Original article

Nutritional status in dysphagic and nondysphagic elderly persons in turkey: a comparison study

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Summary. *Aim:* Dysphagia can directly affect one's food intake, leading to weight loss and malnutrition. This study aimed to investigate the association of dysphagia with nutritional status in elderly persons. *Methods:* This was a descriptive and cross-sectional study including case and control groups. It was conducted in the Hacettepe University Hospitals in Turkey between April 2015-2016. The research sample comprised volunteers aged >65 years who met the study criteria. The study included 55 elderly persons with dysphagia (49.1% male) and 62 without dysphagia (38.7% male) in Hacettepe University Hospitals. The dysphagia risk was evaluated with the Eating Assessment Tool. The dietary intake was recorded by 24-hour dietary recall and anthropometric measurements (body weight and hand-grip strength in kilograms; height, waist circumference and mid upper arm circumference in centimeters; and triceps skinfold thickness in millimeters). Study data were evaluated with the statistical program SPSS 23.0. *Results:* The body weight, body mass index and waist circumference were greater in the control group than the dysphagic males. The mid upper arm circumference, hand-grip strength and muscle area were greater for both genders in the control group than the dysphagic group. According to the Mini Nutritional Assessment, the percentages who were malnourished or at risk of malnutrition were 49.1% and 45.4%, respectively in the dysphagic group, and 9.7% and 41.9% respectively in the control group. In both groups, the vitamin B_1, niacin, folate, calcium, magnesium and zinc intake were inadequate according to RDA. In addition, in the dysphagic group, the daily intake of energy, fiber, vitamins B_1, B_2, B_6, niacin, folate, calcium, magnesium, iron and zinc was found to be inadequate according to the RDA. *Conclusion:* Dysphagia has a great impact on the nutritional risk and malnutrition and also may be responsible for nutritional deficiencies in elderly persons because nutritional deficiencies are common comorbidities of dysphagia in this age group, regular nutritional monitoring should be part of the geriatric care plan.

Keywords: Anthropometric measurement**,** dysphagia, nutrition, elderly

Introduction

Malnutrition is a serious health problem in elderly persons. It leads to a decreased functional capacity and quality of life and an increased risk of infection and longer stays in the hospital. Furthermore, it is a predictor of morbidity and mortality. In elderly persons, many physiologic factors affect the nutritional status, including decreased digestive motility; decreased absorption; loss of taste, smell, and appetite; tooth loss; use of dentures; and chewing and swallowing difficulties (1). Dysphagia, a symptom that can be directly related to the nutritional status, is the inability to swallow food due to any disorder affecting the pathway from the mouth to the stomach or due to the loss of coordination of the swallowing muscles (2). Dysphagia is sometimes an isolated disorder,

although it may also develop in association with other diseases. The prevalence rates reported by different studies vary widely, from 5% to 72% of community-dwelling elderly individuals (3) and 40% to 68% of elderly nursing home residents (4). Age-related changes, such as an increase in the amount of connective tissue in the tongue, a loss of dentition and a reduced masticatory strength and pressure of the tongue can be causes of dysphagia (5). In persons 65 years of age and over, although there are no significant changes in oromotor skills, oral phase problems are common (6). With aging, saliva production is reduced and disorders of jaw strength, loss or deficiencies of the teeth and fat-phase connections of the tongue affect the oral phase (7). Oral abnormalities (e.g., difficulties in ingesting food or controlling and delivering a bolus relative to swallowing initiation) were seen in 63% (6). Pharyngeal phase abnormalities are clinically important for swallowing, and despite the preservation of muscle activities, pharyngeal swallowing may be delayed in healthy elderly persons compared with younger people (8,9). The number of studies on nutritional status and dysphagia in the literature is limited; studies in stroke patients are more common. Smithard et al. (10) studied acute stroke patients and reported a poorer nutritional state in patients with dysphagia. Another study showed that vitamin E and magnesium levels were significantly lower in individuals with swallowing difficulties, (11) and yet another study showed that dysphagia was associated with a greater likelihood of malnutrition (12). However, no articles have reported on such interactions in elderly persons in Turkey. Associations among the presence of dysphagia, the nutritional status and anthropometric measurements have not been evaluated in elderly persons. Therefore, the aim of this study was to investigate the effect of dysphagia on the nutritional status in elderly persons. This will be useful for the preparation of personalized nutrition plans for elderly persons and the provision of nutritional support in cases of need.

