Aging Medicine and Healthcare 2023;14(1):9-14. doi:10.33879/AMH.141.2021.04027

Aging Medicine and Healthcare
https://www.agingmedhealthc.com

Original Article

Nutritional Screening and Physical Activity Status Assessment in Elderly: Comparison of Nutritional Screening Initiative (NSI), Short Nutritional Assessment Questionnaire (SNAQ), the Mini Nutritional Assessment (MNA)

*Sevil KARAHAN YILMAZ[1], Günay ESKİCİ[2]

[1]Department of Nutrition and Dietetics, Faculty of Health Sciences, Erzincan Binali Yıldırım University, Erzincan, Turkey
[2]Department of Coaching Education, Faculty of Sport Sciences, Çanakkale Onsekiz Mart University, Canakkale, Turkey

***Correspondence**
Dr. Sevil KARAHAN YILMAZ
Department of Nutrition and Dietetics, Faculty of Health Sciences, Erzincan Binali Yıldırım University, Erzincan, Turkey
E-mail:
karahany.sevil12@gmail.com

Received 24 April 2021
Accepted 20 August 2021

Keywords
Elderly, international physical activity questionnaire, mini nutritional assessment, nutritional screening initiative, short nutritional assessment questionnaire.

ABSTRACT

Background/Purpose: Malnutrition is quite common in the elderly. The aim of this study was to evaluate the nutritional and physical activity status of individuals over 65 years of age.

Methods: The research was carried out on a total of 140 individuals. Demographic characteristics, anthropometric measurements, food consumption records, nutritional status (Nutritional Screening Initiative (NSI), Short Nutritional Assessment Questionnaire (SNAQ), Mini Nutritional Assessment (MNA)) and physical activity levels (International Physical Activity Questionnaire (IPAQ) of the individuals were evaluated.

Results: Assessment of nutritional status revealed that a high risk of malnutrition was present in 14.3% and 30% of the males and females, respectively, as a result of the NSI (X^2=6.102, p <0.05). Results of MNA demonstrated that 60.9% of men and 62.1% of women were found to have malnutrition (X^2=7.035, p <0.05). According to SNAQ, 51 of the individuals (36.4%) were found to be at risk for body weight control.

Conclusion: SNAQ was found to be a more general test in the assessment of the nutritional status, while the NSI and MNA were established to include more specific questions in accordance with the data obtained.

1. INTRODUCTION

World Health Organization (WHO) defines Healthy Ageing "as the process of developing and maintaining the functional ability that enables wellbeing in older age". Functional ability is about having the capabilities that enable all people to be and do what they have reason to value.[1] Recent age classifications have tended to group the elderly into the young old (age 65 to 74), the old old (age 75 to 84), and the oldest old (older than 85).[2]

Process of aging is a period of development of

some chronic diseases; however, it is possible to defer health problems by implementing healthy nutrition habits and health style changes.[3] Aging is characterized by a decreased appetite, impaired functional capacity and an increased risk of infection.[4] Providing an adequate and balanced nutrition in old age is of great importance in preventing diseases, and maintaining, improving and developing good health, regulating the lifestyle habits and increasing the life expectancy and improving the quality of life.[3]

Evaluation of nutritional status is one of the critical cornerstones in the evaluation of aging.[5] The prevalence of malnutrition in elderly is high. Malnutrition or risk of malnutrition can be detected by use of nutritional screening or assessment tools.[6,7] Various screening tests are used to diagnose nutritional problems: Nutrition Screening Initiative (NSI), The Mini Nutritional Assessment (MNA) and Short Nutritional Assessment Questionnaire (SNAQ).[5]

In late life, people have lower levels of physical activity and a reduction in energy needs, thus both food consumption and energy intakes decline.[8] Regular physical activity has an important place in healthy aging.[9] It contributes to the reduction of morbidity and mortality risks with aging and regulation of nutritional status.[10,11] The International Physical Activity Questionnaire (IPAQ) is a commonly used measurement tool.[12]

The aim of this study was to evaluate the nutritional satus, anthropometric measurements, and nutritional and physical activity status of individuals over 65 years of age.

