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ANOREXIA OF AGING ASSOCIATED WITH NUTRIENTS INTAKE IN BRAZILIAN ELDERLY

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Abstract: This study evaluated the association between anorexia of aging and nutrients intake. It was a cross-sectional study with 130 individuals aged 60 years or older, undergoing outpatient care in the city of Campinas, São Paulo. Anorexia of Aging (AA) was assessed using the Simplified Nutrition Appetite Questionnaire (SNAQ), and food consumption was evaluated using the 24-hour recall (24HR). The prevalence of AA was 27.7%, in which 66.7% were women and 38.9% were older than 80 years. Elderly with AA presented lower intake of calories (1172.6 kcal vs 1477.9 kcal; $p = 0.003$), carbohydrates (158.5 g vs 194.1 g; $p = 0.015$), proteins (49.9 g vs 68.5 g; $p = 0.004$) and lipids (34.6 g vs 46.1 g; $p = 0.006$). They also had lower intake of fibers (12.6 g vs 19.4 g; $p < 0.001$), iron (6.4 mg vs 8.9 mg; $p < 0.001$) and zinc (6.0 mg vs 8.5 mg; $p = 0.004$). Our results show that intake of most nutrients is significantly lower in AA elderly, except carbohydrates, which may point to worse-quality diets. The diagnosis of AA, as well as the evaluation of elderly food intake, are essential to prevent undernutrition, vulnerabilities, and increased morbidity and mortality.

Key words: Older adults, appetite, nutrition, food consumption.

Introduction

The Brazilian population pyramid currently exhibits a profile close to that of developed countries, with a growing participation of people over 50 years of age in the middle and upper levels of the social structure. According to the 2010 Demographic Census, in that year Brazilian elders were already 11% of the general population, or almost 21 million inhabitants aged 60 or older (1, 2). In developing countries, the process of population aging is accelerated, meaning that these countries have little time to adapt, even within an already complex scenario of social and economic problems (3, 4). This rapid aging process means that public health care has to assist even more elderly, who have specific and significant care demands.

The geriatric syndromes are big challenges in elderly care. This complex aging process involves many factors, such as family and social issues, multimorbity, overlapping of symptoms and atypical symptoms. The multifactorial nature of the geriatric syndromes can cause falls, cognitive deficits, or incontinence even in young and robust older individuals. Other highly prevalent geriatric syndromes are frailty, pain, depression, delirium, and polypharmacy (5). Characterized by inappetence and low food intake, anorexia of aging is a geriatric syndrome which has been the focus of much discussion within the scientific community (6, 7).

Anorexia of aging is a multiple causal syndrome, related to diseases, polypharmacy, and physiological factors intrinsic to aging itself, as well as social, psychological, environmental and lifestyle factors that can further affect eating habits and nutritional status, leading to loss of weight and malnutrition (8-11). It appears to be highly prevalent and is associated with protein-energy malnutrition, sarcopenia, frailty, deterioration of function, morbidity, and mortality. Absent early identification and effective intervention, it can have dramatic consequences (12, 13).

The best way to deal with anorexia of aging is prevention, since many of its causal factors are typical of aging itself. However, when the condition cannot be prevented, good treatment involves several stimuli: nutritional, environmental, clinical, and pharmacological (12, 14). According to evidence presented in the literature, the relationship between age and the reduction of energy intake may negatively affect an otherwise healthy aging process, considering elderly usually only have main meals, in a smaller amount, and eat more slowly. In addition, elderly have lower intakes of all food groups, and a greater tendency for monotonous diets, which can lead to food deficiencies (15, 16).

We evaluated the association between anorexia of aging, calorie intake, macronutrients and micronutrients, in a population of elderly patients undergoing ambulatory care. We also sought to identify possible nutrient inadequacies among elderly suffering from anorexia of aging.

Materials and Methods

Study design and participants

This was a cross-sectional study conducted in the city of Campinas, SP–Brazil between June and December 2017. The participants were outpatients of an university hospital with total Unified Health System coverage. All participants were previously informed of the research procedures and voluntarily agreed to participate. This study was approved by the Research Ethics Committee of the University of Campinas (Authorization No. 2,144,752).