Material and methods

Study design and selection of participants

This was a descriptive and cross-sectional study including case and control groups. It was conducted in the Hacettepe University Hospitals in Turkey between April 2015-2016. The research sample comprised volunteers aged >65 years who met the study criteria.

While benefiting from the results of the previous studies, we estimated that a total of minimum 55 elderly persons with dysphagia and without dysphagia would be needed to detect a difference between groups, with a two-tailed α of 0.05 and a (1-β) of 0.80, and the power analysis was statistically calculated using NCCS PAS 11 program. One hundred seventeen individuals voluntarily participated in this study: The study population consisted of 55 volunteer elderly persons with dysphagia (27 male and 28 female) and 62 volunteer elderly persons (24 male and 38 female) without dysphagia.

Data on demographic characteristics, comorbidities and the presence of malnutrition were obtained by interview and examination.

Evaluation of dysphagia

The dysphagia risk was evaluated by the Eating Assessment Tool (EAT-10). Belafsky et al. (13) developed the 10-item questionnaire for dysphagia screening. Each item is scored from 0 to 4, with a score of 0 indicating no problem and a score of 4 indicating a severe problem. An EAT-10 score of 3 or higher is abnormal and indicates the presence of swallowing difficulties. The EAT-10 was translated into Turkish and was determined to be reliable and valid (14).

Dietary assessment and mini nutritional assessment

Food intake was assessed by 24-hour recall dietary records maintained for 1 day by using a photographic atlas of the food portion size (15). The Nutrient Database (BeBİS, EBISpro for Windows, Willstaett, Germany; Turkish Version, BeBiS 7) was used to determine the daily energy and nutrient intake, and the results were compared with the Turkish recommended daily (or dietary) allowance (RDA) according to the age and gender Dietary Guidelines for Turkey (16). A nutrient intake below two thirds of the RDA (67%) was considered low. Nutritional screening was performed with the Mini Nutritional Assessment (MNA) (17).

Anthropometric measurements

Anthropometric measurements (body weight and hand-grip strength in kilograms; height, waist circumference and mid-upper arm circumference in centimeters; and triceps skinfold thickness in millimeters) of the elderly persons were taken according to the standard procedures (18). The body mass index was calculated as the body weight (kg)/height $(m)^2$ for each person (18). The triceps skinfold thickness was measured in triplicate on the left side of the body to the nearest 0.1 mm with the Harpenden skinfold caliper (Holtain Ltd, Brynberian, Pembrokeshire, Wales) (18). The hand-grip strength was assessed using a hand-grip test instrument with a dynamometer (Holtain Ltd) and was measured in kilograms with a 0.1-kg resolution**.** The dominant and non-dominant hands were measured twice, and the averages were calculated and recorded in kilograms (18).

Statistical analysis

Study data were evaluated with the statistical program SPSS 23.0 (Statistical Package for the Social Sciences, Inc.; Chicago, Illinois, United States). Quantitative variables were expressed as the mean±SD (standard deviation), and differences were analyzed by the student's t-test or Mann-Whitney U-test, as appropriate. Categorical data were expressed as the frequency (percentage), and differences were analyzed using the Fisher's exact test (when including any expected value ≤ 5) or the chi-square test. The results were reported with a 95% confidence interval, and $P < .05$ was considered statistically significant.

Ethical aspects of the study

Written approval to use the document was secured, and ethical approval was obtained from the Noninvasive Clinical Research Ethics Committee (Approval number: GO 15/265) at Hacettepe University. Written and verbal informed consent was obtained from all subjects.

