RESEARCH

EVALUATION OF PREOPERATIVE NUTRITION WITH THREE DIFFERENT TOOLS IN ELDERLY PATIENTS

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Abstract

Introduction: This study was conducted to evaluate the preoperative nutritional status of patients over 65 years of age, determine the factors affecting nutrition, and compare the effectiveness of the three screening tools that were used to evaluate nutritional status.

Materials and Method: The research was cross-sectional and correlational. Two hundred elderly patients in the preoperative period of the surgical service were interviewed. The Mini Nutritional Assessment short form (MNA-SF), Nutritional Risk Screening form (NRS-2002), and Geriatric Nutritional Risk Index (GNRI) were used.

Results: Elderly patients—35.0% according to the MNA-SF, 35% according to NRS-2002, and 39.5% according to GNRI —were found to have a higher risk of preoperative malnutrition. A significant correlation was found between dysphagia and loss of appetite in elderly patients and the risks of malnutrition. Based on Receiver operating characteristic analysis, GNRI and MNA-SF were found to have high diagnostic value for preoperatively diagnosing malnutrition in elderly patients (area under the curve 0.95 and 0.90, respectively). The highest sensitivity (93.7%) belongs to Geriatric Nutritional Risk Index.

Conclusion: The use of the Geriatric Nutritional Risk Index tool is appropriate in evaluating the preoperative nutritional status in elderly patients.

Keywords: Aged; Malnutrition; Nutritional Status; Preoperative Care.

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INTRODUCTION

According to the World Health Organization, aging is defined as a progressive decrease in vital functions and the adaptation process in the environment (1). Physiological changes occur in elderly patients as the result of cellular damage caused by aging. Physiological changes, psychological problems, loneliness, chronic diseases, and multiple drug use affect the elderly's nutritional status (2). In a study of 425 geriatric patients in China, the rate of malnutrition was found to be 40.9% with the *Nutritional Risk* Screening 2002 (NRS 2002) tool and 58.6% with the Nutritional *Assessment* Short *Form* (MNA-SF) tool (3). In a study conducted with 284 geriatric patients in Italy, 24.6% of the elderly were diagnosed for malnutrition, and 28.2% of the patients were found to be at high risk of malnutrition (4). Malnutrition is a serious problem that increases the development of complications and mortality in elderly patients who will undergo surgery. The European Association for Parenteral and Enteral Nutrition (ESPEN) emphasizes that the nutritional status of every elderly patient should be evaluated (5). If malnutrition is present in the patient during the preoperative period and necessary nutritional support is provided, then wound healing is accelerated, the risk of developing complications is reduced, and the duration of the patient's hospital stay is shortened (6-8). The literature provides limited studies on the factors affecting the preoperative malnutrition rates and nutritional status of elderly patients (3,4,9).

Several screening tools are used to determine the nutritional status of elderly patients (10). In a study conducted in China, 425 patients over the age of 70 years were evaluated, and the NRS 2002 and MNA-SF screening tools were compared. The NRS 2002 and MNA-SF were considered appropriate tools for assessing nutritional deficiency in geriatric patients (3). In a study conducted on 131 patients over 60 years of age, the Geriatric *Nutritional Risk Index* (GNRI) and MNA-SF assessment tools were compared, and GNRI was found to be a more appropriate tool for evaluating nutrition in the elderly (9). ESPEN recommends the use of MNA-SF to diagnose nutritional status in the elderly (5). In Turkey, NRS 2002 is used to evaluate the nutritional status of elderly in hospitals. In the literature, there is no study about which tool is more meaningful for evaluating the nutritional status in the preoperative period in patients aged 65 years and over.

This study was conducted to evaluate the preoperative nutritional status of patients over 65 years of age and to compare the MNA-SF, NRS 2002, and GNRI screening tools, which are used to define the preoperative nutritional status of the patient.

