominantemente feminina, com baixa escolaridade e

renda. A avaliação do estado cognitivo e da independência na realização das atividades diárias demonstrou que 20,7% da amostra apresentou declínio cognitivo e 13,4% possuíam dependência na realização de atividades cotidianas. **Resultados:** Os idosos avaliados apresentaram baixo consumo regular de frutas (75,6%), hortaliças (65,9%), leguminosas (67,1%) e especialmente oleaginosas (8,5%). No modelo de análise de regressão logística ajustado para sexo, idade, arranjo domiciliar, renda e escolaridade, os idosos que apresentaram consumo irregular de hortaliças possuíram 5,04 vezes mais chances de desenvolver declínio cognitivo, enquanto no modelo que incluiu, além das variáveis supracitadas, atividade física e fatores de risco clínicos para declínio cognitivo, eles apresentaram 6,19 vezes mais chances. **Conclusão:** O presente estudo apontou que a amostra apresentou um percentual importante de declínio cognitivo, baixo consumo regular de alimentos variados dos grupos das frutas, hortaliças, leguminosas e oleaginosas, sendo que o consumo irregular de hortaliças influenciou em maiores chances de os idosos apresentarem comprometimento cognitivo.

Palavras-chave: Envelhecimento. Demência. Consumo Alimentar.

INTRODUCTION

Population aging has led to an increase in the prevalence of chronic degenerative diseases, mainly neurocognitive.¹ The occurrence of neurodegenerative diseases is increasing exponentially around the world, and it is estimated that the number of people living with this condition will triple from 50 million to 152 million in 2050.²

Dementia stands out as one of the diseases with most impact on the elderly's functionality and quality of life,³ as it is characterized by progressive losses affecting memory and other cognitive abilities and behaviors. Alzheimer's disease is the most common type of dementia representing between 60 and 70% of cases.⁴

The pathogenesis of these diseases involves the oxidative stress process,⁵ which is an imbalance between the production of reactive species and antioxidant defenses. The aging process is intensified due to the decline of the body's antioxidant defenses, which leads to an increase in the action of reactive species.⁶ These alterations, at the mitochondrial level, compromise the normal production of energy in neurons.⁷

Cerebral hypometabolism is one of the Alzheimer's disease causes, and the decrease in mitochondrial function in producing adenosine triphosphate (ATP), associated with an increase in the production of free radicals, are considered key factors for the onset of dementias.⁸

Among the strategies to maintain a healthy neuronal population in the aging brain for as long as possible, nutrition stands out through the supply of nutrients needed to maintain the brain functioning normally.⁹

Also with regard to oxidative damage, studies have shown that it can be prevented with adequate consumption of nutrients with antioxidant capacity, such as vitamins C, E and selenium, or with the supplementation of these nutrients.⁹ In addition to these, stands out the consumption of foods rich in bioactive compounds, such as carotenoids and polyphenols, which have the ability to inhibit lipid peroxidation.¹⁰

Considering that functional disability can reduce autonomy in performing basic and instrumental activities, and that so far there is no efficient treatment to alter the course of neurodegenerative diseases, prevention becomes a priority and nutrition is an important factor in modifiable risk. The present study aimed to evaluate the cognitive status and frequency of consumption of foods rich in bioactive compounds and antioxidant nutrients in the elderly.

METHODS

Cross-sectional quantitative research with primary data collection, carried out from June 2017 to April 2018. It was submitted and approved by the Ethics Committee for Research with Human Beings at the Universidade Federal da Fronteira Sul, under CAAE 67329517.3.0000.5564. All research participants received and signed the Informed Consent Form. For convenience, three municipalities in the Paraná southwest region were selected. As inclusion criteria, the following were adopted: individuals of both sexes, aged ≥ 60 years, residents of the urban or rural areas of the cities mentioned. Exclusion criteria were: illiterate, institutionalized and severe dementia elderly. The elderly were invited to participate in the research from the coexistence or health care groups of these municipalities.

