

Determination of the malnutrition risk in overweight and obese patients with cardiovascular disease

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ABSTRACT

Objective: This study was performed to determine the risk of malnutrition in overweight and obese individuals with cardiovascular disease.

Methods: We enrolled 238 patients who were undergoing treatment at the hospital. The demographic characteristics and health status of the patients were recorded, and their anthropometric parameters were measured. The Nutritional Risk Screening-2002 and Mini Nutritional Assessment-Short Form were used to determine the patients' risk of malnutrition.

Results: As per Nutritional Risk Screening-2002, 39.95% of the subjects were at risk of malnutrition. According to the Mini Nutritional Assessment-Short Form evaluation, 42.4% of the patients were at risk of malnutrition, and 7.1% of them were malnourished. As per Nutritional Risk Screening-2002, 18.8% of the overweight patients and 21.1% of the obese patients were at risk, and as per the Mini Nutritional Assessment-Short Form, 20.6% of the overweight patients and 21.8% of the obese patients ($p > 0.05$) were at risk of malnutrition. As per the Mini Nutritional Assessment-Short Form, 2.5% of the overweight patients and 4.6% of the obese patients had malnutrition ($p > 0.05$). There was a significant and poor consistence between the two screening tools ($\kappa = 0.308$).

Conclusion: About 40% of the overweight and obese patients were found to be at risk of malnutrition; this demonstrates the importance of nutrition screening in this patient group. We recommend that nutrition screening be performed by dieticians using appropriate screening tools for all patients undergoing treatment in the clinics.

Keywords: Malnutrition, nutrition, screening, obese

Introduction

The prevalence of overweight and obesity is increasing rapidly across the world, and excess weight is considered one of the most important global public health problems. Obesity, a preventable cause of death, is reported as an important risk factor for various diseases, especially cardiovascular diseases (1, 2). Moreover, obesity reportedly has a negative effect on the nutritional status of individuals, and overnutrition may be accompanied by malnutrition in these patients (2, 3). The European Society of Clinical Nutrition and Metabolism (ESPEN) classifies overweight and obesity as nutrition disorders; however, routine nutrition screening is not performed in clinics because these patients are not considered to be at risk of malnutrition (3, 4).

It is recommended that nutrition screening be performed using appropriate screening tools for all individuals who

consult health institutions in order to determine their risk of malnutrition. Although many screening tools exist for determining the risk of nutrition, the ESPEN guidelines recommend the use of Nutrition Risk Screening-2002 (NRS-2002) for hospitalized patients, Malnutrition Universal Screening Tool (MUST) for adults, and the long or short form of the Mini Nutritional Assessment (MNA) for the elderly (3, 5).

Thus far, few studies have determined the risk of malnutrition in overweight and obese patients. The present study was designed to assess the risk of malnutrition in overweight and obese patients with cardiovascular disease by using two different screening tools. The risk of developing cardiovascular disease is high for obese individuals; thus, our study population comprised patients with cardiovascular disease. NRS-2002 and MNA-SF were selected as screening tools because the enrolled patients were hos-

pitalized, and most of the subjects belonged to an older age group (>65 ages).

Methods

Study plan

This cross-sectional, descriptive study was performed at the Erciyes University Faculty of Medicine Yılmaz-Mehmet Öztaşkın Heart and Vascular Hospital from October 2018 to March 2019. The study population included patients aged ≥ 18 y with a body mass index (BMI) of ≥ 25 kg/m² who were undergoing treatment following a diagnosis of cardiovascular diseases. Patients who were in the terminal period and had difficulty in communicating because of dementia and other reasons were excluded. The minimum number of patients that were to be included in the study was determined as 235, with the expectation that malnutrition would be observed in 50% of the obese and overweight individuals at an accuracy rate of 5% and confidence interval of 95% ($\alpha=0.05$, $N=600$) (6); the study was completed with 238 patients.

The work permit and ethics committee approval were obtained from the Erciyes University Faculty of Medicine Hospitals (21.11.2018 date and decision no. 2018/599) before initiating the study. Furthermore, all the study subjects were informed about the study, and their written and verbal consents were received.