MATERIALS AND METHODS

Study Design

The study was conducted on patients aged 65 years and over in the preoperative period who applied to the General Surgery, Orthopedics, Cardiovascular Surgery, Urology, and Ear Nose and Throat Clinics of Research Hospital in the Aegean region between October 2020 and June 2021. The sample size was calculated as 15% malnutrition rate in elderly patients, 95% confidence interval and significance level of 0.05. The sample size was 185 people. In this study the stratified sampling method was applied. A total of 200 patients were interviewed, including 79 from orthopedics, 34 from general surgery, 39 from urology, 28 from otolaryngology and 20 from cardiovascular surgery services.

The study sample included patients aged 65 years and older who were in the pre-operative period, fed orally, had occasional person orientation, had no cognitive problems, and were admitted to the clinic for 24 h. The sample excluded those who were intubated, parenterally and enterally fed, immobile, or had hip fractures.

Data Collection

The patient descriptive information form was created by reviewing the literature (3, 4, 6) and com-

posed of two parts. In the first part, there were questions regarding the patient's sociodemographic characteristics and anthropometric measurements were determined and BMI was calculated. The second part included questions about the problems affecting nutrition. In our study, Mini-Nutritional *Assessment* Short *Form* (MNA-SF), *Nutritional Risk* Screening 2002 (NRS 2002) and Geriatric *Nutritional Risk Index* (GNRI) are used to evaluate the nutritional status of the elderly in hospitals.

Rubenstein et al. in 2001 developed the MNA-SF form (11). In the validity and reliability study conducted in Turkey, the kappa compliance score of MNA-SF was found to be 0.66, while the sensitivity and specificity were 94% and 81%, respectively (12). The MNA-SF consists of six items to evaluate the patient's nutritional status. Those who were normally fed received between 12 and 14 points, at risk patients received between 8 and 11 points, and patients who were markedly malnourished received seven points or less.

NRS-2002 was developed by Kondrup et al. (13). The scale was examined in two stages. In the first stage, the patient's BMI, weight loss, decrease in food intake, and presence of risky disease were evaluated. If one of these items was yes, the main evaluation was initiated. The second stage is evaluated as deterioration in nutritional status and disease severity and scored. In addition to this score, if the patient was 70 years or older, one point was added. If the total score was three or more, it was determined that there was a risk and a nutrition plan was applied (13). The Turkish version of the NRS 2002 showed the following results: kappa compliance score of 0.804; sensitivity of 88%; and specificity of 92% (14).

The GNRI is a nutritional formula developed specifically for the elderly to identify and predict nutrition-related complications rather than diagnose malnutrition (15). The sensitivity and specificity of the GNRI was 45% and 81.7%, respectively. A score below 82 on the index indicates a severe risk. A score between 82 and 92 is interpreted as medium risk, a score between 92 and 98 is interpreted as low risk, and an index above 98 points is interpreted as no risk (15).

This index calculated using the following equation:

GNRI = [1.489 × albumin (g/L)] + [41.7 × (weight/WLo*)]

*WLo = the ideal weight calculated from the Lorentz formula as follows:

For men: height (cm) – 100 – [(height in cm – 150)/4]

For women: height (cm) – 100 – [(height in cm – 150)/2.5]

Patients were interviewed at least 24 h after hospitalization. The researcher collected data of our study. The patient's height measurements were made by placing the patient's feet together and placing the head in the horizontal Frankfort plane while standing. The patients' weight was measured using the Tefal PP1061V0 coded scale. In order to measure the weight accurately, the patients were dressed thinly and shoes were taken off before measurement. The BMI value was calculated. The albumin value was taken from the patients' records.

Statistical analysis

Statistical Package for Social Sciences (SPSS) version 22.0 version was used for the data analysis. Number, percentage, and mean were used in evaluating the data. Correlation analysis was applied to the relationship between malnutrition and the variables affecting nutrition. Kappa analysis was used to evaluate the agreement between the scales. Receiver operating characteristic (ROC) curves of the three scanning tools were also used to assess the ability to accurately distinguish between the malnourished patients. The ROC analysis was based on the fact that ESPEN took a BMI threshold value of 22 kg/m^2 for elderly patients who lost 5% weight in the last 2 months (5). All statistical analyses were conducted

at the 95% confidence level and at a significant level of 0.05. Ethics approval of our study was granted by the local non-interventional clinical research ethics committee (protocol number 2020/05-20).

