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# Evaluation of nutritional status (Nutritional Risk Screening-2002) of hospitalized inpatients and comparison with various variables

#### Hastanede Yatan Hastaların Beslenme Durumunun (Nütrisyonel Risk Taraması-2002) Değerlendirilmesi ve Çeşitli Değişkenlerle Karşılaştırılması

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#### ÖΖ ABSTRACT Amaç: Bu çalışmada, hastanede yatan hastaların beslenme durumlarının Aim: This study aimed to evaluate the nutritional status of hospitalized patients Nütrisyonel Risk Taraması-2002 (NRS-2002)'ye göre değerlendirilmesi ve çeşitli according to Nutritional Risk Screening-2002 (NRS-2002) and to examine the effects değişkenlerin beslenme durumu üzerindeki etkilerinin incelenmesi amaçlandı. of various variables on nutritional status. Yöntem: Kesitsel tipte yapılan araştırmanın örneklemini basit tesadüfi örnekleme Methods: The sample of the cross-sectional study consisted of 469 inpatients yöntemiyle ulaşılan 469 yatan hasta oluşturmuştur. Veriler, Ocak-Mart 2024 tarihleri reached by simple random sampling method. Data was collected from hospitalized arasında hastanede yatan hastalardan yüz yüze görüşme yöntemi kullanılarak anket patients with a survey form using face-to-face interview method between January and ile toplandı. Verilerin toplanmasında kullanılan ankette kişisel bilgilervehastanede March 2024. Personal information and hospital stay characteristics form, NRS-2002 kalış özellikleri formu, NRS-2002 formu kullanıldı. form was used in the survey used to collect data. Bulgular: Çalışmaya alınan hastaların yaş ortalaması 59,8±18,1 yıl olarak Results: The average age of the patients included in the study was found to be 59.8±18.1 years. Of the patients, 51.4% were male and 48.6% were female. bulundu. Hastaların %51,4'ü erkek, %48,6'sı kadındı. NRS-2002 skoru sonucuna göre hastaların 410'u (%87,3) malnütrisyon riski yok, 59'u (%12,6) malnütrisyon riskli According to the total NRS-2002 score result, 410 (87.3%) of the patients were olarak sınıflandırıldı. Hastaların malnütrisyon riski ile cinsiyet, eğitim düzeyi, hastane classified as no risk of malnutrition and 59 (12.6%) were classified as risk of diyeti ve hastane klinikleri arasında istatistiksel olarak anlamlı bir farklılık bulunamadı malnutrition. No statistically significant difference was found between patients' (p>0,05). Ancak hastaların malnütrisyon riski ile yaş, beden kütle indeksi (BKİ) malnutrition risk and gender, education level, hospital diets, hospital clinics (p>0.05). ve hastanede kalış süresi arasında istatistiksel olarak anlamlı bir farklılık bulundu However, a statistically significant difference was found between the malnutrition risk (p<0,05). of the patients and their age, body mass index (BMI) and length of hospital stay Sonuç: Özellikle yaşlı, hastanede yatış süresi uzun ve BKİ düşük olan hastaların (p<0.05). malnütrisyon riskinin daha yüksek olması nedeniyle bu hastalara beslenme tarama Conclusion: Nutrition screening tools should be applied more frequently to these araçlarının daha sık uygulanması gerekmektedir. patients, especially since the risk of malnutrition is higher in patients who are elderly, have a long hospital stay, and have a low BMI. Anahtar Sözcükler: Malnütrisyon, Beslenme durumu, Nütrisyonel Risk Taraması Keywords: Malnutrition, Nutritional status, Nutritional Risk Screening

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#### Introduction

ne of the main problems for hospitalized patients is malnutrition. Developed countries try to minimize the risk of malnutrition in hospitalized patients. Malnutrition causes an increase in hospital stay, morbidity and mortality [1-3]. It also reduces the patient's quality of life and leads to significant increases in healthcare expenses. Hospitalization causes patients to become malnourished. Micro and macronutrient deficiencies caused by malnutrition affect the immune system of patients and increase the risk of infection. Therefore, early detection of malnutrition in hospitalized patients is important [3]. The American Society for Parenteral and Enteral Nutrition (ASPEN) recommends that all hospitalized patients undergo nutritional screening at the beginning of hospitalization [4].

In the hospital setting, one of the most important screening tools used to identify patients at risk of malnutrition is the NRS-2002 [1]. Additionally, European Society for Clinical Nutrition and Metabolism (ESPEN) recommends the use of NRS-2002 in nutritional assessment [5]. Implementation of the NRS-2002 screening tool does not require high training for healthcare professionals, is rapid and easy to administer [6]. In NRS 2002, patients are evaluated and scored in terms of nutritional deficiency and disease severity. Patients with a total score  $\geq$  3 are considered to be at nutritional risk [5]. It has been determined that there is a significant relationship between the increase in the NRS score and the increase in hospital stay, morbidity, mortality and hospital costs [7-10].