2. METHODS

The universe of the research consisted of 247 individuals over the age of 65 years and registered in three different Family Health Centers in the city center of Erzincan. The number of individuals to be included in the sample was calculated using the sample selection formula that is used in cases when the number of elements in the universe is known.

$$n = \frac{Nt^2\,pq}{d^2\,(N-1)+t^2\,pq}$$

N: Population size
n: Sample size
p: Population proportion
q: 1-p
t: The theoretical value found from the t table at a certain degree of freedom and detected error level
d: Precision

According to this formula, the sample was determined as 140.

A questionnaire form was used as data collection tool in the research. The survey included questions such as demographic characteristics, anthropometric measurements, NSI, SNAQ, MNA and IPAQ.

2.1. Anthropometric Measurements

Body weight, height, waist circumference and calf circumference measurements were measured by the researcher and the Body Mass Index (BMI) was determined. BMI was calculated by dividing the body weight in kilograms by the square of height in meters (BMI-kg/m^2). Under nutrition was defined as a BMI <21 kg/m^2.[13] A waist circumference >102 cm in men and >88 cm in women poses a risk for abdominal obesity. The lower limit of normal range for calf circumference is considered as 31 cm. Lower than this value is associated with sarcopenia.[14]

2.2. Nutritional Screening Initiative (NSI)

NSI was developed by the American Academy of Family Medicine, the American Diet Academy and the National Aging Council to assess the nutritional status and nutritional risk factors of the elderly. A total score between 0-2 points reflects low risk for nutritional evaluation, necessitates re-evaluation after 6 months; 3-5 points reflects moderate risk, necessitates re-evaluation after 3 months; ≥6 points reflects high risk, necessitates referring the patient to physician and dietician.[15]

2.3. Short Nutritional Assessment Questionnaire (SNAQ)

An appetite based SNAQ is primarily used to detect risk of future weight loss.[16] Turkish validity and reliability of the questionnaire was performed by Ilhan et al (2018).[17] The minimum and maximum scores range between 4 and 20. A score of ≤14 is accepted as having a significant risk of a least 5% weight loss within the following six months in community-dwelling elderly.[13]

2.4. Mini Nutritional Assessment (MNA)

Nutrition was assessed by the Turkish version of the MNA long and short forms.[18] The MNA was developed by Guigoz, Vellas and Garry. Based on the total score, subjects were classified into three categories: <17 as malnutrition, 17–23.5 as risk of malnutrition and ≥24 as well-nourished according to the MNA long.[19]

2.5. International Physical Activity Questionnaire (IPAQ)

Validity and reliability studies for IPAQ created to determine physical activity levels was performed by Craig et al. (2003)[20] and the validity and reliability study in Turkey by Ozturk (2005).[21] The questionnaire consists of questions about any a physical activity performed for at least 10 minutes in the past 7 days.

The total physical activity score (TPAS) is calculated by converting vigorous and moderate activities and walking times to the Metabolic equivalent of task (MET) value corresponding to the basal metabolic rate (1 MET=3.5 ml/kg/min). A TPAS <600 MET is defined as 'physically inactive', a TPAS=600- 3000 MET is defined as 'low physical activity level', and a TPAS >3000 MET is defined as 'sufficient physical activity level'.

2.6. Statistical Analysis

This research is a quantitative, descriptive and cross-sectional study. IBM SPSS ver 22.0 (IBM Corp. Armonk, N.Y., USA) statistical package program was used to analyze the data. "Mean and standard deviation", Kolmogorov-Smirnov Test, Independent Groups t Test (Student's t Test), Pearson Chi-square Test and Pearson Correlation Analysis were used in the statistical evaluation of the data. Multivariate logistic regression models were performed to explore potential influence factors (gender and age) for nutritional risk and physical activity level. Adjusted OR (AOR) and 95% confidence interval (CI) were obtained from logistic regression models. The results were evaluated at a 95% CI and level of significance was accepted as p <0.05.

3. RESULTS

The study was carried out in a total of 140 elderly individuals, 70 men (50%) and 70 women (50%). The mean age of the individuals participating in the study was 70.19±4.89 years. Mean BMI was calculated as 27.60±4.32 kg/m^2 and 29.23±5.03 kg/m^2 in males and females, respectively. Mean waist circumference was 101.17±13.87 cm in males and 103.37±15.12 cm in females (Table 1).