To characterize the studied sample, sociodemographic data were collected: gender, age, education, living arrangements, monthly income, work or retirement, and clinical data that constitute risk factors for dementia: family history of Alzheimer's or Parkinson's, smoking, alcohol consumption, previous history of depression, head trauma, cerebrovascular disease. Furthermore, information on the practice of physical activity (free time, commuting and occupational) was collected and evaluated in accordance with the recommendations of the World Health Organization.¹¹

The assessment of cognitive status was carried out using the Mini Mental State Examination (MMSE) developed by Folstein, Folstein and McHugh,¹² an instrument consisting of temporal questions and local orientation, recording

of three words, attention and calculation, recall memory, language and visual constructive ability. The MMSE score ranges from 0 (greater cognitive impairment) to a maximum of 30 points (best cognitive ability). To assess the MMSE, the cutoff points proposed by Bertolucci et al.¹³ were used, which consider the educational level of the participants.

The functional capacity of research participants was assessed using the Pfeffer questionnaire (QPAF),¹⁴ whose answers have the following options and subsequent scores: normal (0); never did, but could do (0); does with difficulty (1); never did and now would have difficulty (1); needs help (2); not able (3). For each item in the questionnaire, the elderly person can obtain 0-3 points, totaling a maximum of 30 points, with a score greater than or equal to 5 points already indicating that the elderly person is dependent.

Food consumption was assessed using a reduced ELSA-BRASIL Food Frequency Questionnaire (FFQ) adapted by Mannato.¹⁵ The FFQ is a semi-quantitative instrument with 76 items that address the usual consumption of the last 12 months, divided into the following food categories: breads, cereals and tubers; fruits; vegetables, legumes and pulses; eggs, milk and dairy products; pasta and other preparations; candy; and drinks. For this study, the foods that have the greatest availability of bioactive compounds and antioxidant nutrients were considered the group of fruits, vegetables, legumes and oilseeds. From the collected data, the sample was divided into two groups: those who had regular consumption, that is, who reported consuming the aforementioned foods at least once a day; and irregular consumption, for those who reported not consuming the aforementioned foods on a daily basis.

Data were analyzed using descriptive and comparative statistics considering the elderly with and without cognitive decline, using the Prism 5.0 software. To assess possible associations between the regularity of consumption of the food groups studied and the presence of cognitive decline, Fisher's exact test was used. Subsequently, the study outcome was explored in a dichotomous manner (with and without cognitive decline) through logistic regression, obtaining odds ratio values and its respective confidence intervals (95%CI) using the STATA package, version 13.1. The variables were included in blocks in the analysis, using four adjustment models in total. Model 1 was adjusted for demographic variables (gender, age), while model 2 was adjusted for living arrangement, family income and education, in addition to sex and age. Model 3 included risk factors for dementia related to lifestyle habits (smoking, drinking and physical activity), along with the variables mentioned in models 1 and 2. Finally, model 4 also included risk factors for dementia related to the condition of family and personal health (Alzheimer, Parkinson, depression, head trauma, cardiovascular disease and cerebrovascular disease). All models included the main exposure (consumption of foods rich in bioactive compounds and antioxidants) in the analysis. The Akaike (AIC) and Bayesian (BIC) information criteria were used to assess the fit of the models. The level of statistical significance used was 5%, considering $p < 0.05$.

RESULTS

Eighty-two elderly people participated in the research, with ages ranging from 60-94 years old, with a higher proportion of elderly people aged 60-69 years old (59.8%). The sociodemographic and clinical characteristics can be observed in table 1. The sample was predominantly female, representing 75.6% of the total sample. Data related to education revealed a prevalence of low education (64.6%). Regarding monthly income, 95.1% claimed to receive up to two minimum wages, and 34.1% reported living only with their spouse. With regard to occupation, 92.7% of the elderly claimed to be retired, of which 7.3% reported that despite enjoying the benefit, they still worked; and another 7.3% of the elderly did not receive a pension. Regarding cognitive status, it was possible to identify that 20.7% of the sample had cognitive decline according to the assessment carried out by the MMSE, while the results of the Pfeffer questionnaire showed that 13.4% of the elderly participants in the survey were dependent on others people to carry out everyday activities.