It is important to evaluate the relationship between the malnutrition risk of hospitalized patients and information about their personal characteristics or hospital stay. In addition, upon examining previous literature on the subject, it is notable that there is no data detecting hospital malnutrition in Alanya, an important tourism district in our country. This makes the contribution of our study to the literature very significant. This study aimed to evaluate the nutritional status of hospitalized patients according to NRS-2002 and to examine the effects of various variables on nutritional status.

#### Materials and Method

#### Sample

The sample of the study consists of inpatients at Alanya Alaaddin Keykubat University Training and Research Hospital. The sample calculation was made according to the malnutrition prevalence (%15-50) in other studies conducted in hospitals [11, 12]. Known universe size it was calculated according to the sampling formula ( $\alpha$ =0.05, p=0.5, d=0.05) and the sample size to represent the population was determined as 393 inpatients. The sample of the study consisted of 469 inpatients reached by simple random sampling method. Those included in the study were voluntary inpatients who were 18 years of age and over and had no speech problems and were hospitalized for at least 2 days. Pregnant and breastfeeding women, unconscious individuals and patients in pediatric, psychiatric and intensive care clinics were not included in the study.

#### **Ethical Regulations**

"Ethics Committee Approval" dated 09.01.2024 and numbered 01/11 (10/2024) was received for the research from the " Alanya Alaaddin Keykubat University non-invasive clinical research ethics committee decision". In addition, before starting the study, written permission was obtained from the hospital chief physician to conduct the study. Data were collected by face-to-face interviews and survey method from hospitalized patients between January and March 2024. Individuals participating in the research were provided with information about the purpose of the study and "voluntary participation consent" was obtained. This research was conducted in accordance with the "Principles of the Declaration of Helsinki" and "Research and Publication Ethics".

#### **Data Collection Tools**

The data was collected using personal information and hospital stay characteristics form, Nutritional Risk Screening-2002.

## Personal information and hospital stay characteristics form

The data form created by the researchers includes personal information such as age, gender, height,

body weight, education level, as well as data on the characteristics of the hospital stay such as the hospital clinics, hospital diets, length of hospital stay (LOHS). Anthropometric data measured by the researchers were evaluated by calculating body mass index (BMI) as kg/m<sup>2</sup> using the formula body weight (kg)/height (m<sup>2</sup>) according to the World Health Organization (WHO) classification. According to the WHO, BMI classification was as: BMI <18.5 kg/m2 as underweight; 18.5-24.9 kg/ m2 as normal; 25-29.9 kg/m2 as preobese; ≥30 kg/m2 as obese [13].

#### Nutritional Risk Screening-2002 (NRS-2002)

NRS-2002, a nutritional screening tool, was developed in 2002 by Kondrup and colleagues with the contributions of the Danish Parenteral and Enteral Nutrition community [5]. The Turkish validity and reliability of the scale was conducted by Bolayır et al (2019). This screening tool aims to determine individuals' malnutrition levels and malnutrition risk rates. NRS-2002 is scored based on weight loss, food intake and BMI (1-3 points), disease severity score (1-3 points) and age correction (+1 point) in individuals over 70 years of age. Patients are classified as having no risk of malnutrition (<3 points) and having a risk of malnutrition (≥3 points) [14].

#### Data Assessment

For statistical analyses of the data obtained, SPSS 25.0 for Windows software (SPSS, Chicago, II, USA) was used. Frequencies, percentages (%), mean, standard deviation ( $\pm$  SD), minimum(min) and maximum(max) values were used in descriptive statistics. Normal distribution of the data was assessed using the Kolmogorov-Smirnov test. In determining the differences between groups, the Chi-Square test was used to evaluate categorical variables, while the t test was used to evaluate continuous variables. A value of p<0.05 was considered significant.

#### Results

A total of 469 adult patients with an average age of 59.8±18.1 years were included in the study. Of the patients, 51.4% were male and 48.6% were female. When the education level of the patients was examined, it was found that more than half (55%) were primary school graduates. The most common hospital diets taken by patients in the hospital were normal diet, diabetic diet and saltfree diet (26.3%, 22.0% and 14.9%, respectively). The average hospital stay of the patients was  $10.7\pm5.2$  days (Table 1).