Results

General characteristics of the participants are given in Table 1. Demographic variables, including sex, marital status, residence (i.e., whether the participant was living with family), education status and total education time, were found to be similar in both groups ($P > .05$). In the dysphagic group, all of the participants had other comorbidities. The most common diseases in the dysphagic group was neurological disorders 58.2% (Table 1). According to the MNA, the percentages of elderly persons who were malnourished were 49.1% in the dysphagic group and 9.7% in the control group and the percentages at risk of malnutrition were 45.4% in the dysphagic group and 41.9% in the control group ($P < .05$).

Anthropometric measurements

The BMI and WC values were higher for males in the control group than males in the dysphagic group ($P < .05$) (Table 2). Also, MUAC, muscle area and hand-grip strength were higher in both males and females in the control group than the dysphagic group ($P < .05$).

Dietary energy and nutrient intake

The mean daily intake of energy and other nutrients is given in Table 3. In the dysphagic group, the daily intake of energy, vegetable protein, MUFA, carbohydrate, fiber, vitamins E, B_1, and B_6, niacin, folate, magnesium and iron was found to be lower than in the control group for both men and women ($P < .05$). In both groups, the vitamin B_1, niacin, folate, calcium, magnesium and zinc intake according to RDA was inadequate. In the dysphagic group, the daily intake of energy, fiber, vitamins B_1, B_2, B_6, niacin, folate, calcium, magnesium, iron and zinc was found to be inadequate according to the RDA (Table 3).

In the dysphagic group, the mean consumption of bread and foods made from cereal crops, vegetables and fruits for both men and women and the sweets consumption for men were found to be significantly lower than in the control group ($P < .05$) (Table 4).

Table 1. General Characteristics of Elderly

	Dysphagic Group (n:55) n (%)	Control Group (n:62) n (%)	P value
Sex			0.270
Male	27 (49.1)	24 (38.7)	
Female	28 (50.9)	38 (61.3)	
Age (years)†	71.01±7.27	72.29±6.8	0.867
Marital status			0.388
Single	-	2 (3.2)	
Married	39 (70.9)	41(66.1)	
Divorced	16 (29.1)	19 (30.6)	
Residential dwelling			0.980
Living alone	4 (7.3)	12 (19.4)	
Together with a family member	51 (92.7)	50 (80.6)	
Educational status			0.238
None	10 (18.2)	14 (22.6)	
< High school	27 (49.0)	28 (45.2)	
High school	6 (10.9)	9 (14.5)	
Postgraduate or higher	12 (21.8)	11 (17.7)	
Total education time (year)†	9.29±4.53	9.28±4.09	0.085
Co-morbidities§			
Neurological diseases	32 (58.2)	14 (22.6)	0.340
Stroke	18 (32.7)	-	**0.023***
Cardiovascular diseases	16 (29.1)	20 (30.2)	0.687
Diabetes Mellitus	16 (29.1)	28 (54.2)	1.00
Hypertension	30 (50.0)	43 (69.4)	**0.004***
ALS	10 (18.2)	-	**0.023***
Hyperlipidemia	10 (18.2)	25 (40.3)	0.104
MNA Score			**<0.001***
24-30 Normal nutritional status	3(5.5)	30 (48.4)	
17.5-23.5 At Risk of malnutrition	25(45.4)	26 (41.9)	
<17 Malnourished	27(49.1)	6 (9.7)	

* p<0.05, † Mean±SD, § Values calculated more than one disease or supplement in the same patient.