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The sample was comprised of 130 elderly people, aged 60 years or older, of both sexes. Exclusion criteria were: enteral or parenteral diet, inability to answer to our questions due to cognitive disturbances, neurological diseases or confusion, or being unaccompanied.

Anorexia of Aging Assessment

All participants responded to the Simplified Nutrition Appetite Questionnaire (SNAQ), an instrument used to evaluate anorexia of aging (17) which has been translated and validated for the Brazilian population (18) and the elderly (19). The questionnaire evaluates appetite by means of 4 inquiries: 1) My appetite is (a. very poor, b. poor, c. average, d. good, e. very good); 2) When I eat (a. I feel full after eating only a few mouthfuls, b. I feel full after eating about a third of a meal, c. I feel full after eating over half a meal, d. I feel full after eating most of the meal, e. I hardly ever feel full); 3) Food tastes (a. very bad, b. bad, c. average, d. good, e. very good); 4) Normally I eat (a. less than one meal a day, b. one meal a day, c. two meals a day, d. three meals a day, e. more than three meals a day).

Each question has five possible answers, with 1 being the lowest score and 5 the highest. The questionnaire's total score is the sum of the answers to the four items and ranges from 4 (worst) to 20 (best). Anorexia of aging is considered present when the sum of the answers results in a ≤ 14 score.

Food consumption assessment

The 24-hour dietary recall (24HR) method was used to evaluate the dietary intake of the elderly. The 24HR is quick to apply, low cost, and can also be used with illiterate elderly (20). Respondents were asked about the food and drink they had consumed the day before the interview—from the time they woke up until bedtime. If the patient was unable to recall all meals of the previous day, the data could also be collected from the caregivers who provided them. All interviewers made questions regarding the nutritional aspects of the food and its preparation, as well as the measures of quantity used in the home, in order to provide better quantitative accuracy for the 24HR or USD 247.00.

Socioeconomic, demographic and clinical characteristics

The investigated variables were: sex, age (mean and standard error for two age brackets: 60–79 years and ≥ 80 years), ethnicity (caucasian, black, other, or mixed race), marital status (single, married, divorced, widowed), educational level (0 to 3, 4 or more years of schooling), and per capita monthly income (divided into two groups: 0 to 2 minimum wages and more than 2 minimum wages – one minimum wage was considered to be BRL 937.00).

Elderly were considered to have adequate physical activity when they performed 150 minutes of moderate exercise or 75 minutes of vigorous exercise per week—as recommended by the World Health Organization (21). We also measured Body Mass Index (BMI—body weight in kilograms divided by the square of height in centimeters) and the values were assigned to categories according to recommended criteria by the Brazilian Ministry of Health (22, 23). The clinical characteristics gathered from the medical records were: number of medications, diseases, presence of hypertension, type 2 diabetes, and dementia.

Statistical analysis

Dietary recall was quantified using common references for the evaluation of the Brazilian population's food intake (24-26). The analysis of the 24HR data was performed using the DietPro software version 4.0, by means of the following food composition tables: Brazilian Food Composition Table (TACO), IBGE Food Composition Table, Sonia Tucunduva, and USDA 20 (27-30).

The selected macronutrients and micronutrients were: carbohydrates, proteins, lipids and their fractions (monounsaturated, polyunsaturated and saturated fatty acids), cholesterol, dietary fiber, calcium, iron, zinc, and sodium. Macronutrient adequacy was determined by matching food intake in terms of total energy value in accordance with World Health Organization recommendations. Elderly who failed to meet the following parameters: ingestion of carbohydrates within 55–75% of the recommendation, proteins 10–15%, and total lipids 15–30%, were considered as having inadequate macronutrient intake (31).

Protein adequacy was determined through macronutrient intake per kilogram of body weight, with intake values below 1 g/kg, total calories below 30 kcal/kg, and fiber consumption below 25 g/day indicating inadequacy, according to the values recommended by the ESPEN Guideline (32).

