



# Factors Associated with Nutritional Status in Geriatric Outpatients

## Ayaktan Başvuran Geriatrik Hastalarda Beslenme Durumu ile İlişkili Faktörler

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### ABSTRACT

**Aim:** Malnutrition is a geriatric syndrome that should not be ignored considering its negative consequences in older adults. There are many factors that affect nutritional status. We aimed to determine the factors related to malnutrition in the elderly in this study.

**Materials and Methods:** This cross-sectional study included 356 elderly outpatients admitted to a geriatric outpatient clinic. Comprehensive geriatric assessments were performed and factors related to nutritional status were assessed. The Mini Nutritional Assessment Tool (MNA) and the Global Leadership Initiative on Malnutrition (GLIM) criteria were used to screen and diagnose malnutrition.

**Results:** The participants had a mean age of 72.2±6.5 years. Of the participants, 93 (26.1%) were considered malnourished according to the GLIM criteria. Malnourished participants had poorer quality of life, physical functioning, sleep quality, and higher depressive and anxiety symptoms. MNA scores were positively correlated with quality of life scores ( $r=0.355$ ,  $p=0.000$ ) and negatively correlated with depressive and anxiety symptoms scores ( $r=-0.346$ ,  $p=0.000$ , and  $r=-0.301$ ,  $p=0.000$ , respectively). Age and higher depressive symptom scores were found to be independent variables for malnutrition [ $p=0.026$ , Odds ratio (OR): 1.07 and  $p=0.045$ , OR: 1.07, respectively].

**Conclusion:** This study has shown that malnourished older adults are more likely to have impaired functional status, depressive and anxiety symptoms, poorer quality of life and sleep quality. Depressive symptoms and age have been found to increase the risk of malnutrition. Comprehensive geriatric assessment should be performed in all older adults to avoid undesirable consequences.

**Keywords:** Malnutrition, elderly, depression, quality of life, physical functioning

### ÖZ

**Amaç:** Malnütrisyon, yaşlı erişkinlerde olumsuz sonuçları göz önüne alındığında göz ardı edilmemesi gereken bir geriatrik sendromdur. Beslenme durumunu etkileyen birçok faktör vardır. Bu çalışmada yaşlılarda malnütrisyon ile ilişkili faktörleri belirlemeyi amaçladık.

**Gereç ve Yöntem:** Bu kesitsel çalışmaya bir geriatri polikliniğine başvuran 356 yaşlı ayaktan hasta alındı. Katılımcılara kapsamlı geriatrik değerlendirme yapıldı ve beslenme durumu ile ilgili faktörler değerlendirildi. Malnütrisyon tarama ve tanısı için Mini Nutritional Assessment Tool (MNA) ve Global Leadership Initiative on Malnutrition (GLIM) kriterleri kullanıldı.

**Bulgular:** Katılımcıların ortalama yaşı 72,2±6,5 yıl idi. Katılımcıların 93'ü (%26,1) GLIM kriterlerine göre malnütre olarak kabul edildi. Malnütrisyonu olan katılımcılar daha düşük yaşam kalitesi, fiziksel işlevsellik, uyku kalitesi ve daha yüksek depresif ve anksiyete semptomlarına sahipti. MNA puanları ile yaşam kalitesi puanları arasında pozitif ( $r=0,355$ ,  $p=0,000$ ), depresif ve anksiyete belirtileri puanları arasında negatif korelasyon (sırasıyla  $r=-0,346$ ,  $p=0,000$  ve  $r=-0,301$ ,  $p=0,000$ ) saptandı. Yaş ve yüksek depresif belirti puanları malnütrisyon için bağımsız değişkenler olarak bulundu [sırasıyla  $p=0,026$ , Odds oranı (OR): 1,07 ve  $p=0,045$ , OR: 1,07].

**Sonuç:** Bu çalışma, malnütrisyonlu yaşlı erişkinlerde işlevsel durumda bozulma, depresif ve anksiyete belirtileri, daha düşük yaşam kalitesi ve uyku kalitesine sahip olma olasılığının daha yüksek olduğunu göstermiştir. Depresif belirtiler ve yaşın malnütrisyon riskini artırdığı bulunmuştur. İstenmeyen sonuçlardan kaçınmak için tüm yaşlı erişkinlerde kapsamlı geriatrik değerlendirme yapılmalıdır.