Table	1.	Personal	information	and	hospital	stay	characteristics	of
inpatients (n=469)								

Variables		Results	
Gender, n (%)	Female	228 (48,6)	
	Male	241 (51,4)	
Age, years (mean±SD)	/ (min-max)	59,8±18,1 / (18-97)	
Education level, n	Literate	74 (15,8)	
(%)	Primary school	258 (55,0)	
	High school	91 (19,4)	
	University	46 (9,8)	
BMI, kg/m2 (mean±SD) / (min-max)		26,7±5,5 / (14,6-47,9)	
	Clear liquid diet (regimen1)	45 (9,6)	
	Full liquid diet (regimen 2)	59 (12,6)	
Hospital diets, n (%)	Normal diet (regimen 3)	123 (26,3)	
	Salt-free diet	70 (14,9)	
	Diabetic diet	103 (22,0)	
	Other diets	69 (14,8)	
	General surgery	80 (17,0)	
	Orthopedy	53 (11,3)	
TT	Internal medicine	77 (16,4)	
(%)	Cardiology	57 (12,1)	
(//)	Gynecology	58 (12,4)	
	Neurology	70 (15,0)	
	Palliative	74 (15,8)	
LOHS, days (mean±SD) / (min-max)		10,7±5,2 / (2-82)	

In our study, the nutritional status of the patients was evaluated according to NRS 2002. According to the total NRS-2002 score result, 410 (87.3%) of the patients were classified as no risk of malnutrition and 59 (12.6%) were classified as risk of malnutrition (Table 2).

In this study, no significant difference was found between patients' nutritional risk and gender, education level, hospital diets, hospital clinics (p>0.05). However, a significant difference was found between the patients' nutritional risk and age, BMI and LOHS (p<0.05). According to the results of our study, the hospital stay of patients at risk of malnutrition was longer than that of patients no risk of malnutrition, and the difference was found to be statistically significant ( $6.21\pm10.84$  vs 9.49±10.10; p=0.029). In determining the risk of malnutrition according to body mass index, the BMI of patients at risk of malnutrition was lower than patients no risk of malnutrition and the difference was found to be statistically significant (27.32±5.31 vs 22.46±5.36; p<0.001). In determining the risk of malnutrition according to age, the average age of patients at risk of malnutrition was older than patients no risk of malnutrition and the difference was found to be statistically significant (57.48±17.79 vs 72.42±13.79; p<0.001) (Table 3).

Table 2. NRS-2002 scores of inpatients and nutritional status according to NRS-2002 score.

NRS-2002 Score	n	%	
0	319	68,0	
1	36	7,7	
2	55	11,7	
3	38	8,1	
4	15	3,2	
5	6	1,3	
6	-	-	
Total	469	100	
Total NRS-2002 Score			
No risk of malnutrition(NRS score<3 points)	410	87,4	
Risk of malnutrition (NRS score≥3 points)	59	12,6	
Total	469	100	

#### Discussion

This study was conducted to evaluate the nutritional status of hospitalized patients and to examine the variables affecting their nutritional status. In our study, the risk of malnutrition was found in 12.6% of hospitalized patients. In a comprehensive study conducted in 13 hospitals in Germany, the rate of malnutrition in inpatients was determined to be 27.4% [15]. In a study conducted by the Clinical Enteral and Parenteral Nutrition Association (KEPAN) in Turkey, where 29139 patients in 34 hospitals from 19 provinces were evaluated, it was determined that 15% of the patients were at risk of malnutrition at the time of hospitalization [16]. In a study in which 407 inpatients at Kırıkkale University Faculty of Medicine Hospital were evaluated with NRS-2002, malnutrition was detected in 13.6% of the patients, and this rate is very close to the malnutrition rate in our study [17]. In studies evaluating the risk of malnutrition in hospitalized patients with NRS

2002, it is seen that the malnutrition rate spreads over a wide range [12, 16, 17]. The reason for this wide range may be differences in the distribution of the services where patients are hospitalized. The rate of malnutrition also increases in studies with a higher proportion of intensive care patients. Since intensive care patients were not included in our study, the malnutrition rate may have been found to be lower than other studies. Other reasons for the differences in malnutrition rates in the literature may be the size of the provinces and hospitals where the studies were conducted, the types of diseases and differences in the methodology used.

