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Assessment of the Relationship Between Anorexia of Aging and Dietary Intake

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Abstract

Objective: People tend to have less food consumption and energy intakes during old age. Anorexia of aging is one of the major factors reducing energy intake. The aim of this study is to examine the relationship between anorexia of aging and dietary intake among Turkish elderly adults.

Materials and Methods: In the study, the simplified nutritional appetite questionnaire was used to assess the anorexia of aging and a 24-hour recall was employed to evaluate dietary intake. The participants' socio-demographic characteristics (age, sex, and education) as well as their medical history (medication and chronic disease history) lifestyle-related characteristics (smoking and drinking habits and living arrangement), body mass index, and depressive symptoms were analyzed. Binary logistic regression was used to determine risk factors in predicting the anorexia of aging.

Results: A total of 183 Turkish elderly adults were included in the study (mean age of 71.49±5.49 years; female, 56.3%). The prevalence rate of anorexia of aging was 22.4% in the present study. Elderly adults with anorexia of aging had a lower intake of both energy and all macronutrients (proteins, fats, carbohydrates) ($p<0.05$). Furthermore, among micronutrients, elderly adults with anorexia of aging had lower consumption of iron, zinc, calcium, sodium, potassium and magnesium. Moreover, vitamin A, vitamin E, vitamin B1, vitamin B2, niacin, vitamin B6, and vitamin B12 decreased significantly in those with anorexia of aging ($p<0.05$). Living arrangement, depression status, and protein intake were the important predictors in the multivariate model for anorexia of aging.

Conclusion: This study revealed that elderly adults with anorexia of aging had less intake of macro and micronutrients.

Keywords: Anorexia of aging, dietary intake, loss of appetite, elderly adults

Introduction

The rate of elderly population has increased considerably in Turkey in recent years. This rate was 6.7% of the total population in 2000, but increased to 9.7% in 2021, reaching more than 8 million (1). As the elderly population grows, it becomes increasingly important to encourage health protection in this group (2).

Appetite is defined as the natural urge to consume food, which decreases and changes with increasing age and possibly causes severe weight loss (3). The term "anorexia of aging" refers to decreased appetite and/or decreased food intake in old age (3) and is regarded as a geriatric syndrome, today (4-6). Anorexia of aging causes many adverse outcomes including frailty, sarcopenia, decreased physical and cognitive functions, cachexia, malnutrition, reduced bone mass, micronutrient deficiency, impaired quality of life, and increased mortality (7-11). Screening, early diagnosis, and treatment of anorexia are likely to prevent weight loss and malnutrition, improve health outcomes, and decrease mortality rates. Thus, elderly adults may be periodically screened for poor appetite (12). A validated screening tool on appetite is thought to be an early indicator of malnutrition risk in elderly adults by creating opportunities for early intervention (13). The Simplified Nutritional Appetite Questionnaire (SNAQ) has a high level of reliability, sensitivity, and specificity for predicting malnutrition in elderly populations (14-17) and is a rapid screening tool used in clinical settings

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(18). This tool is applied in a relatively short time to predict possible weight loss in the future (2).

Nutrition is regarded as one of the important elements within the scope of geriatric assessment. Being described as the urge to ingest food, appetite significantly influences nutritional intake (18). The aim of this study is to examine the relationship between anorexia of aging and dietary intake in elderly adults.

Materials and Methods

Participants

This was a single-center, cross-sectional study. The sample consisted of a total of 183 elderly adults who were aged ≥65 years and living in Gaziantep. The people who were enterally or parenterally fed, were bedridden, had terminal diseases or mental disturbances, had any neurological disease or declined to participate in the study were excluded from the study.

For this study, approval was obtained from the Gaziantep Islam Science and Technology University Ethics Committee (2022/102). The principles of the Declaration of Helsinki were followed to conduct the study. All of the participants signed the informed consent form.

Anorexia of aging

SNAQ was developed to assess the anorexia of aging (2). It was adapted into Turkish and its validity was conducted for the elderly population in Turkey (19). The SNAQ is a 5-point Likert-type scale with four items and a single domain: 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 item is rated from 1 point (the lowest score) to 5 points (the highest score). The total score is the sum of the answers to the four items. The lowest and highest scores of the scale are 4 and 20, respectively. Scores of ≤14 points signify the presence of anorexia of aging (19,20).