Table 1. Sociodemographic and clinical characteristics of the elderly studied (n=82). Southwest of Paraná. 2017/2018.

| Variables | N | % |
|---|----|------|
| Gender | | |
| Masculine | 20 | 24.4 |
| Feminine | 62 | 75.6 |
| Age (years) | | |
| 60-69 | 49 | 59.8 |
| 70-79 | 26 | 31.7 |
| ≥80 | 7 | 8.5 |
| Education (years) | | |
| 1-4 | 53 | 64.6 |
| 5-8 | 15 | 18.3 |
| ≥9 | 14 | 17.1 |
| Home arrangement | | |
| Alone | 28 | 34.1 |
| With spouse | 28 | 34.1 |
| With sons and/or daughters or other family members | 26 | 31.8 |
| Monthly family income | | |
| Up to 2 minimum wages | 78 | 95.1 |
| > 2 minimum wages | 4 | 4.9 |
| Retired | | |
| Yes | 76 | 92.7 |
| No | 6 | 7.3 |
| Risk factors for dementia related to lifestyle habits | | |
| Smoker | 6 | 7.3 |
| Drinker | 0 | 0 |
| Physical activity | | |
| Actives | 29 | 35.3 |
| Little actives | 19 | 23.2 |
| Sedentary | 34 | 41.5 |
| Risk factors for dementia related to health status | | |
| Family history of: | | |
| Parkinson | 8 | 9.7 |
| Alzheimer | 6 | 7.3 |
| Personal history of: | | |
| Depression | 27 | 32.9 |
| Head trauma | 6 | 7.3 |
| Cerebrovascular disease | 4 | 4.9 |
| Cognitive state (MMSE) | | |
| With cognitive decline | 17 | 20.7 |
| Without cognitive decline | 65 | 79.3 |
| Functional capacity (Pfeffer) | | |
| With dependency | 11 | 13.4 |
| Without dependency | 71 | 86.6 |

National minimum wage in force at the time of data collection (2017-2018): R\$ 937.00 - R\$ 954.00.

As for food consumption, it was observed that the group of vegetables, called the "vegetables group", was regularly consumed by 65.9% of the sample, being the most consumed foods lettuce (54.9%) and cabbage (14.6%). The legume group was regularly consumed by 67.1% of the elderly, and beans (68.3%) were the most consumed food. For the group of fruits, 75.6% of the elderly said they regularly consume the food, with bananas (63.4%) and oranges (48.8%) being the most consumed fruits. Finally, with regard to the group of oilseeds, it was found that only 8.5% of the sample had regular consumption, with walnuts (8.5%) being the only food consumed.

The comparison of the regularity of fruit consumption by the elderly, according to cognitive status, shown in table 2, did not display significant difference in the consumption of food sources of bioactive compounds and antioxidant nutrients in the group of elderly people without cognitive decline, compared to those with cognitive decline. However, it was noted that the regularity of consumption of foods such as oranges (50.8%) and bananas (66.2%) was higher in the group that did not show cognitive decline. For the group of vegetables and for the groups of legumes and oilseeds, as well as in the group of fruits, some foods rich in antioxidant nutrients and bioactive compounds were consumed more frequently by the elderly without cognitive decline, namely: lettuce (60%), kale (18.5%) and walnuts (9.2%).

Table 2. Frequency of regular consumption of foods rich in bioactive compounds and antioxidant nutrients by the elderly in Southwestern Paraná. 2017/2018