Nutritional status of individuals was evaluated using three different assessment tools. According to NSI, 31 (22.1%) individuals were found to be in the high-risk group and 54 (38.6%) in the intermediate-risk group. According to SNAQ, 51 (36.4%) individuals were found to be at risk for body weight control. According to MNA, 20 (14.3%) individuals had malnutrition and 70 (50.0%) had a risk of malnutrition (Table 2).

Table 1. Demographic and anthropometric features of participants

Parameters	Participants (n=140)
Age (years)	70.19±4.89
Gender (n, %)	
Female	70 (%50)
Male	70 (%50)
BMI (kg/m^2)	
Female	29.23±5.03
Male	27.60±4.32
Waist circumference (cm)	
Female	103.37±15.12
Male	101.17±13.87
Calf circumference (cm)	36.58±6.07

BMI: Body mass index

The distribution of NSI, SNAQ, MNA and IPAQ scores of elderly individuals by age groups and genders is shown in Table 3. The evaluation by age groups revealed no statistically significant difference in the NSI, SNAQ and MNA scores between the age groups (X^2=3.226, X^2=1.03, X^2=2769; p >0.05). IPAQ results demonstrated that 23.3% of individuals between the ages of 65-74 years and 58% of them between the ages of 75-84 years were inactive. A significant difference was found in the IPAQ scores between the age groups (X^2=19.365, p <0.05).

Gender evaluation revealed no statistically significant difference in the SNAQ and IPAQ scores between gender groups (X^2=1.511, X^2=5834; p >0.05). Assessment of results of NSI revealed that a high risk of malnutrition was present in 14.3% and 30% of the males and females, respectively, (X^2=6.102, p <0.05). Results of MNA demonstrated that 60.9% of men and 62.1% of women had malnutrition (X^2=7.035, p <0.05).

Association of age and BMI, NSI, SNAQ, MNA and IPAQ scores is presented in Table 4. A significant positive correlation was found between the NSI scores and age (p <0.05) and BMI values of the individuals (p <0.01). There was a significant negative correlation between the SNAQ scores of the individuals and their NSI scores (p <0.05). A negative correlation was found between the MNA and NSI scores (p <0.01) and a positive correlation was found between MNA and SNAQ scores (p <0.01). A positive correlation was found between IPAQ scores and BMI values (p <0.05), SNAQ scores (p <0.05) and MNA scores (p <0.05), and a negative correlation was found between IPAQ and NSI scores (p <0.05).

According to the results of the univariate and multivariate logistic regression analysis, the female participants compared to the male participants were associated with a higher risk of malnutrition according to NSI (AOR=1.13, 95 % CI:1.26, 1.65) and MNA (AOR=1.15, 95 % CI:0.44, 2·01). Participants those 65-74 years of age were more likely to have adequate physical activity compared to the participants 75-84 years of age (AOR=1.65, 95 % CI:1.06, 2.76) (Table 5).

Table 2. Classification of participants according to nutritional status assessment tools

Nutritional status/risk	NSI	SNAQ	MNA
Low risk / No nutritional problem	55 (%39.3)	89 (%63.6)	50 (%35.7)
Medium risk	54 (%38.6)	-	70 (% 50.0)
High risk / malnutrition	31 (%22.1)	51 (%36.4)	20 (% 14.3)

NSI: Nutritional Screening Initiative, SNAQ: Short Nutritional Assessment Questionnaire, MNA: Mini Nutritional Assessment

Table 3. NSI, SNAQ, MNA and IPAQ scores of participants according to age and gender groups (%)

	NSI			SNAQ			MNA		IPAQ		
	Low risk	Medium risk	High risk	Risk	No risk	No nutritional problem	Risk	Malnutrition	Inactive	Low physical activity	Adequate physical activity
Age (year)											
65-74	39 (%43.3)	35 (%38.9)	16 (%17.8)	30 (%33.3)	60 (%66.7)	57 (%63.3)	32 (%35.6)	1 (%1.1)	21 (%23.3)	57 (%63.3)	12 (%13.3)
75-84	16 (%32.0)	19 (%38.0)	15 (%30.0)	21 (%42.0)	29 (%58.0)	30 (%60.0)	17 (%34.0)	3 (%6.0)	29 (%58.0)	13 (%26.0)	8 (%16.0)
p	0.199			0.361			0.256		0.000*		
Gender											
Female	22 (%31.4)	27 (%38.6)	21 (%30.0)	29 (%41.4)	41 (%58.6)	3 (%4.3)	31 (%35.0)	36 (%62.1)	27 (%38.6)	38 (%54.3)	5 (%7.1)
Male	33 (%47.1)	27 (%38.6)	10 (%14.3)	22 (%31.4)	48 (%58.6)	1 (%1.4)	18 (%25.7)	54 (%72.9)	23 (%32.9)	32 (%45.7)	15 (%21.4)
p	0.047*			0.219			0.030*		0.054		