As for micronutrient adequacy, measured values were compared to the ones in the Estimated Average Requirements (EAR) of the Dietary Reference Intakes (DRI) for calcium (51–70 years old men: < 800 mg/day; > 70 years old men: < 1000 mg/day; women: < 1000 mg/day), iron (men: < 6 mg/day; women: < 5 mg/day), zinc (men: < 9,4 mg/day; women: < 6,8 mg/day), and Adequate Intake (AI) for sodium (51–70 years old men and women: > 1.3 g/day; > 70 years old women: > 1.2 g/day) (33-35).

All analyzes were performed using Stata® software version 12. In the descriptive analysis, mean and standard errors were estimated for the continuous variables, and proportions were estimated for the categorical variables. The study's independent variable was the presence of anorexia of aging, evaluated by the Simplified Nutrition Appetite Questionnaire.

Differences in nutrient intake among elderly individuals with and without anorexia of aging were estimated using the Mann–Whitney U test, after adherence to normality of distributions was verified via Shapiro–Wilk. Anorexia of aging prevalence were calculated based on inadequacies in the intake of calories, carbohydrates, lipids, proteins, fibers, calcium, iron, zinc, and sodium, with unadjusted odds ratios (OR) obtained via logistic

regression. Subsequently, the age, sex and Body Mass Index (BMI) factors were selected for the construction of the logistic regression model, to calculate the adjusted ORs and identify factors that remained independently associated in the multiple regression models. The value of $p \leq 0.05$ was employed.

Results

Table 1 shows that the studied population had a mean age of 78.2 years, and the majority were women (68.5%), white (67.7%), and widowers (43.1%). Among other socioeconomic characteristics, 50.4% of the population had up to 3 years of schooling, and 51.6% received up to 2 minimum wages. Based on the World Health Organization's criterion, physically active elderly were 37.7%.

Regarding nutritional status, 50.8% of the population was overweight, 36.9% was eutrophic and 12.3% was underweight. The surveyed elderly consumed on average 9.8 medications per day, and had 4.7 diagnosed diseases. In this population, 78.5% had systemic arterial hypertension, 37.7% had type 2 diabetes mellitus, and 27.7% had anorexia of aging.

In relation to the amount of energy and nutrients ingested, Table 2 shows that elderly with anorexia of aging had lower energy intakes (1172.67 kcal vs. 1477.95 kcal, $p = 0.003$) and also lower intakes of all macronutrients, such as proteins (49.90 g vs. 68.52 g, $p = 0.003$), carbohydrates (158.48 g vs. 194.09 g, $p = 0.015$) and fats (34.65 g vs. 46.17 g, $p = 0.006$). This population also presented a lower consumption of fibers (12.59 g vs. 19.40 g, $p < 0.001$).

In addition, elderly patients with anorexia of aging consumed less lipid fractions: polyunsaturated fats (11.05 g vs. 15.15 g, $p = 0.002$), monounsaturated fats (5.84 g vs. 9.13 g, $p < 0.001$), saturated (11.64 g vs. 14.63 g, $p < 0.001$) and cholesterol (115.62 g vs. 216.17 g; $p = 0.001$). Regarding micronutrients, elderly with anorexia of aging had lower consumption of iron (6.39 mg vs. 8.92 mg, $p < 0.001$) and zinc (6.02 mg vs. 8.53 mg, $p = 0.003$). Calcium and sodium intake were also lower, however the differences were not statistically significant.

Table 3 shows intake values of all nutrients for elderly with and without anorexia of aging, according to sex and different age ranges. Elderly men between the ages of 60 and 79 years who presented anorexia had lower fiber consumption when compared to individuals with normal appetite (17.83 vs. 26.72, $p = 0.029$). Among elderly individuals over 80 years of age, those with anorexia of aging had a lower protein intake (54.49 vs. 91.02, $p = 0.032$).