| Foods | Total | With cognitive | Without cognitive | p* |
|---------------------|-------|----------------|-------------------|--------|
| | % | decline | decline | |
| Group of Fruits | 75.6 | 64.7 | 78.5 | 0.340 |
| Banana | 63.4 | 53 | 66.2 | 0.3139 |
| Orange | 48.8 | 41.2 | 50.8 | 0.5892 |
| Papaya | 30.5 | 29.4 | 30.8 | 1.0000 |
| Apple | 25.6 | 11.8 | 29.2 | 0.2139 |
| Melon | 6.1 | 5.9 | 6.2 | 0.5990 |
| Mango | 6.1 | 11.8 | 4.6 | 0.2755 |
| Pineapple | 4.9 | 11.8 | 3.1 | 0.1884 |
| Grape | 4.9 | 5.9 | 4.6 | 1.0000 |
| Watermelon | 3.7 | 5.9 | 3.1 | 0.5068 |
| Group of Vegetables | 65.9 | 58.8 | 67.7 | 0.569 |
| Lettuce | 54.9 | 35.3 | 60 | 0.1001 |
| Green cabbage | 14.6 | 0 | 18.5 | 0.0631 |
| Cabbage | 9.8 | 5.9 | 10.8 | 1.0000 |
| Chicory | 9.8 | 11.8 | 9.2 | 0.6537 |
| Tomato | 9.8 | 11.8 | 9.2 | 0.6537 |
| Carrot | 8.5 | 17.6 | 6.2 | 0.1520 |
| Chuchu | 6.1 | 5.9 | 6.2 | 1.0000 |
| Pumpkin | 3.7 | 0 | 4.6 | 1.0000 |
| Beet | 3.7 | 0 | 4.6 | 1.0000 |
| Pod | 2.4 | 5.9 | 1.5 | 0.3737 |
| Okra | 2.4 | 0 | 3.1 | 1.0000 |
| Cauliflower | 1.2 | 0 | 1.5 | 1.0000 |
| Broccoli | 1.2 | 0 | 1.5 | 1.0000 |
| Group of Legume | 67.1 | 76.5 | 64.6 | 0.562 |
| Bean | 68.3 | 76.5 | 66.2 | 0.5618 |
| Lentil | 1.2 | 0 | 1.5 | 1.0000 |
| Oilseed Group | 8.5 | 5.9 | 9.2 | 1.0000 |
| Walnuts | 8.5 | 5.9 | 9.2 | 1.0000 |

*Fisher's exact test; P value considered significant below 0.05.

In table 3, it is possible to observe that irregular consumption of vegetables was shown to be a possible risk factor for cognitive decline, and in adjusted model 2, eating vegetables irregularly represented 5.04 times more likely to have cognitive decline (95%CI: 1.17;21.67, p=0.003), in comparison to regular consumption. In the fully adjusted model (model 4), irregular consumption of vegetables increased the chances of developing cognitive decline by 6.19 times (95%CI: 1.09; 35.21, p=0.040). Regarding the consumption of fruits, legumes and oilseeds, it was not possible to observe statistically significant associations with the presence of cognitive decline in any of the four tested models.

Table 3. Logistic regression models for the association between regular consumption of foods rich in bioactive compounds and antioxidant nutrients and cognitive status adjusted for covariates (n=82). Southwest of Paraná, 2017/2018

| | Cognitive decline | | | |
|--|-----------------------|---------------------------|-----------------------|---------------------------|
| | Model 1 OR (IC95%) | Model 2 OR (IC95%) | Model 3 OR (IC95%) | Model 4 OR (IC95%) |
| Vegetable consumption | | | | |
| Regular | Reference | Reference* | Reference | Reference* |
| Irregular | 3.22 (0.95; 10.58) | 5.04 (1.17; 21.67) | 4.14 (0.87; 19.7) | 6.19 (1.09; 35.21) |
| AIC | 92.29280 | 84.82462 | 83.81648 | 85.08146 |
| BIC | 111.4484 | 108.1636 | 114.9443 | 123.3926 |
| Fruit consumption | | | | |
| Regular | Reference | Reference | Reference | Reference |
| Irregular | 1.80 (0.55; 5.90) | 3.08 (0.66; 14.28) | 3.28 (0.68; 15.83) | 3.05 (0.52; 17.86) |
| AIC | 95.32294 | 84.96918 | 84.84109 | 88.25985 |
| BIC | 114.4785 | 111.3081 | 115.9689 | 126.571 |
| Consumption of Legumes and Oilseeds | | | | |
| Regular | Reference | Reference | Reference | Reference |
| Irregular | 0.50 (0.13; 1.84) | 0.29 (0.06; 1.52) | 0.31 (0.06; 1.64) | 0.33 (0.06; 1.86) |
| AIC | 95.11187 | 84.85329 | 85.18712 | 88.17157 |
| BIC | 114.2675 | 111.1922 | 116.315 | 126.4828 |