MNA: Mini nutritional assessment, ALS: Amyotrophic Lateral Sclerosis

Table 2. Anthropometric Measurements of Elderly

Dypshagic Group (n:55)			Control Group (n:62)			
	Male	Female	Male	Female	P[1] value	P[2] value
	x ± SD	x ± S D	x ± S D	x ± S D		
Body weight (kg)	67.88±12.78	62.47±15.27	72.79±13.90	76.6±20.20	**0.003***	0.197
Height (cm)	168.29±8.17	155.39±6.71	167.41±7.40	152.81±8.20	0.179	0.690
BMI (kg/m^2)	24.25±4.08	25.85±5.94	25.82±3.99	33.1±8.37	**<0.001***	0.174
WC (cm)	95.92±10.07	97.07±17.20	100.22±12.92	109.07±15.26	**0.004***	0.188
MUAC (cm)	25.81±3.03	29.01±4.10	29.27±4.17	32.76 ±5.88	**0.005***	**0.001***
TSFT (mm)	7.14 ± 2.86	13.16 ± 4.81	8.69 ± 3.89	14.12 ± 4.85	0.430	0.109
Muscle area	36.1 ± 10.57	45.42 ± 12.74	46.94 ± 16.19	59.42 ± 24.03	**0.007***	**0.006***
Handgrip strength (kg)	20.55 ± 9.76	13.07 ± 5.59	29.86 ± 6.96	17.64 ± 4.73	**0.001***	**<0.001***

*p<0.05, P[1] male, P[2] female: p value of dysphagic and control group

BMI: Body mass index, WC: Waist circumference, MUAC: Mid-upper arm circumference, TSFT: Triceps skin fold thickness.

Discussion

It is important to perform an accurate assessment of the nutritional status in order to generate a meticulous nutritional plan and program for an elderly person. This study is the first cross-sectional study to assess differences in the nutritional status of elderly persons with and without dysphagia in Turkey. Studies across a range of settings support this finding, with a consistent link reported between the dysphagia risk and a poor nutritional status (19,20). Dysphagia affects nutrition, but it is observed independently of malnutrition (19). Dysphagia is directly associated with a risk for nutritional deficiencies so the population with dysphagia is more prone to malnutrition than the risk of malnutrition (21). In this study, malnutrition was found to be 49.1% of persons in the dysphagia group and 9.7% of persons in the control group ($P < .05$) (Table 1). In spite of the higher percentage of persons with a normal nutritional status in the control group, according to the MNA, the risk of malnutrition, based on percentages, was similar in the two groups. Because aging without dysphagia is also a factor that can lead to a risk of malnutrition. It is well known that many factors, such as dental issues, taste or smell loss, dietary restrictions, intake of medications, presence of dementia or depression, a limited income and reduced social contact, affect the nutritional status in elderly persons (1). Therefore, the risk of malnutrition increases in healthy elderly persons, as well.

In general, dysphagic elderly persons consumed less food than the control group (Table 4). The consumption of bread and foods made from cereal crops, such as rice, pasta and noodles, which are basic foods of Turkish people, was significantly less in the dysphagic group than the control group ($P < .05$). In the control group, the mean daily consumption of vegetables and fruits was found to be more than the 400 g recommended by the RDA. The daily consumption of vegetables and fruits was significantly lower in the dysphagic group than the control group for both genders ($P < .05$). The daily consumption of sweets by men was found to be higher in the control group than the dysphagic group ($P < .05$). This could explain the higher energy intake of the control group. Consequently, the energy and nutrient intake and the mean percentage of meeting the daily energy and other nutrient requirements, according to the RDA, were found to be higher in the control group than the dysphagic group in general (Table 3). Milk and dairy product consumption was inadequate in both groups, leading to low levels of calcium. The intake of energy, vegetable protein, MUFA, carbohydrate, fiber, vitamins E, B_1, and B_6, niacin, folate, magnesium and iron was found to be significantly lower in the dysphagic group than the control group for both sexes (Table 3). In the dysphagic group, the daily intake of energy, fiber, vitamin B_1, vitamin B_2, niacin, folate, calcium, magnesium, iron and zinc was found to be inadequate according to the RDA. The difficulty in swallowing of dysphagia reduces oral feeding and may result in nutritional deficiencies. It is important when starting with a diet and treatment to ensure that all nutrients included in the diet for persons with dysphagia. Using oral and enteral supplements between meals contributes to improving the nutritional status (20).