Assessment of food intake

The 24-hour dietary recall (24HR) method was used to evaluate the dietary intake of the participants. The 24HR is a simple and affordable scale and can also be applied to illiterate elderly adults (21). The dietary recalls were performed through face-to-face interviews to assess the amount of food and beverage intakes respondents consume the day before the interview-from the time they woke up until bedtime through household measures (cups, spoons) and mL or grams. Also, the food portion sizes are detected by employing a photographic atlas (22). BEBIS 8 software (Ebispro for Windows, Germany; Turkish version/ BeBiS 8) was used to determine mean energy and macronutrient and micronutrient intakes of elderly adults.

Depressive symptoms

Depressive mood of the participants was assessed using the geriatric depression scale (GDS) (23). Total score of the scale ranges between 0-30 points. Turkish validity and reliability study of this scale was conducted and its cut-off point was 14 for the Turkish elderly adults (24).

Socio-demographic variables

Demographic (age, gender, marital status, education level), medical history (number of medications and chronic disease history), and lifestyle-related characteristics (smoking, alcohol consumption, and living arrangement) of the participants were examined using face-to-face interviews.

Also, height (cm) and weight (kg) of the participants wearing light clothes and no shoes were measured. Body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2).

Statistics

The data were analyzed using SPSS version 22.0 (SPSS Inc. Chicago, IL, USA). The data were presented as number (n), percentage (%), mean ($\bar{X}$), standard deviation, and median values. The participants were assigned to two groups; group without anorexia of aging and a group with anorexia of aging. Polypharmacy was defined as drug administration of ≥5 (25). Differences between categorical variables were detected through Pearson's chi-square test or Fisher's Exact test. Whether or not the variables were normally distributed was checked with the Shapiro-Wilk test. Quantitative data were compared through independent samples t-test for normal distributed variables. Variables that were non-normally distributed were analyzed via Mann-Whitney U test. Odds ratios (OR) and confidence interval of 95% were used with univariate binary logistic regression and multivariate binary logistic regression (enter method) models to estimate the risk factors for anorexia of aging. A value of $p<0.05$ was set as statistically significant.

Results

The data of 183 elderly adults (80 men, 103 women) having a mean age of 71.49±5.49 years (range, 65-89 years) were analyzed in the current study. The prevalence of anorexia of aging was 22.4%. There were significant differences between the groups for age, GDS score, and BMI ($p<0.001$; $p<0.001$; $p=0.020$, respectively). The rate of the diabetic participants was higher in the group without anorexia of aging. Furthermore, the rate of the participants who had hyperlipidemia, hypertension

or other chronic disease did not vary significantly between the groups. Table 1 shows the demographic characteristics and scale scores of the groups.

Elderly adults with anorexia of aging had lower energy intakes (992.53 kcal vs. 1575.48 kcal, p<0.001) and also lower intakes of all macronutrients such as proteins (35.53 g vs. 63.39 g, p<0.001), fats (46.88±12.97 g vs. 65.47±18.03 g, p<0.001) and carbohydrates (107.96 g vs. 169.98 g, p<0.001) in terms of the