AIC: Akaike Information Criterion;

BIC: Bayesian Information Criterion;

Model 1: adjusted for gender and age;

Model 2: adjusted for gender, age, living arrangement, income and education;

Model 3: adjusted for gender, age, living arrangement, income, education, smoking, alcohol consumption and physical activity;

Model 4: adjusted for gender, age, living arrangement, income, education, smoking, alcohol consumption, physical activity, family history of Parkinson's and Alzheimer's, personal history of depression, head trauma and cerebrovascular disease.

OR: odds ratio; CI: confidence interval. *since the CI does not contain 1, the effect of regular and irregular drinking in the presence of cognitive decline is significantly different from zero at the 5% level.

DISCUSSION

From the results of this research, it was possible to observe an important frequency of cognitive decline (20.7%) in the studied sample and low regular consumption of food groups that are sources of bioactive

compounds and antioxidant nutrients, especially oilseeds. It was also identified that irregular consumption of vegetables was associated with greater chances of elderly people presenting cognitive impairment.

The study carried out had limitations regarding the small sample size and possible difficulties of the elderly, with regard to memory, in defining the frequency of consumption of these food groups. On the other hand, this work differs from others by considering the consumption of foods rich in bioactive compounds and antioxidant nutrients as a risk factor for cognitive decline, including, in addition to the analysis of fruits and vegetables, legumes and oilseeds.

It is still not possible to say with certainty the prevalence of neurodegenerative diseases, since, according to PAHO/WHO,⁴ only 14% of countries report data on the number of people being diagnosed with this condition. Previous studies suggest that up to 90% of people with cognitive impairment in low- and middle-income countries are unaware of their condition. The Brazilian government issued a note in February 2019 stating that 11.5% of its elderly population is affected by Alzheimer's disease.²

The estimated prevalence of cognitive decline (20.7%) found in this study was similar to the other studies carried out in Brazil, using the MMSE. Confortin et al.¹⁶ developed a research with 1,197 elderly people, over 60 years of age in the city of Florianópolis, and found a prevalence of cognitive decline of 24.7% in the sample. Ribeiro et al.¹⁷ studied 736 elderly people aged 67 years or over, from the city of Rio de Janeiro, and estimated the prevalence of cognitive decline in 29.2% of the sample.

It was observed that the prevalence of non-institutionalized elderly people who depend on other people to carry out daily activities verified in this study (13.4%) was similar to that found by Matos et al.,¹⁸ who evaluated their prospective cohort study. 202 non-institutionalized elderly over 60 years of age, of both sexes, and estimated that 15.3% of the evaluated elderly had reduced functional capacity. Bierhals, Meller & Assunção¹⁹ carried out a study in Pelotas with 1.451 elderly people, in order to assess the dependence of elderly people aged 60 years and over and found that 21.1% of the sample needed the help of another person to carry out activities everyday.

In the literature, there are few studies on the consumption of fruits, vegetables, legumes and oilseeds associated with cognitive decline in the elderly. Most of the studies evaluated food as a whole, without focusing on these food groups. Miranda et al.,²⁰ in their study with elderly people from Pará, identified a low daily consumption of fruits and vegetables. Silveira et al.²¹ evaluated the consumption of fruits and vegetables in the elderly in Goiânia and identified that 44.4% of the total sample reported consuming at least one fruit daily; 39.7% reported consuming vegetables and 32.5% vegetables.