**Anahtar Kelimeler:** Malnütrisyon, yaşlı, depresyon, yaşam kalitesi, fiziksel işlevsellik

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## INTRODUCTION

Malnutrition is a common geriatric syndrome with an estimated risk of 8.5% in community settings and 28% in hospital settings. Malnutrition can result in poor prognosis and increased health care costs<sup>1</sup>. The origin of malnutrition is complex and there are many factors that reduce dietary intake in older adults (e.g., physiological decrease in appetite, physical and cognitive impairment, chewing and swallowing problems, depression, polypharmacy)<sup>2</sup>. Malnutrition has poor outcomes and is associated with functional and cognitive impairment, poor wound healing, immune dysfunction, longer hospital stays, higher readmission rates, poorer quality of life, and ultimately higher mortality<sup>3,4</sup>.

Depression, one of the most important public health problems, has been reported to have a prevalence of up to 38% in older adults before the COVID-19 pandemic<sup>5</sup>. Depression is the leading cause of weight loss in older adults due to loss of appetite and anorexia it causes<sup>6,7</sup>. Many studies have shown that malnutrition is associated with depression and multiple comorbidities<sup>8,9</sup>. Kaburagi et al.<sup>10</sup> showed that handgrip strength, gait speed, and depressive symptoms scores were the predictors of malnutrition. It is not clear whether depression is the cause or the result of malnutrition, but a vicious cycle is pointed out between the two items<sup>11</sup>.

Studies have shown that malnutrition is closely associated with dependency in activities of daily living and poorer quality of life<sup>12,13</sup>. Additionally, Feldblum et al.<sup>14</sup> found a significant association between geriatric syndromes, including impairments in cognitive and physical functions, malnutrition, and depressive symptoms.

Studies investigating malnutrition and related factors by performing a comprehensive geriatric assessment will also help to solve different problems in geriatric patients in the future. Therefore, in this study, we aimed to examine the relationship between nutritional status and other geriatric conditions.

## MATERIALS AND METHODS

A total of 356 individuals aged  $\geq 65$  years, who were admitted to the Geriatric Outpatient clinic of Gaziantep University Şahinbey Research and Practice Hospital between May 2019 and May 2021, were included in this cross-sectional study. Individuals who agreed to participate in the study and did not have exclusion criteria were included. Exclusion criteria included the presence of acute or chronic inflammatory diseases, cancer, neuromuscular diseases, and additional comorbidities (severe visual and hearing impairments, osteoarthritis, peripheral arterial disease) affecting the comprehensive geriatric assessment. Other comorbid diseases including diabetes mellitus, hypertension, hyperlipidemia, coronary

artery disease, cerebrovascular diseases, neurodegenerative diseases, asthma, chronic obstructive pulmonary disease, rheumatic diseases, thyroid diseases were questioned and the most common diseases were given as sociodemographic data. The minimum sample size calculated with Epi Info software was 183 participants. Informed consent was obtained from the participants. All participants underwent a comprehensive assessment by an experienced physician, including nutritional status, activities of daily living, anxiety symptoms, depressive symptoms, mental status, sarcopenia, quality of life, and sleep quality.

### Assessment of Nutritional Status

The Mini Nutritional Assessment Tool (MNA) was used to screen the nutritional status of participants. According to the tool, the scores of 24 and above are considered adequate nutritional status, the scores of 17-23.5 are considered malnutrition risk, and the scores of 17 and below are considered malnutrition<sup>15</sup>. Afterward, the Global Leadership Initiative on Malnutrition (GLIM) criteria, including 5 criteria (3 phenotypic and 2 etiologic), were used to diagnose malnutrition. Phenotypic criteria include loss of weight ( $>5\%$  in the last 6 months or  $>10\%$  in more than 6 months), reduced muscle mass, and low body mass index ( $<20$  for under 70 years,  $<22$  for under 72 years of age). Etiologic criteria include inflammation and reduced food intake. At least 1 phenotypic criterion and 1 etiologic criterion are required for the diagnosis of malnutrition. The severity of malnutrition is based on phenotypic criteria and is classified as stage 1 (moderate) and stage 2 (severe) malnutrition<sup>16</sup>. Participants were grouped as "malnourished" and "with normal nutritional status" based on GLIM criteria.