Women aged 60 to 79 years with anorexia of aging also had decreased fiber intake (10.90 vs. 17.12, $p = 0.009$), which remained true for men in the same age group. Anorexic elderly women older than 80 years had lower intake of proteins (39.40 vs. 62.21, $p = 0.006$), fats (32.45 vs. 41.42, $p = 0.041$), fibers (10.64 vs. 18.49, $p = 0.004$), iron (4.88 vs. 8.10, $p < 0.001$), and zinc (4.85 vs. 8.00, $p = 0.009$), compared to elderly women without anorexia.

Table 1
Sociodemographic characteristics of the studied sample

Characteristics	n	% or Mean (SE)
Age	130	78.2 (0.73)
Sex		
Man	41	31.5
Woman	89	68.5
Ethnicity		
Caucasian	88	67.7
Black	11	8.5
Other/Mixed race	31	23.8
Marital Status		
Single	10	7.7
Married	54	41.5
Divorced	10	7.7
Widowed	56	43.1
Schooling		
0 to 3 years	60	50.4
4 or more years	59	49.6
Per Capita Monthly Income		
0 to 2 minimum wages	66	51.6
More than 2 minimum wages	62	48.4
Physical Activity		
At least 150 min of moderate exercise in a week, or 75 min of vigorous exercise	49	37.7
Nutritional Status (BMI)		
Underweight (< 22 kg/m^2)	16	12.3
Eutrophic (≥ 22 and < 27 kg/m^2)	48	36.9
Overweight (≥ 27 kg/m^2)	66	50.8
Number of Medications	130	9.8 (0.33)
Number of Diseases	130	4.7 (0.19)
Hypertension	102	78.5
Diabetes	49	37.7
Dementia	34	26.1
Anorexia of aging	36	27.7

SE: standard error; minimum wage: R$ 937.00; BMI: body mass index.

Table 4 shows that, in the adjusted model, anorexia of aging is associated with inadequate intake of calories (OR 9.62, $p = 0.038$) and proteins per kilogram of weight (OR 3.53, $p = 0.008$). Elderly people with anorexia of aging are also approximately 12 times more likely to have inadequate fiber intake (OR 12.25, $p = 0.018$), almost 5 times more likely to have inadequate iron intake (OR 4.81, $p = 0.001$), and nearly 3,5 times more likely to have inadequate zinc intake (OR 3.48, $p = 0.005$).

Table 2
Energy and nutrient intakes according to anorexia of aging presence

Dietary/nutrient intake	Anorexia of Aging		p-value
	Yes	No	
	Mean (SE)	Mean (SE)	
Energy (kcal/day)	1172.67 (94.73)	1477.95 (49.76)	0.003
Proteins (g/day)	49.90 (4.04)	68.52 (3.43)	0.003
Carbohydrates (g/day)	158.48 (11.26)	194.09 (6.84)	0.015
Fats (g/day)	34.65 (3.65)	46.17 (2.12)	0.006
PUFAs (g/day)	11.05 (1.54)	15.15 (0.78)	0.002
MUFAs (g/day)	5.84 (0.69)	9.13 (0.53)	< 0.001
SFAs (g/day)	11.64 (1.46)	14.63 (0.82)	0.021
Cholesterol (mg/day)	115.62 (14.53)	216.17 (19.09)	0.001
Fibers (g/day)	12.59 (1.06)	19.40 (0.98)	< 0.001
Calcium (mg/day)	455.56 (55.84)	553.99 (35.64)	0.088
Iron (mg/day)	6.39 (0.60)	8.92 (0.39)	< 0.001
Zinc (mg/day)	6.02 (0.66)	8.53 (0.50)	0.003
Sodium (mg/day)	1138.43 (133.34)	1315.72 (60.94)	0.073

SE: standard error; PUFAs: polyunsaturated fatty acids; MUFAs: monounsaturated fatty acids; SFAs: saturated fatty acids.

Among inadequate intake levels associated with anorexia of aging, in the studied population the prevalence of inadequate calorie consumption was 87.7%, protein 57.7%, fibers 83.1%, iron 51.5%, and zinc 67.7%.