Data collection

Data regarding the patients' demographic characteristics and health status were obtained using the questionnaire prepared by the researchers. The patients' body weight,

height, waist circumference, and hip circumference were measured by the researchers using standard methods. Based on the weight and height measurement values, the BMI [weight (kg)/height (m)²] values were calculated. The World Health Organization (WHO) Adult Classification was used to classify the subjects as per their BMI, waist circumference, and waist-hip ratio. Thus, those with a BMI value of 30.0–34.9 kg/m² were classified as 1st degree obese, those with a value of 35.0–39.9 kg/m² were classified as 2nd degree obese, and those with a value of ≥ 40.0 kg/m² were classified as 3rd degree obese. Waist circumference can be used as a descriptor for the risk of developing obesity-related chronic diseases; women with a waist circumference value between 80 cm and 88 cm were considered to be at risk and those with values > 88 cm were considered to be at high risk; men with a waist circumference value of 94–102 cm were considered to be at risk, while those with values > 102 cm were considered to be at high risk. The waist/hip ratio was calculated using waist circumference and hip circumference measurements; in women, a ratio > 0.85 and in men, a ratio > 0.90 was considered to indicate high risk for chronic diseases (7).

The NRS-2002 and MNA-SF forms were used to screen the nutritional status of the patients. NRS-2002 form is a screening tool that consists of two parts and scores the deterioration in the nutritional status of patients and the severity of diseases. Information about the BMI values of patients, weight loss in the previous 3 mon, decrease in food intake in the previous week, and disease severity is collected in the first part of the form. The second part of the form is administered to patients who had answered yes to any of the questions in the first part. In the second part, the patients are evaluated in terms of nutritional deficiency and disease severity; if the patient is ≥ 70 y, the total score is determined by adding 1 point to the total score. Patients with a total score of ≥ 3 are considered to be at risk of malnutrition (8).

In the MNA-SF form, patients are asked 6 questions. Decrease in food intake, weight loss during the previous 3 mon, activity status, psychological stress, acute illness complaints, neuropsychological problems, and BMI values are examined. Based on the score obtained from the scale, 0–7 points indicate malnutrition, 8–11 points indicate risk of malnutrition, and 12–14 points indicate normal nutritional status (9).

Statistical analyses

The data were analyzed using IBM Statistical Package for Social Sciences (IBM SPSS Corp.; Armonk, NY, USA) Windows 22.0. Frequency and percentage values of

Main Points

- In our study, we evaluated the nutritional status of overweight and obese patients.
- As per NRS-2002, 18.8% of the overweight patients and 21.1% of the obese patients were at risk of malnutrition.
- As per the MNA-SF, 20.6% of overweight patients and 21.8% of obese patients were at risk of malnutrition.
- As per the MNA-SF form, 2.45% of the overweight patients and 4.6% of the obese patients had malnutrition.
- When the NRS-2002 form was considered as a reference, the sensitivity and selectivity of the MNA-SF form were 80.6% and 60.1%, respectively. Further, there was significant and poor consistence between the two scales ($\kappa=0.308$).
- Nutrition screening is recommended for all hospitalized patients by expert dieticians using appropriate screening tools; thereafter, the required nutritional interventions should be implemented in patients who are identified as being at risk of malnutrition.

descriptive statistics were interpreted using mean and standard deviation values. The normality of the data was tested using the Shapiro-Wilk test. Independent sample t-test was used for comparing the averages values of the normal variables, and the Mann-Whitney U test was used to compare the averages of non-normal parameters. Chi-square test was used for the categorical data. Spearman's correlation test was used for examining the relationships between variables, and the compatibility between the scales was determined using Kohen's Kappa analysis; $p < 0.05$ was considered to indicate statistical significance.

Results

The study was performed on 238 patients, including 117 men and 121 women. The average patient age was 65.02 ± 12.18 y.

Table 1 includes the average anthropometric measurements of the patients and their distribution according as per sex. There was a significant difference in the average anthropometric measurements and anthropometric characteristics distribution of male and female patients ($p < 0.05$).

The mean NRS-2002 score of the patients was 2.40 ± 1.03 , and 39.9% of those who were administered the second part of the form were at risk of malnutrition. As per the MNA-SF evaluation, 42.4% of the patients were at risk of malnutrition and 7.1% were malnourished (Table 2).

As per the NRS-2002, 18.8% of the overweight patients and 21.1% of the obese patients were at risk of malnutrition. As per the MNA-SF, 20.6% of the overweight patients and 21.8% of the obese patients were at risk ($p > 0.05$). As per the MNA-SF form, 2.5% of the overweight patients