### Assessment of Activities of Daily Living

The dependence in activities such as transferring, continence, bathing, toileting, dressing, and feeding was assessed with the Katz Index of Activities of Daily Living (ADL). According to the index, the total score ranges from 0 to 6, with higher scores indicating greater independence<sup>17</sup>.

### Assessment of Instrumental Activities of Daily Living

The Lawton & Brody Index of Instrumental Activities of Daily Living (IADL) measures independence in housekeeping, doing laundry, using the telephone, using transportation, food preparation, shopping, managing money, and taking medicine. According to the index, the total score ranges from 0 to 8, with higher scores indicating greater independence<sup>18</sup>.

### Assessment of Depressive Symptoms

The Geriatric Depression Scale (GDS), consisting of 30 questions, was used to evaluate depressive symptoms. A total score of  $\geq 14$  is considered depression according to the scale<sup>19,20</sup>.

### Assessment of Anxiety Symptoms

The Beck Anxiety Inventory (BAI), consisting of 21 questions, was used. According to the inventory, the scores of 0-7 are considered as no or minimum anxiety, 8-15 as mild anxiety, 16-25 as moderate anxiety, and 26-63 as severe anxiety<sup>21</sup>.

### Assessment of Cognitive Functions

The Mini-Mental State Examination Test (MMSE) was used to assess the cognitive functions. The reliability and validity of the test in the Turkish population were established and the cut-off point was found as 23/24 for the diagnosis of mild dementia<sup>22</sup>.

### Assessment of Quality of Life

Individuals' quality of life was assessed with the European Quality of Life-5 Dimensions (EQ-5D) questionnaire. In the questionnaire, individuals are asked to evaluate their own health status and the index score is calculated. A score of 0 indicates death, 1 indicates perfect health, and negative values indicate someone is bedridden, dependent, and unconscious. The second part of the questionnaire, the EQ-5D visual analogue scale, asks individuals to rate their health status between 0 and 100 points<sup>23</sup>.

### Assessment of Sarcopenia

The European Working Group on Sarcopenia in Older People criteria were used to diagnose sarcopenia. Low muscle strength and mass are required according to the criteria. Handgrip strength was measured using a hydraulic hand dynamometer. A bioelectrical impedance analyzer was used to measure muscle mass. Cut-off values for handgrip strength and muscle mass were used<sup>24,25</sup>.

### Assessment of Sleep Quality

The Pittsburgh Sleep Quality scale (PSQI) was used. The scale has 7 components and each component is rated between 0 and 3 points. A total score of 5 and above indicates poor sleep quality<sup>26</sup>. Concomitant use of five or more drugs was considered polypharmacy.

### Statistical Analysis

Statistical Package for the Social Sciences (SPSS) for Windows version 22.0 (IBM SPSS Statistics, Armonk, NY) was used. The distribution of normality was checked. The Mann-Whitney U test and independent samples t-test were used to compare two independent groups. The chi-squared test was employed to evaluate the relationship between categorical variables and the Spearman's rank correlation coefficients to evaluate the relationship between numerical variables. Correlation coefficient values between 0 and 0.3 (0 and -0.3) were accepted

as weak relationship, between 0.3 and 0.7 (-0.3 and -0.7) as moderate relationship, and between 0.7 and 1.0 (-0.7 and -1.0) as strong relationship<sup>27</sup>. Multivariate binary logistic regression analysis was performed by adding categorical and continuous variables to the analysis and using the "enter model" to identify independent factors of malnutrition.  $p \leq 0.05$  was considered statistically significant, and additionally,  $p$  values of " $\leq 0.01$ " were specified in the correlation analysis.