Table 1. Characteristics of the participants

	Total (n=175)		Without an anorexia of aging (n=142)		With an anorexia of aging (n=41)		p
	n	%	n	%	n	%	
Gender							
Female	103	56.3	75	52.8	28	68.3	0.078*
Male	80	43.7	67	47.2	13	31.7	
Age (year) (X ± SD)	71.49±5.49		70.02±4.16		76.59±6.50		<0.001**
Marital status							
Married	105	57.4	82	57.7	23	56.1	0.240*
Single	15	8.2	10	7	5	12.2	
Divorced/widowed	63	34.4	50	35.2	13	31.7	
Educational status							
Illiterate	45	24.6	32	22.5	13	31.7	0.051*
Literate	30	16.4	20	14.1	10	24.4	
Primary school	11	6.0	7	4.9	4	9.8	
Secondary school	16	8.7	11	7.7	5	12.2	
High school or equivalent	58	31.7	52	36.6	6	14.6	
College or university	23	12.6	20	14.1	3	7.3	
Living arrangement							
Living alone	26	14.2	19	13.4	7	17.1	0.481*
Living with family	113	61.7	91	64.1	22	53.7	
Living with relatives	44	24.0	32	22.5	12	29.3	
Presence of chronic disease							
Hypertension	81	44.3	68	47.9	13	31.7	0.076***
Diabetes	78	42.6	70	49.3	8	19.5	<0.001***
Hyperlipidemia	78	42.6	64	45.1	14	35.1	0.213***
Other	45	24.6	33	23.2	12	29.3	0.430***
Polypharmacy	42	23.0	32	22.5	10	24.4	0.804*
Drinking habit							
Never drinking	150	82.0	123	86.6	27	65.9	<0.001*
Stopped drinking	27	14.7	13	9.2	14	34.1	
Current drinking	6	3.3	6	4.2	-	-	
Smoking habit							
Never smokers	106	57.9	84	59.2	22	53.7	0.746*
Stopped smoking	19	10.4	15	10.6	4	9.9	
Current smokers	59	31.7	43	30.3	15	36.6	
SNAQ score (X ± SD)	15.36±2.32		16.28±1.25		11.68±1.87		<0.001**
GDS score (X ± SD)	11.74±4.99		19.17±5.81		10.08±4.96		<0.001**
BMI (X ± SD)	25.40±3.61		25.73±3.69		24.25±3.08		0.020**

SNAQ: Simlified nutritional appetite questionnaire, GDS: Geriatric depression score, BMI: Body mass index, SD: Standard deviation, * Pearson chi-square test, **Independent samples t-test (X ± SD), ***Fisher's Exact test

amount of energy and macronutrients intake. This difference was maintained between the groups in term of body weight (as kcal/kg or g/kg) (p<0.05). The participants also had a lower consumption of fibers (12±5.56 g vs. 19.65±7.36 g, p<0.001). In addition, elderly adults with anorexia of aging consumed less lipid fractions: polyunsaturated fats (10.66 g vs. 14.94 g, p<0.001), monounsaturated fats (14.48 g vs. 20.82 g, p<0.001), saturated (15.04±5.88 g vs. 21.36±7.04 g, p<0.001) and cholesterol (133.30±109.03 g vs. 262.19±159.77 g; p<0.001). When it comes to micronutrients, elderly adults with anorexia of aging had lower consumption of iron zinc, calcium sodium, potassium and magnesium (p<0.05). Moreover, intake of vitamin A, vitamin E, vitamin B1, vitamin B2, niacin, vitamin B6, folate and vitamin B12 decreased significantly in anorexia of aging group (p<0.05). The daily energy and nutrient intakes of the elderly adults based on presence of anorexia of aging is summarized in Table 2.

The univariate binary logistic regression analysis indicated that age, depression, BMI, energy, daily protein, fat and carbohydrate intake were associated with anorexia of aging (OR=1.26;

Table 2. Daily energy and nutrient intakes of the participants in terms of the presence of anorexia of aging