Anthropometric measurements are indicators of inadequate nutritional status. The dysphagic males had lower body mass index scores than the control group ($P < .05$) because the daily intake of nutrients decreased owing to dysphagia. The WHO's body mass index classification recommends that it is better for an elderly person to be overweight, within an acceptable range of values, than of normal weight or underweight. Overweight elderly persons can maintain adequate nutrient reserves and can therefore cope better with the acute effects of illnesses and recover faster from them (22). In the dysphagic and control groups, the mean body mass index values were 24.3±4.08, 25.9±5.94 kg/m^2 and 25.82±3.99, 33.1±8.37 kg/m^2 for males and females, respectively (Table 2). These values were not lower than a body mass index of 22 kg/m^2, which is the cutoff point for malnutrition in elderly persons (23). It is known that the rate of sarcopenic obesity increases with aging in persons around the world. A waist circumference of 102 cm and over for males and 88 cm and over for females is an indication of a high risk for chronic diseases and metabolic complications and for excessive abdominal adiposity (18). In general, in this study, male participants were found to be at low risk for such disorders and female participants were found to be at high risk. A study conducted by Popman et al.

Table 3. Daily Energy and Nutrients Intake of the Elderly Participants

Nutrients	Dysphagic Group (n:55)			Control Group (n:62)			P[1] value	P[2] value	P[3] value
	Male	Female		Male	Female				
	x ± S D	x ± S D	RDA%	x ± S D	x ± S D	RDA%			
Energy (kcal)	1240.14±513.69	1217.41±452.88	53.18±6.17	1451.38±522.61	1321.74±489.26	69.40±6.67	**0.032***	**0.003***	**<0.001***
Total Protein (g)	40.36±18.01	40.94±19.23	67.06±7.99	45.58±18.56	43.57±17.15	77.48±5.84	0.206	**0.043***	0.120
Total Protein (%)	14.0±3.0	14.0±5.0		13.0±3.0	14.0±4.0		0.714	0.396	
Animal protein (g)	25.59±16.65	26.44±22.26		21.71±13.41	21.84±12.95		0.300	0.361	
Vegetable protein (g)	16.63±11.93	17.11±9.8		23.86±11.08	21.72±9.43		**<0.001***	**<0.001***	
Fat (g)	65.27±30.77	64.49±25.87		76.75±33.24	68.64±29.54		0.138	**0.008***	
Fat (%)	47.0±9.0	48.0±9.0		47.0±9.0	46.0±9.0		0.085	0.984	
Saturated fatty acid (g)	16.68±10.21	17.07±7.68		20.91±9.9	17.87±8.01		0.343	**0.003***	
MUFA (g)	20.17±14.36	20.25±9.5		24.91±13	22.68±10.01		**0.017***	**0.02***	
PUFA (g)	21.49±13.33	22.17±12.62		26.24±14.07	23.87±14.58		0.214	**0.025***	
Dietary cholesterol (g)	191.2±143.6	188.2±120		205.6±132.1	190.7±105.9		0.846	0.492	
Carbohydrate (g)	121.03±57.92	116.52±55.45		142.43 ±59.33	130.19±55.56		**0.021***	**0.009***	
Carbohydrate (%)	40.0±10.0	39.0±10.0		40.0±10.0	40.0±10.0		0.149	0.693	
Fiber (g)	14.85±9.06	11.24±7.6	47.41±9.07	18.98±9.14	18.68±6.99	68.77±31.87	**<0.001***	**0.001***	**<0.001***
Vitamin A (mcg)	872.9±116.79	873.2±191.48	81.25±34.23	1298.7±164.55	934.2±204.33	113.36±54.78	**<0.001***	0.498	**0.001***
Vitamin E (mg)	23.0±13.97	26.43±20.99	147.06±29.85	27.89±14.51	26.61±14.59	186.25±55.64	**<0.001***	**0.013***	0.196
Vitamin C (mg)	102.0±114.0	128.0±125.0	83.26±21.38	148.0±133.0	155.0±141.0	148.81±110.97	0.043	**0.004***	**<0.001***
Vitamin B_1 (mg)	0.45±0.52	0.59±0.29	40.93±5.00	0.74±0.37	0.67±0.22	52.02±17.63	**0.016***	**0.026***	**0.001***
Vitamin B_2 (mg)	0.91±0.59	0.93±0.42	64.88±11.84	1.12±0.51	1.02±0.36	81.05±27.94	0.053	**0.013***	**0.001***
Niacin (mg)	4.65±1.09	6.15±1.06	36.46±9.79	9.28±1.92	8.54±0.91	53.91±12.47	**<0.001***	**0.017***	**<0.001***
Vitamin B_6 (mg)	1.0±0.7	1.1±0.5	51.26±15.75	1.3±0.7	1.2±0.4	70.22±20.69	**0.002***	**0.003***	**<0.001***
Vitamin B_{12} (mg)	1.8±0.8	2.7±1.7	75.93±30.41	2.4±0.9	2.6±1.4	103.29±26.54	0.701	0.299	0.291
Folate (mcg)	215.0±146.0	232.0±128.0	39.36±7.29	293.0±127.0	291.0±122.0	62.27±20.47	**<0.001***	**<0.001***	**<0.001***
Calcium (mg)	502.12±285.66	459.53±227.66	35.70±2.53	580.08±237.77	477.67±225.61	41.84±5.57	0.465	0.057	0.650
Magnesium (mg)	188.01±139.01	170.04±85.61	37.98±3.64	233.94±162.63	198.85±87.26	52.59±19.43	**0.001***	**0.02***	**<0.001***
Iron (mg)	8.81±6.01	7.61±3.68	63.18±5.52	10.98±6.18	8.94±3.44	84.62±28.74	**0.001***	**0.011***	**<0.001***
Zinc (mg)	6.28±4.28	6.15±3.44	53.58±5.43	6.86±3.38	6.46±2.96	46.61±30.10	0.402	0.083	0.189