## RESULTS

The mean age of the 356 individuals was  $72.2 \pm 6.5$  years and 59.0% were female. Ninety-three (26.1%) participants were considered malnourished according to the GLIM criteria (85 cases stage 1 and 8 cases stage 2). The frequency of female participants and the mean age of the participants in the malnourished group were higher than those with normal nutritional status. Of the 93 malnourished patients, 4 were considered to have adequate nutritional status according to the MNA. While the ADL, IADL, MMSE and EQ-5D scores were lower in the malnourished group, the GDS, BAI and PSQI scores were higher. There was no statistically significant difference between the groups in terms of number of medications, number of comorbidities, frequency of sarcopenia and polypharmacy (Table 1).

The MNA score had a negative moderate correlation with BAI ( $r = -0.301$ ,  $p = 0.000$ ) and GDS ( $r = -0.346$ ,  $p = 0.000$ ) scores and a positive moderate correlation with EQ-5D score ( $r = 0.355$ ,  $p = 0.000$ ) (Table 2, 3).

Variance inflation factor (VIF) was calculated and ADL, IADL, and EQ-5D scores and number of medications were excluded due to potential collinearity problem. Multivariate logistic regression analysis was performed, and age and GDS score were found as independent variables for malnutrition ( $p = 0.026$ , OR: 1.07 and  $p = 0.045$ , OR: 1.07, respectively) (Table 4).

## DISCUSSION

Our study revealed that more than a quarter of elderly outpatients were malnourished according to the GLIM criteria, and malnutrition was associated with higher depressive symptoms and poorer physical functioning, quality of life, and sleep quality. It was found that the risk of malnutrition increased as the depressive symptom scores increased.

Previous studies have shown a strong association between depression and malnutrition, similar to our results<sup>8,28</sup>. A recent study has shown that malnourished older adults are 31% more likely to present depressive symptoms than those with normal nutritional status<sup>29</sup>. Although the cause and effect relationship between depression and malnutrition has not been clearly clarified, depression has a significant effect on appetite and dietary intake. Low serotonin levels and altered dopamine

**Table 1. Participants' socio-demographic characteristics and comprehensive geriatric assessment results (n=356)**

Variables	Normal nutritional status (n=263)	Malnourished (n=93)	p	Total (n=356)
<b>Gender</b>				
Female	147 (55.9%)	63 (67.7%)	0.046*	210 (59.0%)
Male	116 (44.1%)	30 (32.3%)		146 (41.0%)
<b>Age<sup>†</sup></b>	71.7±5.8	73.9±7.8	0.004*	72.2±6.5
<b>Number of comorbidities<sup>#</sup></b>	2 (0-7)	3 (0-8)	0.134	2 (0-8)
<b>Number of medications<sup>#</sup></b>	4 (0-18)	5 (0-15)	0.086	4 (0-18)
<b>Comorbidities</b>				
Hypertension	156 (59.3%)	57 (61.3%)	0.738	213 (59.8%)
Diabetes mellitus	129 (49.0%)	47 (50.5%)	0.805	176 (49.4%)
Coronary artery disease	64 (24.3%)	29 (31.2%)	0.196	93 (26.1%)
Neurodegenerative diseases	45 (17.1%)	21 (22.6%)	0.243	66 (18.5%)
Asthma/COPD	33 (12.5%)	17 (18.3%)	0.171	50 (14.0%)
<b>Polypharmacy</b>	114 (43.3%)	51 (54.8%)	0.056	165 (46.3%)
<b>Sarcopenia</b>	94 (37.9%)	32 (37.6%)	0.966	126 (37.8%)
<b>MNA<sup>†</sup></b>	24.4±5.1	15.7±4.3	<0.001*	22.2±6.2
Adequate nutritional status	189 (71.9%)	4 (4.3%)	<0.001*	193 (54.2%)
Risk of malnutrition	33 (12.5%)	52 (55.9%)		85 (23.9%)
Malnutrition	41 (15.6%)	37 (39.8%)		78 (21.9%)
<b>ADL<sup>†</sup></b>	4.6±1.5	4.0±1.8	0.001*	4.5±1.6
<b>IADL<sup>†</sup></b>	6.0±2.3	5.0±2.6	0.001*	5.7±2.4
<b>GDS<sup>#</sup></b>	7 (0-30)	12 (0-30)	0.002*	8 (0-30)
<b>BAI<sup>#</sup></b>	8 (0-48)	15 (0-42)	0.003*	10 (0-48)
<b>MMSE<sup>†</sup></b>	24.1±5.3	22.1±6.2	0.004*	23.6±5.6
<b>EQ-5D index<sup>#</sup></b>	0.58 (-0.53-1.00)	0.32 (-0.32-1.00)	0.005*	0.52 (-0.53-1.00)
<b>EQ-5D VAS<sup>#</sup></b>	70 (20-100)	50 (10-90)	0.001*	60 (10-100)
<b>PSQI<sup>#</sup></b>	5 (0-17)	6 (0-17)	0.042*	6 (0-17)