RESULTS

In our study, 54.5% of the patients were male, mean age was 69.62±3.7 years, 41.0% were secondary school graduates, 83.0% were married, 66.5% were living with their spouses. It was determined that 43.5% had income equal to expenditure, 58% had a BMI between 18.5 - 24.9 kg/m^2, and 92% had at least one chronic disease.

It was determined that 58.5% of the patients had oral and dental problems, 38.5% had difficulty in swallowing, and 45% had a loss of appetite. Looking at the daily diets, it was determined that 14.5% of the patients were on a diet due to their chronic disease, 83.5% were consuming their main meals regularly, 57.5% had snacks, and 56.5% had snacks than the main meal. It was determined that 36% of the patients were smoking cigarettes and 16.5% were consuming alcohol.

It was determined that 35.0% of the patients, according to MNA-SF and NRS-2002, and 39.5% according to GNRI, were at high risk in malnutrition (Table 1). According to the MNA-SF, 6.5% (n:13) of the patients were malnourished.

A significant correlation was found between dysphagia and loss of appetite in patients according to NRS 2002, MNA-SF, and GNRI scores ($p < .001$). In our study, there was a weak correlation between patients' dysphagia and the risk of malnutrition, and a high relationship between loss of appetite and malnutrition risk. There was not significant correlation between oral and dental problems in patients according to MNA-SF, NRS 2002, and GNRI scores ($p >. 05$) (Table 2).

Table 1. Classification of The Risk of Malnutrition with MNA-SF, NRS 2002, and GNRI Tools (n: 200)

Risk of malnutrition	MNA-SF		NRS 2002		GNRI	
	n	%	n	%	n	%
No	117	58.5	130	65	121	60.5
Risk	70	35.0	70	35	79	39.5
Malnutrition	13	6.5	-	-	-	-
Total	200	100	200	100	200	100

MNA-SF, Short Form of Mini Nutritional Assessment; NRS 2002, Nutritional Risk Screening 2002; GNRI, Geriatrics Nutritional Risk Index

Table 2. Pearson Correlation Coefficients of Factors Affecting Nutrition and Tools

Factors Affecting Nutrition	NRS 2002		MNA-SF		GNRI	
	r	p	r	p	r	p
Oral and dental problems	0.104	0.143	-0.068	0.338	-0.055	0.456
Dysphagia	0.335**	0.000	-0.340**	0.000	-0.294**	0.000
Loss of appetite	0.625**	0.000	-0.722**	0.000	-0.649**	0.000

MNA-SF, Short Form of Mini Nutritional Assessment; NRS 2002, Nutritional Risk Screening 2002; GNRI, Geriatrics Nutritional Risk Index. Correlation analysis **$p < 0.01$.

The agreement between the three tools was examined. There was a good agreement between NRS 2002 and MNA-SF (κ =.668, p<0.001), moderate agreement between NRS 2002 and GNRI (κ =.409, p<0.001), and moderate agreement between MNA-SF and GNRI (κ = .561, p<0.001) (Table 3).

It was found that GNRI had the highest sensitivity (93.7%) and NRS 2002 had the lowest sensitivity (66.7%). The specificity was the same for all three tools (88.9%) (Figure 1). According to AUC, the GNRI and MNA-SF had high diagnostic values and NRS 2002 had a moderate diagnostic value for diagnosing malnutrition preoperatively in elderly patients (Table 4).

DISCUSSION

Nutritional tools can aid healthcare professionals in assessing the nutritional status of patients. However, suitability and applicability of these tools is need to evaluate for specific populations. The nutritional health of older inpatients before surgery was assessed using NRS2002, MNA and GNRI in this study. The results of the current study showed the differences in nutritional risk detected by different screening tools.