Discussion

The decline in food intake due to aging is widely recognized, and other studies have pointed out significant differences in food intake between adults and elderly (36-38). Decreased energy intake is a physiological factor of aging, causing diminished hunger and loss of pleasure in eating (39), and leading the elderly to drink less liquids and eat fewer snacks between their already reduced main meals (40). The anorexia of aging itself can lead to a significant reduction in food consumption when associated with other factors involved in human aging, such as social, psychological and physical issues (37).

The prevalence of anorexia of aging may be higher in elderly at ambulatory care, hospitals or in long-term institutions due to the high complexity. The 27.7% anorexia of aging prevalence identified here was similar to the prevalence found by a Mexican study (30.1%) in the elderly community (41). In Turkey, 28.7% of the elderly in a community had anorexia of aging as assessed by the SNAQ. The study investigated the relationship between quality of life and nutritional status (42). In the Netherlands, a study evaluated elderly people in long-term care facilities, nursing homes, hospitals and the community, and found an overall inappetence prevalence of 32.4%. The prevalence of inappetence in hospitals was 55.8%, while in nursing homes it was 28.3%, and in home care 15.9% (43).

Our prevalence result is also similar to the one found by a study conducted in Italy (21.1%). The study found that anorexia of aging prevalence was greater in women (33.3%) than men (26.7%); in long-term care institutions, it was 34.1% for women and 27.2% for men. In the same study, elderly from the community presented prevalence of 3.3% (women) and 11.3% (men) (16). Another Italian study with community elders found a 21% prevalence in a predominantly female population (67%), and that anorexia was more common in older elderly (44).

In Canada, one study evaluated anorexia of aging in a population of 67–84 years old elderly, and found a prevalence of less than 10% (45). Another study evaluating geriatric unit elderly found 50 (15.8%) elderly individuals with symptoms of anorexia in a general sample of 316 patients. This same study showed that elderly people with anorexia were older and had a high risk of malnutrition as evaluated by the Mini Nutritional Assessment (MNA). In addition, there was a large percentage of elderly people with significant weight loss (46).

Inadequacy of nutrient consumption associated with anorexia of aging is an insufficiently explored subject, since there are few studies on dietary issues and loss of appetite. Donini and colleagues found that patients with anorexia of aging have reduced consumption of all food groups, mainly meat, fish, eggs, and fruit and vegetables, as well as a slight decrease in the consumption of cereals (16). These findings corroborate our data, in which elderly people with anorexia of aging were more likely to present inadequacies in protein and fiber intake, as well as micronutrients such as iron and zinc.

The Italian study also shows that lack of dietary variation is related to age, since younger people had diets with more varieties of food. This reaffirms our finding of lower intake of proteins, fats, fibers, iron, and zinc in elderly women with anorexia, compared to elderly women who did not have anorexia. In addition, elderly individuals with adequate intakes of meat, fruits and vegetables had better nutritional parameters (anthropometric measurements and nutritional status) (16).

The study by van der Meij et al. showed that elderly with lower appetites had lower intake of calories, proteins (plant and animal), and fibers (beans, grains, vegetables and fruits). However, they also had a higher consumption of fats, and no difference in milk and dairy consumption (47). In a study by Tek et al., elderly individuals classified by the SNAQ as being at risk of weight loss had worse reported quality of life, whereas adequate calorie and fiber intake was positively correlated with good quality of life. Good appetite was shown to be associated with adequate and balanced nutrition, as well as higher calorie consumption. In the study cited above, women presented a higher degree of malnutrition than men (42).

As for aging in general, according to an English study, elderly men living alone had low intakes of protein and few

Table 3
Energy and nutrient intakes according to Anorexia of Aging presence, per sex and age