*p<0.05, P[1] male, P[2] female: p value of dysphagic and control group; p[3]: p value of RDA% of dysphagic and control group.

MUFA: monounsaturated fatty acids, PUFA: polyunsaturated fatty acids.

Table 4. Daily Consumption of Food Groups in Elderly

	Dysphagic Group (n:55)		Control Group (n:62)			
	Male	Female	Male	Female		
	x ± S D	x ± S D	x ± S D	x ± S D	P^1 value	P^2 value
Milk and dairy products (g)	134.63±140.62	141.25±152.44	129.39±97.03	120.54±105.16	0.426	0.842
Meats (g)	32.63±84.69	47.14±113.94	32.66±65.79	33.10±57.99	0.778	0.543
Eggs (g)	27.59±31.78	29.10 ± 35.35	32.32 ± 70.71	26.29 ± 42.42	0.455	0.914
Pulses and nuts (g)	5.18±13.84	6.07±14.48	18.72±34.48	14.43±23.86	0.089	0.220
Bread and cereal (g)	68.95±49.96	66.42±43.88	140.84±82.34	137.09±83.34	**0.001***	**<0.001***
Vegetables and fruits (g)	177.03±190.37	256.60±249.87	513.40±439.40	532.18±287.29	**0.001***	**<0.001***
Fats and oils (g)	25.50±18.63	31.08±21.02	37.84±29.81	38.97±30.81	0.077	0.249
Sweets (g)	8.35±17.79	8.37±15.55	17.32±24.49	6.71±9.77	**0.019***	0.988

*p<0.05, P^1 male, P^2 female: p value of dysphagic and control group

(24) showed that nutritional risk was positively correlated with a low body mass index and hand-grip strength and negatively correlated with a dysphagia risk. In normal individuals, the age-related loss of muscle mass is associated with a reduction in muscle strength. This decrease involves the muscles that support swallowing, such as those found in the lips, tongue and cheeks (25). The hand-grip strength is usually used to assess the muscle strength in clinical situations (26). Several studies have shown that the masticatory ability was significantly related to the muscle strength of the body and that dysphagia was associated with the hand-grip strength (27). Moriya at al. (26) showed that a self-assessed masticatory ability was significantly related to the hand-grip strength. Studies have shown that the hand-grip strength was significantly lower in dysphagic persons (28,29). A decreased skeletal muscle mass, including a decreased pharyngeal muscle mass, affects the swallowing ability (30). In this study, the dysphagic group had a lower mid-upper arm circumference, muscle area and hand-grip strength than the control group (P < .05) (Table 2).