Table 1. The mean anthropometric measurements of the patients and the distribution as per the anthropometric characteristics				
Anthropometric Measurements	Male	Female	Total	p
Body Weight (kg)	88.0±12.5	84.4±14.4	86.18±13.60	0.030*
Height (cm)	170.5±5.7	156.8±7.2	163.56±9.51	0.000*
BMI (kg/m ²)	30.2±4.3	34.2±5.9	32.30±5.57	0.000*
Waist Circumference (cm)	109.5±10.1	114.9±12.2	112.31±11.58	0.001*
Hip Circumference (cm)	105.0±13.1	115.2±16.5	110.24±15.81	0.000*
Waist-to-Hip Ratio	1.02±0.05	0.98±0.08	1.00±0.07	0.000*
BMI				
Overweight	70 (29.4v)	30 (12.6%)	100 (42.0%)	0.000*
1 st degree obese	30 (12.6%)	42 (17.6%)	72 (30.3%)	
2 nd degree obese	13 (5.5%)	31 (13.0%)	44 (18.5%)	
3 rd degree obese	4 (1.7%)	18 (7.6%)	22 (9.2%)	
Waist Circumference	n = 99**	n = 102**	n = 201**	0.000*
Low risk	3 (1.5%)	0	3 (1.5%)	
Normal	16 (8.0%)	1 (0.5%)	17 (8.5%)	
High risk	80 (39.8%)	101 (50.2%)	181 (90.0%)	
Waist-to-Hip Ratio				
Low risk	2 (1.0%)	2 (1.0%)	4 (2.0%)	0.026*
Normal	24 (12.0%)	10 (5.0%)	34 (17.0%)	
High risk	73 (36.5%)	89 (44.5%)	162 (81.0%)	
* $p < 0.05$				
** Waist and hip circumference measurements could not be performed on every patient.				
BMI: Body Mass Index				

Table 2. Comparison of NRS-2002 and MNA-SF scores according to gender

NRS-2002 (n = 128*)	Score	Male	Female	Total	p
NRS-2002 (Pre-assessment)	Yes	65 (27.8%)	63 (26.5%)	128 (53.8%)	0.605
	No	52 (21.8%)	58 (24.4%)	110 (46.2%)	
Total Score		2.35±0.98	2.46±1.09	2.40±1.03	0.757
Risk of malnutrition	≥ 3	27 (21.1%)	24 (18.8%)	51 (39.9%)	0.920
No Risk	< 3	38 (29.6%)	39 (30.4%)	77 (60.1%)	
MNA-SF	Score	Male	Female	Total	p
Total Score		11.38±2.41	11.14±2.46	11.26±2.43	0.412
Normal nutritional status	12-14	61 (25.6%)	59 (24.8%)	120 (50.4%)	0.873
Risk of malnutrition	8-11	48 (20.2%)	53 (22.3%)	101 (42.4%)	
Malnutrition	0-7	8 (3.4%)	9 (3.8%)	17 (7.1%)	

* The patients who were not administered the second part of the NRS-2002 form were not evaluated for malnutrition risk.
NRS-2002: Nutritional Risk Screening-2002
MNA-SF: Mini Nutritional Assessment- Short Form

Table 3. Comparison of the results of the NRS-2002 and MNA-SF as per the BMI classification

NRS-2002 (n = 128*)	Score	Overweight	Obese	Total	p
Pre-assessment	Yes	61 (25.6%)	67 (28.2%)	128 (53.8%)	0.066
	No	39 (16.4%)	71 (29.8%)	110 (46.2%)	
Risk of malnutrition	≥ 3	24 (18.8%)	27 (21.1%)	51 (39.9%)	0.396
No risk	< 3	37 (28.9%)	40 (31.2%)	77 (60.1%)	
MNA-SF	Score	Overweight	Obese	Total	p
Normal nutritional status	12-14	45 (18.9%)	75 (31.5%)	120 (50.4%)	0.215
Risk of malnutrition	8-11	49 (20.6%)	52 (21.8%)	101 (42.4%)	
Malnutrition	0-7	6 (2.5%)	11 (4.6%)	17 (7.1%)	

* The patients who were not administered the second part of the NRS-2002 form were not evaluated for malnutrition risk.
NRS-2002: Nutritional Risk Screening-2002
MNA-SF: Mini Nutritional Assessment- Short Form

and 4.6% of the obese patients had malnutrition ($p>0.05$) (Table 3).

In Table 4, the correlation between MNA-SF and NRS-2002 scores and anthropometric measurements of patients has been presented. A positive significant relationship was observed between the NRS-2002 score and waist circumference and waist/hip ratio in female patients, and waist/hip ratio in the total study population ($p<0.05$).

When the NRS-2002 was considered as a reference, the sensitivity and selectivity of the MNA-SF form were 86% and 60.1%, respectively. There was significant and poor

consistence between the two scales ($\kappa=0.308$) (Table 5).

Discussion

Overweight and obesity pose a high risk for various chronic diseases and may cause malnutrition via deterioration of nutritional status (2, 10). Malnutrition should also be examined in terms of overweight and obesity due to overnutrition (11). Therefore, it is important to perform nutritional status screening of overweight and obese hospitalized patients using appropriate screening tools (12).