	Men 60–79 y		Men 80+ y		Women 60–79 y		Women 80+ y	
	Intake Mean (SE)	p-value	Intake Mean (SE)	p-value	Intake Mean (SE)	p-value	Intake Mean (SE)	p-value
Energy (kcal/day)								
AA (yes)	1300.90 (119.97)	0.089	1353.85 (321.73)	0.449	1155.40 (218.22)	0.094	1038.77 (126.99)	0.063
AA (no)	1683.05 (119.90)		1751.41 (155.60)		1364.88 (79.63)		1377.24 (72.70)	
Proteins (g/day)								
AA (yes)	64.60 (7.09)	0.179	54.49 (6.75)	0.032	47.55 (8.64)	0.376	39.40 (3.99)	0.006
AA (no)	87.50 (12.14)		91.02 (8.14)		55.68 (4.53)		62.21 (4.40)	
Carbohydrates (g/day)								
AA (yes)	170.31 (17.00)	0.179	199.27 (67.70)	0.528	150.37 (19.97)	0.169	147.27 (19.27)	0.183
AA (no)	210.97 (19.43)		213.55 (18.60)		182.50 (11.25)		188.81 (10.91)	
Fats (g/day)								
AA (yes)	40.13 (6.35)	0.179	37.64 (9.46)	0.130	32.03 (6.92)	0.178	32.45 (7.05)	0.041
AA (no)	54.35 (4.90)		59.23 (7.62)		41.53 (3.50)		41.42 (2.70)	
Fibers (g/day)								
AA (yes)	17.83 (1.95)	0.029	11.37 (5.11)	0.165	10.90 (1.67)	0.009	10.64 (1.40)	0.004
AA (no)	26.72 (3.04)		18.64 (2.17)		17.12 (1.37)		18.49 (1.56)	
Calcium (mg/day)								
AA (yes)	474.22 (118.14)	0.698	597.86 (306.44)	0.377	408.10 (96.88)	0.713	457.58 (85.50)	0.218
AA (no)	512.04 (91.09)		902.48 (122.05)		411.87 (43.07)		550.44 (47.44)	
Iron (mg/day)								
AA (yes)	9.03 (1.29)	0.060	5.54 (1.72)	0.058	6.02 (1.10)	0.141	4.88 (0.64)	< 0.001
AA (no)	11.29 (0.91)		11.36 (1.57)		7.53 (0.52)		8.10 (0.43)	
Zinc (mg/day)								
AA (yes)	7.81 (1.16)	0.179	4.83 (1.56)	0.058	6.05 (1.45)	0.422	4.85 (0.71)	0.009
AA (no)	10.93 (1.31)		11.93 (1.88)		6.30 (0.55)		8.00 (0.66)	
Sodium (mg/day)								
AA (yes)	1497.34 (307.52)	0.928	1172.25 (345.04)	0.256	866.64 (212.29)	0.070	1156.77 (228.07)	0.365
AA (no)	1530.29 (152.86)		1460.64 (136.76)		1139.67 (89.69)		1311.79 (111.78)	

SE: standard error; AA: anorexia of aging.

food sources of potassium, calcium, magnesium, copper, and zinc. The observed decrease in energy intake is attributed to the normal physiological responses of healthy aging, in addition to other factors, such as living alone (48).

Schröder et al. evaluated healthy elderly and did not find the significant intake inadequacies seen in our study. However, they showed that the community elderly between 65 and 74 years old had lower intakes of iron and zinc when compared to younger elderly (49). Sharkey et al. found that 51% of the studied individuals had inadequate zinc consumption, and that women had an average iron intake lower than that of men. In this same study, elderly women presented lower intakes of energy, proteins and the 15 vitamins and minerals evaluated, probably due to diseases, oral health and depressive symptoms (50).

In Brazil, food consumption was estimated in 4,322 individuals participating in a national survey and aged 60 years or older, by recording their food consumption for two non-consecutive days and showed that average consumption of iron and zinc was 9 mg, similar intakes of the values described here for the elderly without aging anorexia. Anorexia of aging was probably the cause of the higher inadequacies seen in this study—iron and zinc inadequacy were 23.1% and 56.1%, respectively, in comparison to the 12.8% and 30.5% seen elsewhere (51).