<sup>†</sup>p<0.05; <sup>#</sup>Data are presented as mean±SD, <sup>\*</sup>Data are presented as median (minimum-maximum).  
 COPD: Chronic obstructive pulmonary disease, MNA: The Mini Nutritional Assessment Tool, ADL: Katz Index of Activities of daily living, IADL: Lawton & Brody index of Instrumental Activities of Daily Living, GDS: The Geriatric Depression Scale, BAI: The Beck Anxiety Inventory, MMSE: Mini Mental State Examination, EQ-5D: The European Quality of Life-5 Dimensions questionnaire, PSQI: The Pittsburgh Sleep Quality Index

release play a role in the development of depression and can also reduce appetite<sup>30</sup>.

Another significant finding of our study was that age was an independent risk factor for malnutrition. A meta-analysis reported that older age and functional limitations were the determinants of malnutrition in community-dwelling older adults<sup>31</sup>. Chen et al.<sup>32</sup> showed that age, comorbidities, and depressive symptoms were significantly correlated with nutritional status among frail older adults. Older adults are at higher risk of malnutrition, as aging is a risk factor for the development of chronic diseases.

In this study, ADL, IADL, MMSE and EQ-5D scores were lower in the malnourished group. Thus, malnourished older adults are more likely to suffer from physical impairment, frailty, lower cognitive function, and poorer quality of life. The relationship between nutritional scores and daily living activities scores

in our study highlights the importance of malnutrition in functionality. In a cross-sectional study involving older adults, it was found that malnutrition was strongly associated with physical dependency<sup>33</sup>. Additionally, a recent study has shown that lower MNA scores are associated with depression and dependency in ADL<sup>34</sup>.

We found a moderate positive correlation between EQ-5D and MNA scores, which is consistent with the results of Jiménez-Redondo et al.<sup>35</sup>. De Oliveira et al.<sup>36</sup> showed that higher health-related quality of life scores were associated with better physical state and nutritional status in older adults<sup>36</sup>. Furthermore, previous studies investigating the association between nutritional status and quality of life have suggested that good nutritional status is a protective factor for the quality of life<sup>37,38</sup>. Therefore, it is important to identify malnutrition as it is associated with adverse outcomes in older adults, such

**Table 2. Correlation analysis results between the variables**

		MNA	Age	Number of diseases	Number of medications	ADL	IADL	EQ5D index score
MNA	r		-0.107	-0.253	-0.249	0.027	0.184	0.355
	p		0.044*	0.000**	0.000**	0.611	0.000**	0.000**
Age	r	-0.107		0.075	0.044	-0.089	-0.298	-0.297
	p	0.044*		0.159	0.403	0.092	0.000**	0.000**
Number of diseases	r	-0.253	0.075		0.624	0.093	-0.160	-0.357
	p	0.000**	0.159		0.000**	0.081	0.002**	0.000**
Number of medications	r	-0.249	0.044	0.624		0.030	-0.141	-0.271
	p	0.000**	0.403	0.000**		0.575	0.008**	0.000**
ADL	r	0.027	-0.089	0.093	0.030		0.537	0.541
	p	0.611	0.092	0.081	0.575		0.000**	0.000**
IADL	r	0.184	-0.298	-0.160	-0.141	0.537		0.666
	p	0.000**	0.000**	0.002**	0.008**	0.000**		0.000**
EQ5D index	r	0.355	-0.297	-0.357	-0.271	0.541	0.666	
	p	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	

r: Spearman rank correlation coefficient; \*Significant at 0.05 level; \*\*Significant at 0.01 level.  
MNA: The Mini Nutritional Assessment Tool, ADL: Katz Index of Activities of daily living, IADL: Lawton & Brody index of Instrumental Activities of Daily Living, EQ-5D: The European Quality of Life-5 Dimensions questionnaire