Limitations of the study

The present study had several limitations. This study design was cross-sectional. Therefore, it was not possible to generate any statements on causation, and neither could we exclude the possibility of reverse causation. Longitudinal or interventional studies are required to determine causal relationships between the nutritional status, anthropometric measurements and dysphagia in elderly persons.

In conclusion, the presence of dysphagia had a great impact on the nutritional risk and presence of malnutrition, and it also may be responsible for nutritional deficiencies in elderly persons. Therefore, the knowledge about changes in the nutritional status that may occur with a diagnosis of dysphagia will be useful not only for solving nutritional problems but also for obtaining a better clinical outcome. For this reason, the nutritional status should be evaluated in patients and multidisciplinary nutritional therapy should be planned. In this period of decreased oral intake of nutrients, the use of oral or enteral supplements or oral preparations is important in terms of preventing morbidity and mortality and increasing the quality of life in elderly persons. In addition, it may be useful to repeat the nutritional assessment at certain intervals to determine the effectiveness of the nutrition.

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References

1. Fávaro-Moreira NC, Krausch-Hofmann S, Matthys C, et al. Risk factors for malnutrition in older adults: a systematic review of the literature based on longitudinal data. Adv in Nutr 2016; 7 (3): 507-22.
2. Altuğ , Koçkar CM. Disfaji. Yeni Tıp Dergisi 2008; **25** (2): 76-9.
3. Madhavan A, LaGorio LA, Crary MA, Dahl WJ, Carnaby GD. Prevalence of and risk factors for dysphagia in the community dwelling elderly: A systematic review. J Nutr Health Aging 2016; 20(8): 806-815.
4. Park YH, Han HR, Oh BM, et al. Prevalence and associated factors of dysphagia in nursing home residents. Geriatr Nurs 2013; 34 (3): 212-7.
5. Nicosia MA, Hind JA, Roecker EB, et al. Age effects on the temporal evolution of isometric and swallowing pressure. J. Gerontol A Biol Sci Med Sci 2000; 55 (11): 634-40.
6. Ekberg O, Feinberg MJ. Altered swallowing function in elderly patients without dysphagia: radiologic findings in 56 cases. AJR Am J Roentgenol 1991; 156 (6): 1181-4.
7. Kuo P, Holloway RH, Nguyen NQ. Current and future techniques in the evaluation of dysphagia. J Gastroenterol Hepatol 2012; 27 (5): 873-81.
8. Robbins J, Hamilton JW, Lof GL, Kempster GB. Oropharyngeal swallowing in normal adults of different ages. Gastroenterology 1992; 103 (3): 823-9.
9. Tracy JF, Logemann JA, Kahrilas PJ, et al. Preliminary observations on the effects of age on oropharyngeal deglutition. Dysphagia 1989; 4 (2): 90-4.
10. Smithard DG, O'neill PA, Park CL, et al. Complications and outcome after acute stroke. Does dysphagia matter? Stroke 1996; 27 (7): 1200-4.
11. Mann T, Heuberger R, Wong H. The association between chewing and swallowing difficulties and nutritional status in older adults. Aust Dent J 2013; 58 (2): 200-6.
12. Galán Sánchez-Heredero MJ, Santander Vaquero C, Cortázar Sáez M, et al. Relationship between dysphagia and malnutritition in patients over 65 years of age. Enferm Clin 2014; 24 (3): 183-90.