Iron is a very important micronutrient and its deficiency is associated with numerous health complications, such as deterioration of physical functions, increased occurrence of falls, frailty, cognitive impairment, and mortality (52). The main sources of iron are meats (as well as zinc), fortified

Table 4
Association between anorexia and inadequate nutrient intake, after adjustment

	Inadequacy (%)	Crude OR	p-value	Adjusted OR	p-value
Energy (30 kcal/kg)	87.7	6.64	0.072	9.62	0.038
Proteins (%/day)	71.5	1.56	0.331	1.61	0.319
Proteins (1 g/kg)	57.7	2.38	0.041	3.53	0.008
Carbohydrates (%/day)	56.9	0.79	0.555	0.79	0.564
Fats (%/day)	71.5	0.77	0.526	0.76	0.525
Fibers (g/day)	83.1	10.06	0.027	12.25	0.018
Calcium (mg/day)	88.5	1.30	0.696	1.07	0.600
Iron (mg/day)	23.1	3.76	0.003	4.81	0.001
Zinc (mg/day)	56.1	3.13	0.009	3.48	0.005
Sodium (mg/day)	49.2	0.56	0.147	0. 53	0.128

OR: Odds Ratio; Adjusted by: age, sex and BMI.

cereals and legumes. In the elderly, adequate intake of iron becomes complex due to decreased absorption as well as modifications in the dietary pattern which result in a more limited diet (53).

Zinc is one of the elements most used by the body and is involved with immune responses, hormone production, bone mineralization, cognitive functions, taste and many other functions. A significant zinc deficiency can cause many complications, increasing the chance of morbidity in the elderly. Besides, studies show that this deficiency is associated with the reduction of energy needs, and also to sensory impairments related to aging (54). In addition, low intake of zinc food sources associated with psychosocial factors are recognized phenotypic characteristics of frailty (55).

As in this study, other research has shown a decreased protein intake in older elderly. Studies also show that lower protein intake is more strongly associated with females than males (50, 56). In general, the lower consumption of proteins in older elderly is due to multimorbity, oral health, perception of taste, and increased dependence. However, a protein consumption of 1.0 g/kg or more contributes to preventing the appearance of disabilities over the next 5 years (57).

Due to low energy intake, anorexia of aging is strongly associated with malnutrition, and may therefore correlate with important geriatric syndromes, such as sarcopenia. Landi et al. demonstrated the correlation between anorexia of aging and sarcopenia; however, there was no clear evidence of malnutrition in the studied individuals (44). According to Muscaritoli, weight loss and some of its consequences such as loss of muscle mass and strength can occur in the early stages of anorexia of aging due to low intake of calories and certain nutrients, especially proteins and vitamins (58).

This study has a few limitations worth mentioning. The 24-hour recall evaluation may not be enough to characterize an individual's customary diet (20). However, Brazilian elderly people demonstrate having low-variety customary diets. In a study by Fisberg et al., the foods that contributed the most to this diet's total energy value were rice, beans, and meat (51). The low quality of elderly diets due to lack of variety has also been evaluated in a study that demonstrated food monotony in the elderly (16).

However, this study has some highlights. The elderly participants followed up in an outpatient care, and therefore make up an ideal population for monitoring the nutritional status. In addition, the few studies that evaluated the food consumption of elderly with AA were conducted only in more developed countries and it is important to assess the consumption of populations in low and middle income countries (59). Otherwise, low and middle income countries will comprise 57% of the individuals 80 years or older by 2025 (60).

Conclusions

In this study, elderly people with anorexia of aging show worse food intake in terms of both macronutrients and micronutrients. Meanwhile, chances for inadequacies are significant for calories, proteins, fibers, iron and zinc - essential nutrients that, when insufficiently ingested, may lead to the previously mentioned undesirable outcomes. This study also sought to emphasize the importance of the prevention and early identification of anorexia of aging, considering its innumerable impacts on elderly food intake. With a thorough assessment of diet, nutritional status, and clinical status, the elderly may be subjected to prompt and targeted actions that may improve the quality of their diets and life.

Anorexia of aging treatment should involve a multiprofessional team with a good understanding of the countless health conditions typical of this stage in life. Targeted nutrition should enhance food's palatability, textures and

flavors, as well as their quality and variety, while respecting the elderly's social, personal and clinical characteristics.

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