Table 3. Relationship between nutritional status of various variables (1	n =
469).	

		r			
		No risk of	Risk of	p-value	
		malnutrition	malnutrition		
		(n=410)	(n=59)		
Gender, n	Female	201 (88,2)	27 (11,8)	0,639*	
(%)	Male	209 (86,7)	32 (13,3)		
Age (years), mean±SD		57,48 ±17,79	72,42 ±13,79	<0,001**	
	Literate	61 (82,4)	13 (17,6)		
El ada	Primary	221 (85,7)	37 (14,3)		
Loucation	education			0,066*	
level, II (70)	High school	86 (94,5)	5 (5,5)		
	University	42 (91,3)	4 (8,7)		
BMI, (kg/m2	e)mean±SD	27,32±5,31	22,46±5,36	<0,001**	
	Clear	38(84,4)	7(15,6)		
	liquid diet				
	(regimen1)				
	Full liquid diet	50(84,7)	9(15,3)		
Hospital	(regimen 2)			0.171*	
diets, n (%)	Normal diet	113 (91,9)	10 (8,1)	0,171	
	(regimen 3)				
	Salt-free diet	59(84,3)	11(15,7)		
	Diabetic diet	88(85,4)	15(14,6)		
	Other diets	62(89,9)	7(10,1)		
	General	72 (90,0)	8 (10,0)		
	surgery				
	Orthopedy	47 (87,0)	6 (13,0)		
Hospital	Internal	66 (85,7)	11 (14,3)		
clinics, n	medicine			0,412*	
(%)	Cardiology	49 (86,0)	8 (14,0)		
	Gynecology	52 (89,0)	6 (11,0)		
	Neurology	61 (87,1)	9 (12,9)		
	Palliative	63 (85,1)	11 (14,9)		
LOHS (days)	LOHS (days), mean±SD		9,49±10,10	0,029**	

p<0,05, \*Chi-Square test, \*\*t test

In this study, the malnutrition rate was found

to be 11.8% in women and 13.3% in men, and there was no significant difference in the risk of malnutrition according to gender (p>0.05). In the study conducted by Güngör et al. in 2022, it was found that the risk of malnutrition was higher in men and the difference was significant [18]. There are studies showing that the rate of malnutrition in women is significantly higher than in men [17, 19]. There appears to be no consensus in the literature regarding the relationship between malnutrition and gender.

In this study, there was no significant relationship between the type of diet the patients took and the clinic they stayed in and the risk of malnutrition (p>0.05). Güngör et al. found that the risk of malnutrition was higher in patients hospitalized in oncology, general surgery and cardiac surgery services [18]. The reason why no difference was found in the risk of malnutrition depending on the ward where the patients were hospitalized may be due to the lack of oncology and intensive care services in our study. In our study, although the risk of malnutrition was found to be higher in individuals with low education levels, no significant relationship was found (p>0.05). In a study conducted in Kırıkkale in 2023, they found an inverse relationship between education level and malnutrition risk [17].

In our study, the average age of patients at risk of malnutrition was older than patients without risk of malnutrition, and the difference was found to be statistically significant (p<0.05). In another study conducted with 762 female and 662 male patients, it was reported that the risk of malnutrition was associated with increasing age, similar to our study [20]. Other studies have also found that increasing age increases the risk of malnutrition statistically significantly [21, 22].

It is expected that nutritional status screening tools and some anthropometric measurements will be correlated with each other. An inverse correlation is also expected between BMI and NRS-2002. Our study also meets this expectation and the BMI of patients at risk of malnutrition was lower than patients no risk of malnutrition and the difference was found to be statistically significant (p<0.05). In the study conducted by Kroc et al. in 2021, a negative relationship was found between both BMI and waist circumference and the NRS-2002 score [21]. In a comprehensive metaanalysis study, it was stated that NRS-2002 had a significant negative correlation with BMI [23].

This study, the hospital stay of patients at risk of malnutrition was longer than that of patients no risk of malnutrition, and the difference was found to be statistically significant (p<0.05). There are many studies in the literature showing a significant relationship between an increase in the NRS-2002 score and an increase in the length of hospital stay [7-10]. According to these results, we can think that a long hospital stay is an important criterion that increases the risk of malnutrition.

**Limitation:** The main limitation of this study is that the patient group is heterogeneous and the reasons for hospitalization are different. Another limitation is that patients in intensive care units were not included in the study.

**Conclusion:** Nutritional problems of hospitalized patients due to their current illness and complications and the resulting risk of malnutrition are common in hospitals. Preventing and treating malnutrition also contributes significantly to the treatment of the patient's current disease and accelerates recovery. NRS-2002 is a reliable screening tool used to detect malnutrition status of patients all over the World. Malnutrition risk screening tools should be applied to hospitalized patients at the time of hospitalization and at frequent intervals thereafter. In particular, nutritional screening tools should be applied more frequently, as patients of older ages, longer hospital stays and low BMI have a higher risk of malnutrition. Establishing nutrition support teams in hospitals and/or supporting their work can minimize the risk of malnutrition in patients.

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**0002-9277-100X)** and **A.E.B.** (0000-0003-2254-2348) All authors contributed to the manuscript conception, design, literature research, writing, critical review and final approval.

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