13. Belafsky PC, Mouadeb DA, Rees CJ, et al. Validity and reliability of the Eating Assessment Tool (EAT-10). Ann Otol Rhinol Laryngol 2008; 117 (12): 919-24.
14. Demir N, Arslan-Serel S, İnal Ö, Karaduman AA. Reliability and validity of the Turkish Eating Assessment Tool (T-EAT-10). Dysphagia 2016; 31 (5): 644-9.
15. Rakıcıoğlu N, Tek Acar N, Ayaz A, Pekcan G. Yemek ve Besin Fotoğraf Kataloğu-Ölçü ve Miktarlar, 2. Baskı, 2009; Ata Ofset Matbaacılık, Ankara.
16. Besler HT, Rakıcıoğlu N, Ayaz A, Büyüktuncer Demirel Z, et.al. Türkiye'ye Özgü Besin ve Beslenme Rehberi. 1. Baskı, 2015. Hacettepe Ü. Sağlık Bilimleri F. Beslenme ve Diyetetik Bölümü, Ankara.
17. Guigoz Y. The Mini Nutritional Assessment (MNA®) review of the literature-what does it tell us? J Nutr Health Aging 2006; 10 (6): 466-85.
18. WHO. Obesity: Preventing and Managing the Global Epidemic. Geneva: WHO Technical Report Series 894. Report of a WHO Consultation, 2000; 252.
19. Takeuchi K, Aida J, Ito K, Furuta M, Yamashita Y, Osaka K. Nutritional status and dysphagia risk among community-dwelling frail older adults. J Nutr Health Aging 2014; 18 (4): 352-7.
20. Eglseer D, Halfens RJG, Schols JMGA, Lohrmann C. Dysphagia in hospitalized older patients: Associated factors and nutritional interventions. J Nutr Health Aging 2018; 22 (1): 103-10.
21. Ekberg O. Dysphagia: diagnosis and treatment. Berlin: Springer-Verlag, Berlin Heidelberg, 2012.
22. Lee CM, Huxley RR, Wildman RP, Woodward M. Indices of abdominal obesity are better discriminators of cardiovascular risk factors than BMI: a meta-analysis. J Clin Epidemiol 2008; 61 (7): 646-53.
23. Cederholm T, Bosaeus I, Barazzoni R, et al. Diagnostic criteria for malnutrition–an ESPEN consensus statement. Clin Nutr 2015; 34 (3): 335-40.
24. Popman A, Richter M, Allen J, Wham C. High nutrition risk is associated with higher risk of dysphagia in advanced age adults newly admitted to hospital. Nutr Diet 2018; 75 (1): 52-8.
25. Gingrich LL, Stierwalt JA, Hageman CF, LaPointe LL. Lingual propulsive pressures across consistencies generated by the anteromedia and posteromedian tongue by healthy young adults. J Speech Lang Hear Res 2012; 55 (3): 960-72.
26. Moriya S, Tei K, Yamazaki Y, et al. Relationships between perceived chewing ability and muscle strength of the body among the elderly. J Oral Rehabil 2011; 38 (9): 674-9.
27. Yoshimura Y, Wakabayashi H, Bise T, Tanoue M. Prevalence of sarcopenia and its association with activities of daily living and dysphagia in convalescent rehabilitation ward inpatients. Clin Nutr 2018; 37 (6): 2022-8.
28. Matsuo H, Yoshimura Y, Ishizaki N, Ueno T. Dysphagia is associated with functional decline during acute-care hospitalization of older patients. Geriatr Gerontol Int 2017; 17 (10): 1610-6.
29. Maeda K, Takaki M, Akagi J. Decreased skeletal muscle mass and risk factors of sarcopenic dysphagia: a prospective observational cohort study. J Gerontol A Biol Sci Med Sci 2017; 72 (9): 1290-4.
30. Maeda K, Akagi J. Sarcopenia is an independent risk factor of dysphagia in hospitalized older people. Geriatr Gerontol Int 2016; 16 (4): 515-21.

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