Pearson chi-square test,*p <0.05, NSI: Nutritional Screening Initiative, SNAQ: Short Nutritional Assessment Questionnaire, MNA: Mini Nutritional Assessment, IPAQ: International Physical Activity Questionnaire

Table 4. Correlation between participants' age, BMI, NSI, SNAQ, MNA and IPAQ scores

Parameters	Age	BKİ	NSI	SNAQ	MNA	PAQ
Age (year)	1					
BMI(kg/m^2)	0.014	1				
NSI	0.033*	0.001**	1			
SNAQ	0.099	0.277	-0.010*	1		
MNA	0.134	0.464	-0.000**	0.000**	1	
IPAQ	0.242	0.025*	-0.004*	0.030*	0.029*	1

Pearson correlation, *p <0.05, **p <0.01, BMI: Body Mass Index, NSI: Nutritional Screening Initiative, SNAQ: Short Nutritional Assessment Questionnaire, MNA: Mini Nutritional Assessment, IPAQ: International Physical Activity Questionnaire

Table 5. Results of univariate and multivariate logistic regression analyses

Variables	NSI AOR (95% CI)	SNAQ AOR (95% CI)	MNA AOR (95% CI)	IPAQ AOR (95% CI)
Gender				
Male	1.00	1.00	1.00	1.00
Female	1.13 (1.26-1.65)*	1.56 (0.78-3.14)	1.15 (0.44-2.01)*	1.03 (0.46-2.22)
Age (year)				
65-74	0.40 (0.30-1.40)	1.47 (0.72-3.02)	0.49 (0.32-0.95)	1.65 (1.06-2.76)*
75-84	1.00	1.00	1.00	1.00

NSI: Nutritional Screening Initiative, SNAQ: Short Nutritional Assessment Questionnaire, MNA: Mini Nutritional Assessment, IPAQ: International Physical Activity Questionnaire

4. DISCUSSION

This research was carried out to evaluate the nutritional and physical activity status of 140 elderly individuals were registered in three different Family Health Centers in Erzincan city center.

Among the anthropometric measurements, BMI <21 kg/m^2 was defined as malnutrition.[13] In this present study, mean BMI in males and females was calculated as 27.60±4.32 kg/m^2 and 29.23±5.03 kg/m^2, respectively. Waist circumference >102 cm in males and >88 cm in females poses a risk for abdominal obesity. In this study, the mean waist circumference was measured as 101.17±13.87 cm and 103.37±15.12 cm in males and females, respectively. The lower limit of normal range for calf circumference is accepted as 31 cm and below this level is associated with sarcopenia.[14] In this study mean calf circumference was found to be 28.76±3.54 cm. According to the anthropometric measurements, elderly individuals who are considered to be slightly overweight according to BMI and obese according to waist circumference can be evaluated as having sarcopenia according to calf circumference measurement. In the study conducted with 173 elderly individuals, the mean BMI values for men was 25.9±0.1 kg/m^2, it was determined as 27.3±0.1 kg/m^2 for women. The calf circumference was measured over 31 cm in both genders.[22] In another study; mean BMI values were 27.4 kg/m^2 for females and 26.3 kg/m^2 for males; waist circumferences were 98.0±13.4 cm for males and 102.9±13.6 cm for males; calf circumferences were 34.4±5.3 cm and 34.8±4.0 cm.[23] Therefore anthropometric measurements alone in defining the nutritional status of elderly individuals remain inadequate in defining malnutrition.