The prevalence of malnutrition risk for the older patients before surgery ranged from 35.0% to 39.5%. According to the GNRI, MNA-SF and NRS-2002, 39.5%, 35.0%, and 35.0% of the patients were

Table 3. The Agreement Among NRS 2002, MNA-SF and GNRI

		NRS 2002	MNA-SF	GNRI
NRS 2002	κ		.668	.409
	p		.000	.000
MNA-SF	κ	.668		.561
	p	.000		.000
GNRI	κ	.409	.561	
	p	.000	.000	

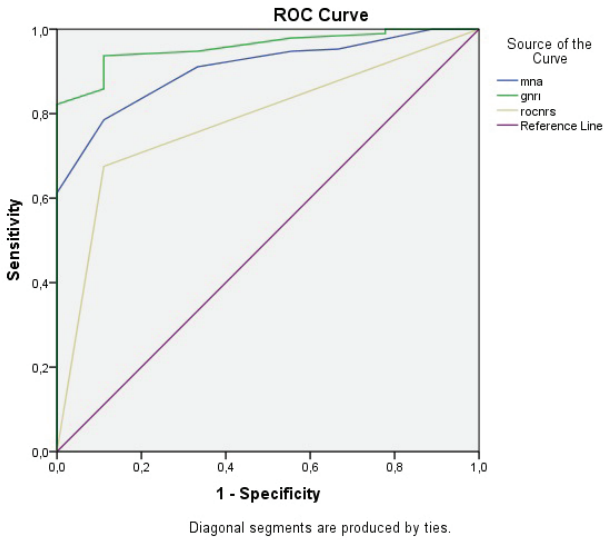
MNA-SF, Short Form of Mini Nutritional Assessment; NRS 2002, Nutritional Risk Screening 2002; GNRI, Geriatrics Nutritional Risk Index, **κ,** Kappa analysis

Table 4. Statistical Evaluation of Nutrition Screening Tools Compared with BMI

	NRS 2002	MNA-SF	GNRI
Sensitivity %	67.5	78.5	93.7
Specificity %	88.9	88.9	88.9
p value	.004	.000	.000
(AUC 95 %)	0.78 (0.650–0.914)	0.90 (0.839–0.973)	0.95 (0.921–0.994)
Cut-off value	2.5	10.5	93.5

AUC, area under the curve from ROC; MNA-SF, Short Form of Mini Nutritional Assessment
NRS 2002, Nutritional Risk Screening 2002; GNRI, Geriatrics Nutritional Risk Index

Figure 1. Receiver operating characteristics of predicted probabilities for nutritional risk incorporating the Mini Nutritional Assessment-Short Form (MNA-SF), Geriatric Nutritional Risk Index (GNRI), and Nutritional Risk Screening 2002 (NRS2002) tools.



malnourished, respectively. According to the MNA-SF tool, 6.5% (n:13) of the patients were malnourished. In a study conducted with 425 geriatric patients hospitalized in China, the risk of malnutrition was 40.9% with the NRS 2002 tool and 58.6% with the MNA-SF tool (3). In a study conducted with 284 geriatric patients hospitalized in Italy, 24.6% of the elderly were diagnosed with malnutrition and 28.2% of the patients were at high risk of malnutrition (4). It was found that 4.3% of the elderly patients who will undergo surgery in the USA are malnourished, and 18.2% of the patients have a risk of malnutrition (16). Our study showed that the rate of malnutrition risk seen in elderly patients who will undergo surgery is higher than the rate of malnutrition risk in Italy and USA. Food intake of elderly patients may be decreased due to reasons such as loss of appetite and low retired pay. Additionally, malnutrition is observed in patients due to the catabolism created by stress in the preoperative period (17). For these reasons, it is thought that the risk of malnutrition is higher in elderly patients who will undergo surgery.