**Table 3. Correlation analysis results between the variables**

		MNA	BAI	GDS	MMSE	HGS	PSQI
MNA	r		-0.301	-0.346	0.132	0.228	-0.277
	p		0.000**	0.000**	0.013*	0.000**	0.000**
BAI	r	-0.301		0.641	-0.105	-0.281	0.450
	p	0.000**		0.000**	0.104	0.000**	0.000**
GDS	r	-0.346	0.641		-0.331	-0.367	0.426
	p	0.000**	0.000**		0.000**	0.000**	0.000**
MMSE	r	0.132	-0.105	-0.331		0.320	-0.082
	p	0.013*	0.104	0.000**		0.000**	0.212
HGS	r	0.228	-0.281	-0.367	0.320		-0.164
	p	0.000**	0.000**	0.000**	0.000**		0.013*
PSQI	r	-0.277	0.450	0.426	-0.082	-0.164	
	p	0.000**	0.000**	0.000**	0.212	0.013*	

r: Spearman rank correlation coefficient; \*Significant at 0.05 level; \*\*Significant at 0.01 level.  
MNA: The Mini Nutritional Assessment Tool, BAI: The Beck Anxiety Inventory, GDS: The Geriatric Depression Scale, MMSE: Mini Mental State Examination, HGS: Handgrip strength (kg), PSQI: The Pittsburgh Sleep Quality Index

as poor quality of life, impaired functional status, increased healthcare costs, and mortality rates<sup>39</sup>.

In our study, it was also found that malnourished individuals had poorer sleep quality. A recent study has shown that poor sleep quality is significantly associated with the risk of malnutrition among older adults<sup>40</sup>. Considering the role of sleep quality in healthy aging, the importance of adequate nutrition increases even more.

### Study Limitations

Our study has several limitations. First, due to its cross-sectional nature, no cause-effect relationships between the assessment results can be suggested. Second, study participants were elderly individuals admitted to a tertiary referral hospital, and these results cannot be generalized to community-dwelling older adults. The strengths of our study are that it included an acceptable number of participants for data extraction, that there was homogeneity between the groups so that the factors

**Table 4. Multivariate logistic regression analysis results of the independent variables for malnutrition**

Variable	Malnutrition	
	OR (95% CI)	p value
Age	1.07 (1.01-1.13)	0.026*
Gender (female vs. male)	1.04 (0.52-2.08)	0.923
Number of diseases	1.19 (0.96-1.48)	0.108
GDS	1.07 (1.00-1.14)	0.045*
BAI	1.04 (1.00-1.08)	0.078
MMSE	0.97 (0.91-1.03)	0.386
PSQI	1.02 (0.93-1.11)	0.750
Sarcopenia	1.04 (0.98-1.09)	0.212

\*p<0.05 according to multivariate binary logistic regression analysis.  
 CI: Confidence interval, OR: Odds ratio, GDS: The Geriatric Depression Scale, BAI: The Beck Anxiety Inventory, MMSE: Mini Mental State Examination, PSQI: The Pittsburgh Sleep Quality Index

affecting malnutrition could be clearly evaluated, and that we performed comprehensive geriatric assessments using valid tools.

**CONCLUSION**

In this study, age and depressive symptoms were found to be independent variables for malnutrition. We also showed that malnourished older adults were more likely to suffer from impaired functional status, depressive and anxiety symptoms, poorer quality of life and sleep quality. Our results highlight the importance of adequate nutrition and psychological support in older adults to avoid potential adverse outcomes.

**Ethics**

**Ethics Committee Approval:** This study was approved by the Gaziantep University Clinical Research Ethics Committee (decision number: 2015/296, date: 02.11.2015).

**Informed Consent:** Informed consent was obtained from the participants.

**Peer-review:** Externally peer-reviewed.

**Authorship Contributions**

Surgical and Medical Practices: A.Ç., Concept: Z.A.Ö., Design: E.M.E., Z.A.Ö., Data Collection or Processing: A.Ç., Analysis or Interpretation: A.Ç., Literature Search: E.M.E., Writing: A.Ç.

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