Mini Nutritional Assessment is an important nutritional screening tool (gold standart) that is also recommended by ESPEN.[24] Primary screening test for nutritional status commonly used in elderly individuals is MNA, because it contains specific questions about the changing nutritional status of the individuals.[25]

According to the results of the NSI, 22.1% of individuals were found to be in the high risk group and 38.6% in the intermediate risk group. According to SNAQ, 36.4% of individuals were at risk for body weight control and according to MNA, 14.3% of individuals had malnutrition and 50% had a risk of malnutrition. Malnutrition rate ranges between 14.3% to 36.4% according to these three nutritional screening tools (NSI-SNAQ-MNA).

In the studies performed, Bauer et al. (2005)[26] demonstrated that 30% of the individuals had malnutrition and 37.5% had a risk of malnutrition according to MNA results. Demir et al. (2019)[27] in their study in which they evaluated the nutritional status of elderly using MNA found that 70.3% of the elderly were normal, 20.6% of them were at risk of malnutrition and 3.7% of them had malnutrition. Hoca et al. (2017) in their study reported a 16.7% of risk of malnutrition (4.8% in males, 28.6% in females) according to MNA scores. Malnutrition risk was statistically significantly higher in females (p <0.05). Similarly, a statistically significant difference was found in MNA scores between the two genders in this present study (p <0.05).[3]

In the study by Kang et al. (2018) in 3885 elderly individuals, 48.4% of the individuals were found to be at high risk according to the NSI assessment and this risk was higher in women (50.7%) compared to men (46.0%) (p <0.05).[28] Similarly, it was determined in this study that women (30.0%) had a higher risk of malnutrition compared to men (14.3%) according to the NSI scores (p <0.05).

Yaxley et al. (2015) in their study reported that 63% of elderly individuals according to MNA (≤23.5) and 19.4% according to SNAQ had a risk of malnutrition.[29] Akin et al. (2019) on the other hand reported that, according to MNA (≤23.5), 44.8% of individuals had a risk of malnutrition or malnutrition and they determined a 31% risk of weight loss according to SNAQ. Similar to other studies, the risk of malnutrition according to MNA (≤23.5) and SNAQ was found to be 64.3% and 36.4%, respectively in this present study. A positive correlation was determined between MNA scores and SNAQ scores of the individuals (p <0.01). However, elderly individuals who had a good nutritional status according to the results of these scanning tools might actually have a risk of malnutrition as well. Although SNAQ is a poor nutritional tool in the diagnosis of malnutrition and and risk of malnutrition in elderly individuals, it can be used practically in the estimation of weight loss.

With increasing age, metabolic changes, some changes in appetite and body composition begin to be seen, and the risk of malnutrition is seen more in the elderly than in the young. The decrease in body mass with aging is mainly due to a decrease in muscle mass. This loss of muscle mass is called "sarcopenia" and explains the reductions in basal metabolic rate, muscle strength and physical activity.[30] When the physical activity status of elderly individuals was evaluated; 23.3% of 65-74 year-old individuals and 58% of 75-84 year-old individuals were found to be inactive according to IPAQ (p <0.05). Slavíková et al. (2018) found a positive relationship between physical activity states and MNA classifications.[23] A positive correlation was found between IPAQ scores and MNA scores in this present study as well. Malnutrition is associated with functional/cognitive impairment and eating difficulties.[19] The importance of routine evaluation of risk factors such as functional impairment as well as nutritional disorders was emphasized in order to prevent and treat malnutrition.[31]

Three different nutritional screening tools were used in this study to evaluate nutritional status and physical activity level in the elderly. In terms of nutritional status, 22.1% of individuals are in the high risk group and 38.6% in the intermediate risk group according to NSI. According to SNAQ, 36.4% are at risk in terms of body weight and according to MNA, 14.3% have malnutrition and 50% have a risk of malnutrition. When physical activity states are evaluated, 23.3% of 65-74 year-old individuals and 58.0% of 75-84 year-old individuals were found inactive according to IPAQ. The strength of our study is that evaluation of nutritional status with different nutritional screening tools. This study had several limitations. First, it was was cross-sectional study, making it difficult to find the causal relationship between the various factors. Second, it included a small sample size.