	Without anorexia of aging		With anorexia of aging		U^A/t^B	p
	X ± SD	Median	X ± SD	Median		
Energy (kcal)	1548.83±249.47	1575.48	1028.63±235.13	992.53	U=401.00	<0.001
Energy (kcal/kg)	24.96±5.13	24.77	16.62±4.16	16.61	t=-7.242 df=181	<0.001
Protein (g)	63.39±16.01	62.11	36.76±12.70	35.53	U=478.50	<0.001
Protein (g/kg)	0.94±0.26	0.93	0.59±0.19	0.55	t=-9.316 df=181	<0.001
Protein (% energy)	16.91±4.02	17.00	14.93±5.60	14.00	U=1756.00	0.010
Carbohydrate (g)	172.63±45.81	169.98	110.81±34.33	107.96	U=807.00	<0.001
Carbohydrate (g/kg)	2.57±0.84	2.46	1.79±0.59	1.77	U=1326.00	<0.001
Carbohydrate (% energy)	45.47±9.37	46.00	43.83±8.16	45.00	U=2690.50	0.460
Fat (g)	65.47±18.03	65.94	46.88±12.97	48.71	t=-6.15 df=181	<0.001
Fat (g/kg)	0.97±0.30	0.95	0.76±0.22	0.77	t=-4.213 df=181	<0.001
Fat (% energy)	37.51±8.21	38.00	40.32±7.01	41.00	t=1.99 df=181	0.030
SFA (g)	21.36±7.04	21.25	15.04±5.88	13.70	t=-5.24 df=181	<0.001
SFA (g/kg)	0.32±0.12	0.31	0.24±0.10	0.21	t=-4.094 df=181	<0.001
MUFA (g)	21.85±7.90	20.82	16.55±6.21	14.48	U=1449.50	<0.001
MUFA (g/kg)	0.32±0.12	0.30	0.27±0.10	0.27	U=2175.00	0.014
PUFA (g)	16.51±8.19	14.94	11.42±5.72	10.66	U=1779.00	<0.001
PUFA (g/kg)	0.24±0.12	0.22	0.19±0.10	0.17	t=1.13 df=181	0.010
Dietary cholesterol (mg)	262.19±159.77	245.12	133.30±109.03	75.65	U=2668.00	<0.001
Fiber (g)	19.65±7.36	19.07	12.00±5.56	11.90	t=-6.16 df=181	<0.001
Vitamin A (µg)	885.79±720.42	645.82	598.07±450.31	457.19	U=1994.50	0.020
Vitamin E (mg)	16.20±8.97	14.72	11.24±6.45	10.43	U=1941.00	0.010
Vitamin B1 (mg)	0.81±0.26	0.78	0.48±0.19	0.46	t=-7.47 df=181	<0.001
Vitamin B2 (mg)	1.21±0.42	1.15	0.73±0.31	0.71	U=945.50	<0.001
Niacin (mg)	12.88±6.26	11.59	7.11±3.67	5.96	U=1035.50	<0.001
Vitamin B6 (mg)	1.21±0.43	1.13	0.71±0.39	0.65	U=1020.50	<0.001
Folate (µg)	279.88±120.38	263.40	182.17±100.72	159.67	U=1381.00	<0.001
Vitamin B12 (mg)	4.10±3.07	3.28	2.28±1.69	1.85	U=1594.00	<0.001
Sodium (mg)	1557.29±802.74	1399.80	1234.21±504.81	1118.55	U=2223.00	0.030
Potassium (mg)	2219.02±773.89	2120.06	1428.82±690.11	1325.10	U=2253.00	0.030
Calcium (mg)	653.38±256.92	635.48	445.89±188.6	443.69	U=131.00	<0.001
Magnesium (mg)	259.55±91.35	239.62	163.13±67.45	150.60	t=-6.28 df=181	<0.001
Iron (mg)	9.94±3.31	9.68	6.01±2.60	5.26	U=1033.00	<0.001
Zinc (mg)	9.20±2.59	8.69	6.11±2.58	5.73	U=927.50	<0.001

[A]: Mann-Whitney U test, [B]: Independent samples t-test

p<0.001, OR=4.111; p<0.001, OR=0.887; p<0.05, OR=0.992; p<0.001, OR=0.853; p<0.001, OR=0.931; p<0.001, OR=0.964; p<0.001, respectively); however, multivariate analysis (enter method) revealed that depression, daily protein intake, and living arrangement are correlated with anorexia of aging (OR=3.919, p=0.004; OR=0.331 p=0.037; OR=0.035, p=0.043). Table 3 summarizes the results of binary logistic regression analysis.

Discussion

The relationship between anorexia of aging and dietary intake was examined in the current study. Elderly adults with anorexia of aging had a lower intake of macronutrients and micronutrients than their counterparts without anorexia of aging. Moreover, multivariate logistic regression analysis revealed that anorexia of aging had an effect on living arrangement, depression, and daily protein intake. The prevalence rate of anorexia was 22.4% among elder adults in this study. In a systematic review, it was determined that the prevalence rate of anorexia of aging ranged between 13.0% and 21.2% in this population (26). This finding is compatible with previous studies reporting that 21.5-30.1% of community dwelling elder adults in Turkey suffered from poor appetite (19,20,27).