Table 4. Correlation of the NRS-2002 and MNA-SF scores with anthropometric measurements

Anthropometric Measurements		Male		Female		Total	
		MNA-SF	NRS	MNA-SF	NRS	MNA-SF	NRS
Body Weight	r	0.047	-0.096	0.107	0.079	0.079	0.000
	p	0.614	0.442	0.245	0.533	0.222	0.998
Body Mass Index	r	0.071	-0.066	0.084	0.126	0.050	0.016
	p	0.449	0.596	0.358	0.317	0.445	0.856
Waist Circumference	r	0.000	0.041	0.052	0.299	0.042	0.179
	p	1.000	0.760	0.604	0.031*	0.554	0.061
Hip Circumference	r	0.096	-0.124	-0.081	0.189	0.021	0.026
	p	0.343	0.354	0.417	0.175	0.766	0.783
Waist-to-Hip Ratio	r	-0.113	0.210	0.176	0.345	0.035	0.206
	p	0.267	0.113	0.077	0.012*	0.619	0.031*

*p < 0.05

NRS-2002: Nutritional Risk Screening-2002

MNA-SF: Mini Nutritional Assessment- Short Form

Table 5. The consistence of MNA-SF with NRS-2002

	Sensitivity (%)	Selectivity (%)	Positive prediction value (%)	Negative prediction value (%)	Kappa
MNA-SF	86	60.1	34.6	94.2	0.308

NRS-2002: Nutritional Risk Screening-2002

MNA-SF: Mini Nutritional Assessment- Short Form

In a relevant study, the nutritional status of overweight and obese patients who were newly hospitalized was screened using the NRS-2002; 23.2% of the overweight patients and 24.8% of the obese patients were at risk of malnutrition (13). Another study that used the MNA for screening overweight and obese oncology patients showed that 50% of them were at risk of malnutrition and 12% were malnourished (4). In our study, we used two different screening tools were employed to screen the nutritional status of overweight and obese patients. As per the NRS-2002, 18.8% of overweight patients and 21.1% of obese patients were at risk of malnutrition. As per the MNA-SF, the risk of malnutrition was 20.6% in overweight patients and 21.8% in obese patients. Based on the MNA-SF form, 2.5% of the overweight patients and 4.6% of the obese patients were malnourished ($p > 0.05$) (Table 3). Our findings are consistent with previous reports (4, 13), and the indicated ratios show the importance of nutritional status screening in overweight and obese patients.

In the present study, we examined the correlation between the NRS-2002 and MNA-SF scores and the anthropometric measurements of the patients.

The NRS-2002 score increased with an increase in the waist circumference and waist/hip ratio in female patients; the waist/hip ratio was positively related to the NRS-2002 score in all the patients ($p < 0.05$). This result is attributed to the high-energy but low-quality diet consumed by the patients. To our knowledge, no previous study has assessed the correlation between these scores and anthropometric measurements.

In our study, NRS-2002, recommended for use in hospitalized patients, and MNA-SF forms, recommended for use in elderly by the ESPEN guidelines, were used for nutritional status screening of the patients (3, 5). The evaluation showed that 39.9% of the patients were at risk of malnutrition as per the NRS-2002 form; as per the MNA-SF form, 42.4% of the patients were at risk of malnutrition and 7.1% were malnourished. Mobility and the presence of neuropsychological problems, as assessed using the MNA-SF form could change with age; therefore, it was considered that the malnutrition ratio obtained using this scale was high-

er (average age 65.02 ± 12.18 y). When the NRS-2002 form was considered as a reference, the sensitivity and selectivity of the MNA-SF form were 80.6% and 60.1%, respectively; further, there was significant and poor consistence between the two scales ($\kappa=0.308$). In a study on elderly patients who had undergone surgery for hip fracture, both, NRS-2002 and MNA-SF form were sufficient for evaluating the parameters of malnutrition; however, the MNA-SF form was more effective for mortality prediction (14). In another study, it was emphasized that the MNA-SF form was a useful tool for assessing the nutritional status of elderly hospitalized patients (15). Raslan et al. (16) reported that NRS-2002 and MNA-SF forms obtained similar results in terms of determination of the nutritional status in elderly patients. Considering previous findings and our results, the MNA-SF form in addition to NRS-2002 appears useful for nutritional status screening of hospitalized elderly patients.

Our results highlight the importance of screening for the risk of malnutrition in overweight and obese patients. Thus, nutrition screening should be performed for all hospitalized patients by expert dieticians using appropriate screening tools, and the required nutritional interventions should be administered in patients who are identified as being at risk of malnutrition.

Study limitations

The study population only included overweight and obese patients with cardiovascular diseases. In future studies, the results of general population can be obtained by evaluating all overweight and obese patients.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Erciyes University (Date: 21.11.2018, Decision No: 2018/599).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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