5. CONCLUSION

The prevalence of malnutrition is high in elderly individuals. It is extremely important to carry out routine screening and regular interval follow-up in elderly individuals to defer/prevent the diseases caused by a sedentary lifestyle and malnutrition and improve the quality of life. Although studies on the positive effects of nutrition and physical activity on healthy life are increasing day by day, individuals should be informed and supported to be more careful about living a healthy and quality life.

CONFLICTS OF INTEREST

On behalf of all authors, the corresponding author states that there is no conflict of interest.

ETHICS DECLARATIONS

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975. Informed consent was obtained from all patients included in the study. The research was approved by the OOO University Human Research Ethics Committee (dated 27/02/2020, decision number 02-08).

REFERENCES

1. World Helath Organization. Ageing: healthy ageing and functional ability. Accessed on 21 March 2021 at: https://www.who.int/ageing/healthy-ageing/en

2. Şimşek A, Girgin E, Lale H, Güngör Z. Nutrition in Elderly. In: Elderly, Diseases and Nutrition, Göksu Şeker E. (eds), Ankara:Hatiboğlu Yayınevi; 2016, p.31-54.

3. Hoca M, Türker PF. Nutritional habits, nutritional status and quality of life of elderly people living in Famagusta, Cyprus. *Bes Diy Derg*. 2017;**45**(1):44-52.

4. Tsai AC, Chang TL, Wang YC, Liao CY. Population-specific short-form mini nutritional assessment with body mass index or calf circumference can predict risk of malnutrition in community-living or institutionalized elderly people in Taiwan. *J Am Diet Assoc*. 2010;**110**(9):1328-34.

5. Akın S, Ozera FF, Zararsız GE, Şafak ED, Mucuke S, Göçer Ş, et al. Validity of simplified nutritional appetite questionnaire for Turkish community-dwelling elderly and determining cut-off according to mini nutritional assessment. *Arch Gerontol Geriatr.* 2019;**83**:31-6.

6. Račić M, Ivković N, Kusmuk S. Screening of nutritional status among elderly people at family medicine. *Acta Med Croatica*. 2015;**69**(4):347-56.

7. Ramsey KA, Meskers CGM, Trappenburg MC, Verlaan S, Reijnierse EM, Whittaker Ramsey KA, et al. Malnutrition is associated with dynamic physical performance. *Aging Clin Exp Res*. 2019;**32**(6):1085-92.

8. Tsutsumimoto K, Doi T, Nakakubo S, Kim M, Kurita S, Ishii H, et al. Association between anorexia of ageing and sarcopenia among Japanese older adults. *J Cachexia Sarcopenia Muscle*. 2020;**11**(5):1250-7.

9. Vagetti GC, Barbosa Filho VC, Moreira NB, Oliveira Vd, Mazzardo O, Campos WD. Association between physical activity and quality of life in the elderly: a systematic review, 2000-2012. *Braz J Psychiatry*. 2014;**36**(1):76-88.

10. Bernstein M, Munoz N. Academy of Nutrition and Dietetics. Position of the Academy of Nutrition and Dietetics: food and nutrition for older adults: promoting health and wellness. *J Acad Nutr Diet*. 2012;**112**(8):1255-77.

11. Soini H, Routasalo P, Lagström H. Characteristics of the Mini-Nutritional Assessment in elderly home-care patients. *Eur J Clin Nutr*. 2004;**58**(1):64-70.

12. Cleland C, Ferguson S, Ellis G, Hunter RF. Validity of the International Physical Activity Questionnaire (IPAQ) for assessing moderate-to-vigorous physical activity and sedentary behaviour of older adults in the United Kingdom. *BMC Med Res Methodol*. 2018;**18**(1):16.

13. Rolland Y, Perrin A, Gardette V, Filhol N, Vellas B. Screening older people at risk of malnutrition or malnourished using the Simplified Nutritional Appetite Questionnaire (SNAQ): a comparison with the Mini-Nutritional Assessment (MNA) tool. *J Am Med Dir Assoc*. 2012;**13**(1):31-4.

14. Sieber CC. Nutritional screening tools-How does the MNA® compare? Proceedings of the session held in Chicago May 2-3, 2006 (15 years of Mini Nutritional Assessment). *J Nutr Health Aging*. 2006;**10**(6):488-94.

15. Posner BM, Jette AM, Smith KW, Miller DR. Nutrition and health risks in the elderly: the nutrition screening initiative. *Am J Public Health*. 1993;**83**(7):972-8.