In a study carried out by Valle et al.²² with 1.558 elderly people from Bambuí, Minas Gerais, it was found that the lower intake of fruits and vegetables was related to a worse cognitive prognosis, with individuals who did not regularly consume vegetables presented 1.94 times more probably to present lower MMSE scores. Morris et al.²³ studied a population of 3.718 elderly residents in Chicago for six years and also found that higher vegetable consumption was associated with slower rate of cognitive decline, while fruit consumption was not associated with cognitive decline, similar to the present study. A study carried out in Boston by Kang et al.,²⁴ evaluating 15.080 elderly women, also found that the high consumption of vegetables, especially green leafy vegetables and cruciferous vegetables, was associated with less cognitive decline.

Several studies present data that support the existence of a beneficial relationship between the Mediterranean dietary pattern and cognitive performance. The Mediterranean diet is based on abundance of plant-derived products, such as fruits, vegetables, breads, cereals, beans and nuts, which are rich in antioxidant properties. The intake of dairy products, eggs and meat is low to moderate, with fresh fish or white meat being a priority.²⁵ Tangney et al.²⁶ followed a group of 3.790 elderly residents of Chicago for 7.6

years and found that the Mediterranean diet was associated with reduced rates of cognitive decline. Trichopoulou et al.²⁷ evaluated a population of 401 elderly people from Athens, over a period of 6.6 years, and observed that it is highly likely that adherence to the Mediterranean diet has protective effects against cognitive decline.

According to Souza et al.,²⁸ the food intake of the elderly is mainly influenced by physiological factors, taste and smell capacity, swallowing disorders and income. Income is a preponderant factor in the quality of the diet, since, due to insufficient economic resources, the elderly have a lower consumption pattern than those with better purchasing power. In the present study, the sample consisted predominantly of elderly people with a family income of less than two minimum wages (95.1%), which may be due to the low level of education (64.6%) and influence the food monotony and irregularity consumption of fruits, vegetables and oilseeds, as these are associated with higher selling costs.

Previous data have shown that continued intake of foods rich in carotenoids and phenolic compounds is generally associated with the prevention of several types of degenerative diseases. These effects have been particularly attributed to compounds that have antioxidant activity in vegetables: vitamins C and E, phenolic compounds, especially flavonoids and carotenoids.²⁹

Studies demonstrates that vitamins C and E are considered important antioxidants for brain tissue, as it acts in the synthesis of neurotransmitters, protect neurons from oxidative stress and constitute the membranes of neurons. Therefore, a low consumption of foods with a high content of vitamins can trigger neurological disorders.⁹ Carotenoids, precursors of vitamin A, are important lipophilic antioxidants that act by capturing reactive oxygen species and regenerating vitamin C after reacting with a free radical.¹⁰

Oilseeds and legumes are considered the best food sources of phenolic compounds.³⁰ These are capable of inhibiting lipid peroxidation, through the neutralization or scavenging of free radicals and in metal chelation, acting in the initiation step and in the peroxidation propagation step lipid.³¹

CONCLUSION

The findings of the present study exhibited important frequency of cognitive decline in the sample of elderly people studied and that most participants reported not consuming fruits, vegetables, legumes and various oilseeds with regular frequency. Especially with regard to oilseeds, the regular consumption of this food group was relatively low. It was found that the irregular consumption of vegetables influenced the greater chances of the elderly to present cognitive impairment, in comparison to the same age group that consumed vegetables daily. Although no significant difference was found between the regularity of consumption of fruits, legumes and oilseeds and the cognitive status, it was possible to notice higher frequency of consumption of these among the elderly who presented better cognitive performance.

We emphasize the necessity of studies with larger samples, in order to elucidate the possible relationship between the reduction of oxidative stress and the development of dementias, and to broaden the discussion on the different factors associated with neurodegenerative diseases and food consumption in the elderly.

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Contributors

Zionko JA, Scheid VN, Vieira GA, Naszeniak TF and Koehnlein EA were responsible for the conception, design and data collection; Zionko JA, Zanelatto C and Koehnlein EA were responsible for analyzing and interpreting the data; Zionko JA and Koehnlein EA were responsible for reviewing and approving the final version.

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