The presence of acute and chronic diseases and the related medication may affect the anorexia of aging (28). The rate of diabetic elderly adults was higher in the participants without anorexia of aging. This may be due to the type of diabetes drugs of the participants. For instance, insulin may result in weight gain and control blood glucose levels. This can be associated with reduction in energy loss via glycosuria, the anabolic effects of insulin, and a resulting increase in food intake (29). However, metformin or glucagon-like peptide-1 receptor agonists (GLP-1 RAs) used to treat type 2 diabetes may lead to weight loss. Metformin-associated weight loss is caused by the modulation of hypothalamic appetite-regulatory centers and alteration in the gut microbiome. GLP-1RAs suppress the appetite and feeling of hunger, slow the release of food from the stomach, and boost the feeling of fullness after eating (30).

Table 3. Risk factors predicting anorexia aging by binary logistic regression analysis

	Univariate		Multivariate (enter)	
	OR (95% CI)	p	OR (95% CI)	p
Age	1.26 (1.163-1.365)	<**0.001**	1.473 (0.989-2.193)	0.052
Gender (Ref.=Male)				
Female	1.924 (0.922-4.015)	0.081	3.142 (0.027-3.872)	0.317
Marital status (Ref.= single)				
Married	0.393 (0.114-1.353)	0.139	0.016 (0-1.466)	0.073
Divorced/widowed	0.343 (0.094-1.258)	0.107	0.073 (0.002-3.314)	0.179
Living arrangements (Ref: Living alone)				
Living with someone	0.750 (0.291-1993)	0.552	0.035 (0.001-0.904)	**0.043**
Polypharmacy (Ref: Four or less medication)				
Five or more medication	1.109 (0.491-2.503)	0.804	0.574 (0.027-12.087)	0.721
Depression (Ref: Absent)				
Present	4.111 (2.199-7.122)	<**0.001**	3.919 (2.755-6.738)	**0.004**
Hypertension (Ref: Absent)				
Present	0.505 (0.242-1.054)	0.069	4.775 (0.692-7.474)	0.085
Hyperlipidemia (Ref: Absent)				
Present	0.632 (0.306-1.305)	0.215	0.493 (0.123-2.618)	0.355
Diabetes (Ref: Absent)				
Present	0.249 (0.108-0.577)	0.081	0.002 (0.003-0.124)	0.062
BMI	0.887 (0.800-0.983)	**0.022**	1.229 (0.869-1.770	0.195
Energy	0.992 (0.990-0.994)	<**0.001**	1.219 (0.978-1.521)	0.267
Protein	0.853 (0.811-0.899)	<**0.001**	0.331 (0.117-0.936)	**0.037**
Fat	0.931 (0.906-0.957)	<**0.001**	0.166 (0.023-1.173)	0.072
Carbohydrate	0.964 (0.953-0.976)	<**0.001**	0.432 (0.175-1.069)	0.069

Ref: Reference group, BMI: Body mass index, CI: Confidence interval, OR: Odds ratio, **bold values are for p<0.05**

Decreasing dietary intake induced by anorexia of aging has been investigated in a limited number of studies (31-33) on dietary issues and loss of appetite. Van Der Meij et al. (33), reported that intake of calories, proteins, and fibers was lower in elderly adults with poor appetite. Another study revealed that Brazilian elderly adults with anorexia of aging had lower intake of energy, carbohydrates, proteins and lipids as well as fibers, iron and zinc (32). In their study, Donini et al. (31), determined that patients suffering from anorexia of aging consumed less mainly meat, fish, eggs, and fruit and vegetables, and slightly cereals. Results of this study are compatible with these previous reports saying that elderly adults with anorexia of aging had the decreased dietary intake of energy, protein, fat, carbohydrate, vitamin A, vitamin E, vitamin B1, vitamin B2, niacin, vitamin B6, Vitamin B12, and folate as well as calcium, sodium, potassium, iron, and zinc.