16. Wilson MM, Thomas DR, Rubenstein LZ, Chibnall JT, Anderson S, Baxi A, et al. Appetite assessment: simple appetite questionnaire predicts weight loss in community-dwelling adults and nursing home residents. *Am J Clin Nutr*. 2005;**82**(5):1074-81.

17. İlhan B, Bahat G, Oren MM, BKılıç C, Durmazoglu S, Karan MA. Reliability and validity of Turkish version of the Simplified Nutritional Appetite Questionnaire (SNAQ). *J Nutr Health Aging*. 2018;**22**(9):1039-44.

18. Sarıkaya D. Geriatrik hastalarda Mini Nutrisyonel Değerlendirme (MNA) testinin uzun ve kısa (MNA-SF) formunun geçerlilik çalışması, Hacettepe Tıp Fakültesi İç hastalıkları Anabilim Dalı Uzmanlık Tezi, Ankara, 2013.

19. Guigoz, Y., Vellas, B., Garry, P.J. (1996). Assessing the nutritional status of the elderly: the Mini Nutritional Assessment as part of the geriatric evaluation. *Nutr Rev*. 1996;**54**(1):59-65.

20. Craig CL, Marshall AL, Sjöström M, Bauman AE, Booth ML, Ainsworth BE, et al. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc*. 2003; **35**:1381-95.

21. Öztürk M. Üniversitede Eğitim-Öğretim Gören Öğrencilerde Uluslararası Fiziksel Aktivite Anketinin Geçerliliği ve Güvenirliği ve Fiziksel Aktivite Düzeylerinin Belirlenmesi. Yüksek Lisans Tezi. Hacettepe Üniversitesi Sağlık Bilimleri Enstitüsü, Ankara, 2005.

22. Keskin Ş. Evde yaşayan yaşlılarda malnütrisyon riskleri ile günlük yaşam aktiviteleri arasındaki ilişki. MSD thesis, Aydın Adnan Menderes Üniversitesi, Aydın, 2019.

23. Slavíková M, Procházka B, Dlouhý P, Anděl M, Rambousková J. Prevalence of malnutrition risk among institutionalized elderly from North Bohemia is higher than among those in the capital city of Prague, Czech Republic. *Cent Eur J Public Health*. 2018; **26**(2):111-17.

24. Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff S, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. *Clinical Nutrition*. 2017;**36**(1):49-64.

25. Vellas B, Anthony P. The MNA (Mini Nutritional Assessment): 20 years of research and practice in the field of malnutrition and intervention in the elderly. *J Nutr Health Aging*. 2006;**10**:455.

26. Bauer JM, Vogl T, Wicklein S, Trögner J, Mühlberg W, Sieber CC. Comparison of the Mini Nutritional Assessment, Subjective Global Assessment, and Nutritional Risk Screening (NRS 2002) for nutritional screening and assessment in geriatric hospital patients. *Z Gerontol Geriatr*. 2005;**38**(5):322-7.

27. Demir HP, Bayram HM, Yavuzel G. Investigation of nutritional status and life satisfaction of elderly people living in nursing home and own home. *IGUSABDER*. 2019;**7**:641-55.

28. Kang J, Qiu Y, Hailong LI, Xiaodong SHI, Wei C. Multicenter cross-sectional community-based nutrition risk screening in 3885 Chinese elderly adults. *Acta Academiae Medicinae Sinica*. 2018;**40**(5):637-641.

29. Yaxley A, Crotty M, Miller M. Identifying malnutrition in an elderly ambulatory rehabilitation population: agreement between mini nutritional assessment and validated screening tools. *Healthcare*. 2015;**3**(3):822-9.

30. Eskici G, Ersoy G. Yaşlanma sürecinde egzersiz ve sağlikli beslenmenin kazandırdıkları. Ankara: Türkiye Emekliler Derneği: İlksan Matbaacılık Ltd. Şti.;2014,226.

31. Madeira T, Peixoto-Plácido C, Sousa-Santos N, Santos O, Alarcão V, Goulão B, et al. Malnutrition among older adults living in Portuguese nursing homes: the PEN-3S study. *Public Health Nutr*. 2018;**15**:1-12.