In this study it was found that 58.5% of the elderly patients had oral and dental problems. There was found no significant relationship between the presence of oral and dental problems and the three tools' scores (p >. 05). In studies, a statistically significant difference was found between dental problems and malnutrition in the elderly (18,19). In systematic review, there was found an extensive interrelation between oral health and malnutrition; however, it remains unclear whether poor oral health increases the risk of being malnourished (20). Oral and dental problems of our patients may not have caused malnutrition.

We were found that 38.5% of the elderly had dysphagia. A weakly significant correlation was found between the patients' dysphagia and the nutritional status of the MNA-SF, NRS 2002, and GNRI tools (p < .001). Approximately 53.2% of patients with dysphagia have a risk of malnutrition, according to NRS 2002, and 55.8% of these patients have a risk of malnutrition according to GNRI. According to MNA-SF, 11.7% of patients with dysphagia are malnourished. A study conducted on 73 elderly people living in nursing homes found that 24.7% of the elderly had dysphagia and 85% of patients with dysphagia were at risk of malnutrition (21). Patients with dysphagia experience discomfort while eating, so their food intake is reduced, and leading to malnutrition. Therefore, the risk of malnutrition is high in our patients with swallowing difficulties who will undergo surgery.

In our research, 45% of the elderly patients had a loss of appetite. A moderately correlation was found between the loss of appetite and the nutritional status of the MNA-SF, NRS 2002, and GNRI tools (p < .001). In studies investigating the appetite status of the elderly, loss of appetite was found in 31-32.5% of the patients (22,23) and a correlation was found between the loss of appetite and malnutrition (23). A good appetite is necessary to maintain adequate food and nutrient intake. When there is a decrease

in the appetite of elderly patients, adequate and balanced nutrition will not be available and oral intake will decrease. For this reason, patients with loss of appetite may have a high risk of malnutrition.

It was found that there was good agreement between NRS 2002 and MNA-SF tools, moderate agreement between NRS 2002 and GNRI tools, and moderate agreement between MNA-SF and GNRI tools. In a study evaluating the agreement of MNA-SF and NRS 2002 in elderly patients, moderate agreement was found between these tools (3). In our study, ROC analysis was used to determine which of the three nutritional assessment tools was more effective with BMI values. The AUC values were 0.78 (0.650–0.914) for NRS 2002, 0.90 (0.839–0.973) for MNA-SF, and 0.95 (0.921–0.994) for GNRI. The AUC = 0.5 indicates that a tool has no diagnostic value, AUC = 0.5–0.7 indicates a tool has a low diagnostic value, AUC = 0.7–0.9 indicates that a tool has moderate diagnostic value, and AUC = 0.9–1 means that a tool has a high diagnostic value (24). In studies evaluating the nutritional status of elderly patients with MNA-SF and NRS 2002, these tools were moderate diagnostic value according to their AUC values (3,25). In another study in which MNA-SF and GNRI were compared in 134 hospitalized elderly patients, it was emphasized that both tools had a moderate diagnostic value in geriatric patients according to AUC values, but GNRI was simpler and more efficient (9). In our study, when the nutritional status of elderly patients was evaluated according to the AUC value, MNA-SF and GNRI had a high diagnostic value, and when the sensitivity of the scales was evaluated, the highest value belonged to the GNRI scale (93.7%). For this reason, the use of GNRI is appropriate in evaluating the preoperative nutritional status in elderly patients.

CONCLUSION

Our research found that the risk of malnutrition was between 35% and 39.5% in elderly patients in the preoperative period. There was a relationship between the loss of appetite and dysphagia of elderly patients and the risks of malnutrition. The GNRI tool was found more effective in diagnosing the preoperative nutritional status of elderly patients

It is recommended that patients aged 65 and over be should be evaluated in terms of nutritional deficiency when they are hospitalized for surgery, a detailed evaluation of the nutrition of patients with loss of appetite and swallowing difficulties.

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