The related studies have reported that reduced food intake is frequently seen with aging thus it is crucial for this vulnerable group to achieve optimal nutritional intake in order to satisfy macronutrient and micronutrient needs and achieve maximum prospects of good health (34). elderly adults are suggested to have an energy intake of approximately 30 kcal/kg/day (24-36 kcal/kg/day) and if they are underweight, then more than 30 kcal/kg/day may be suitable to meet energy requirements (35). Energy intake, when compared with the recommended energy intake, was lower in elderly adults with anorexia of aging (16.62±4.16 kcal/kg/day); whereas, elderly adults without anorexia of aging had an energy intake at its lower limit (24.96±5.13 kcal/kg/day).

Dietary protein is crucial to maintain muscle mass through the promotion of muscle protein synthesis, cognitive and body functions and the immune system (36). The recommendations of the PROT-AGE study group and the European Society for Clinical Nutrition and Metabolism are intakes of 1-1.2 g/kg/day for healthy elderly adults, up to 1.5 g/kg/day for elderly people with acute or chronic disease and up to 2 g/kg/day for elderly people suffering from malnourishment (37). Elderly adults with anorexia of aging consumed almost half the recommended protein intake, while elderly adults without anorexia of aging consumed the lower limit of the recommended protein intake.

During the early stages of age-related anorexia, people tend to lose weight, body fat, muscle/bone mass, bodily functions, and even micronutrients because they consume less energy and fewer nutrients (38). Deficiency of vitamin B6, B12 and folate influences cognitive functioning and depressive symptoms are also prevalent among elderly adults (39,40). Low calcium intake is more likely to cause osteoporosis and cardiovascular diseases (41). Magnesium deficiency results in low bone mineral density, high levels of C-reactive protein indicative of systemic inflammation, and an increased risk for the metabolic syndrome (42,43). Iron deficiency causes numerous health complications, such as deterioration of physical functions, increased occurrence of falls, frailty, cognitive impairment, and mortality (44). Zinc is mostly used by the body takes part in immune responses, hormone production, bone mineralization, cognitive functions, taste and many other functions. A considerably zinc deficiency in the elderly adults may bring along many complications and increase the risk of morbidity (45).

Anorexia of aging is considered as one of indicators for a variety of geriatric syndromes. Since decreased dietary intake in elderly individuals frequently results in decreased physical activity and reduced muscle mass, they become more vulnerable and may develop secondary complications (e.g., sarcopenia, frailty, comorbidities or disability) (10,11,38). Therefore, adequacy of food intake is essential to slow down the process resulting in anorexia of aging (32).

Moreover, living arrangement, depression and protein intake were the important predictors in multivariate model for anorexia of aging. In a previous study (46), it was determined that elderly adults who were living alone and so eating alone had poor appetite 1.75 times more. Likewise, in this study, it was found that people living alone had a more poor appetite than those living with someone. Mudge et al. (47), stated that nutritional intake was assessed by measuring plate waste, and in a multivariate reported, poor appetite was the strongest predictor of inadequate nutritional intake. Poor appetite can lead to low dietary intake and malnutrition among elderly adults (13) and psychological factors such as depression and well-being are related to appetite (14).

Although previous studies conducted with different populations have yielded similar results, the findings of this study would contribute to the current literature since they reveal that elderly adults with anorexia of aging had lower intake in terms of macronutrients and micronutrients.

Study Limitations

The most important limitation of this study is that the analyses were performed with data from a relatively small sample. It is recommended to conduct prospective studies examining the effects of specific nutrition interventions on anorexia of aging and to support them by laboratory and clinical data in larger populations.

Conclusion

In this study, elderly adults with anorexia of aging had a lower food intake of macronutrients and micronutrients. Optimizing nutritional status is and also improving other factors affecting anorexia of aging can reduce the risk of functional decline in the elderly population. That, in turn, means that anorexia would no longer be inevitable.

Ethics

Ethics Committee Approval: The protocol of the study was approved by the Gaziantep Islam Science and Technology University Ethics Committee (2022/102). The principles of the Declaration of Helsinki were followed to conduct the study.

Informed Consent: All participants signed the informed consent form.

Peer-review: Externally peer-reviewed.

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