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Comparison of Geriatric Nutrition Risk Index and Mini Nutrition Assessment-short Form in Nutritional Assessment of Older Outpatients

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Abstract

Objective: The risk of malnutrition is higher in older patients. Malnutrition in older patients causes increased mortality rates and increased risk of infection and hospitalization. Therefore, in older patients, high-risk individuals for malnutrition should be identified and appropriate interventions for malnutrition should be made early. In this study, we aimed to compare mini nutritional assessment-short form (MNA-SF) and geriatric nutrition risk index (GNRI) screening tests in detecting malnutrition in older outpatients.

Materials and Methods: The study was conducted in a geriatric outpatient clinic. This study was conducted between January 2020 and June 2020. The study was cross-sectional. One hundred and seventy-three patients were aged 60 years and over.

Results: The median age of the whole group was 75 (71-81) interquartile range (IQR) years, and 108 (62%) of them were female. The median MNA-SF score for the whole group was 12 (11-14) IQR, and for GNRI this was 104.2 (101.2-107.2) IQR. In the receiver operating curve analysis, 103.5 points were determined as the cut-off point of GNRI. GNRI had lower specificity [specificity: 95% confidence interval (CI), 66.67 (58.8-73.9)], but optimal sensitivity [sensitivity: 95% CI, 100 (76.8-100)] compared with MNA-SF.

Conclusion: A new cut-off value of 103.5 with higher sensitivity but lower specificity than the original cut-off value is recommended when using the GNRI in the assessment of the nutritional status of older outpatients.

Keywords: Mini nutritional assessment-short form, geriatric nutritional risk index, older, outpatients, nutritional status

Introduction

The risk of malnutrition is higher in older patients. There are many reasons for this. Difficulty eating, dysphagia, decreased mobility, decreased appetite, psychological stress, difficulty in accessing healthcare, and poor oral health are some of these reasons (1-4). Malnutrition in older patients causes increased mortality rates and increased risk of infection and hospitalizations (5). Therefore, in older patients, high-risk individuals for malnutrition should be identified and appropriate interventions for malnutrition should be made early (6). Various tests are available to evaluate the nutritional status of older people (7). Mini nutrition assessment-short form (MNA-SF) is a test that can be used in nutritional screening of older patients. The geriatric nutrition risk index (GNRI) is also used to detect nutritional status in older patients. MNA-SF was developed in 2001 (8). It is a test that can be easily performed. The MNA-SF was revised in 2009. A malnutrition cut-off point was determined. Based on this cut-off point, older patients can be diagnosed with malnutrition, risk of malnutrition, or normal nutrition (9). GNRI, a prognostic index for nutritional status-related complications, is recommended for the evaluation of the nutritional status of older patients (10). GNRI is an easily applied test used to determine nutritional status and is associated with increased mortality among older patients in both acute and long-term care settings (10-13).

MNA-SF is generally used for malnutrition screening in older outpatients. However, the patient must also actively participate in this test and answer the questions. In addition,

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body mass index (BMI) or calf circumference measurements are required to perform this test. Because dementia, vision, and hearing problems are common in older patients, they sometimes have difficulty participating in this test. Furthermore, because BMI is high in older obese patients, malnutrition assessed by MNA-SF may be missed. Therefore, GNRI may be more appropriate than MNA-SF in older outpatients (14). Assessment of nutritional status using GNRI in older outpatients has not been previously reported in Turkey. In this study, we compared MNA-SF and GNRI in detecting malnutrition in older outpatients.

Materials and Methods

Participants

We conducted the study in a geriatric outpatient clinic. The study was conducted between January 2020 and June 2020. During this period, patients who applied to the outpatient clinic were included in the study. Patients with acute illness, delirium, malignancy, rheumatological disease, and active infection were excluded. The study was cross-sectional. One hundred and seventy-three patients were aged 60 years and over.

The ethical approval was taken from Gazi University Non-Interventional Research Ethics Committee (decision number: 150, date: 10.02.2020). Informed consent was provided by the patient after providing verbal and written information about the study.

Data Collection

Within the scope of comprehensive geriatric assessment, Katz activities of daily living (ADL) and Lawton-Brody instrumental ADL tests were applied for functionality evaluation (15,16). The mini-mental state examination was used to assess cognitive status (17). The Yesavage geriatric depression scale was used for mood evaluation (18). Patients' age, gender, past medical history, and drugs were recorded.

Nutritional Assessment

We obtained data from the medical records, and the GNRI score was obtained as follows: GNRI=[1.489 × albumin (g/L)] + [41.7 × [weight/ideal body weight according to the Lorentz formula (WLo)]. WLo was calculated using the Lorentz equation: male = height -100 – [(height -150)/4]; female = height -100 – [(height -150)/2.5]. If the "weight/WLo" ratio is equal to or greater than 1, the ratio is considered as 1. Nutritional status according to GNRI was determined as follows: GNRI score <82: severe risk of malnutrition, GNRI score: 82-92: moderate risk of malnutrition, GNRI score: 92-98: low risk of malnutrition, GNRI >98 score: no risk for malnutrition (19). MNA-SF was routinely completed in all patients. Scoring in this test is as follows: score ≤7: malnutrition, score: 8-11: risk for malnutrition, score: 12-14: normal nutrition (20).

Statistics

Frequency (%) for categorical variables, mean ± standard deviation for normally distributed variables, and median [interquartile range (IQR)] for non-normally distributed variables were used. For correlation analysis, Pearson or Spearman correlation coefficient tests were used. The receiver operating curve (ROC) test was used to determine the GNRI cut-off point. SPSS software (version 21.0) was used for statistical analyses. $p<0.05$ indicates that it is statistically significant.

Results

Total 213 patients were assessed. Forty patients were excluded because they had active infection, and statistical analyses were performed for 173 patients. The median age of the whole group was 75 years (71-81) IQR, and 108 (62%) of them were female. The median MNA-SF score of the whole group was 12 (11-14) IQR, and for GNRI this was 104.2 (101.2-107.2) IQR. The median C-reactive protein value was 4 mg/L (2-7) IQR. The characteristics of the participants are given in Table 1. When MNA-SF was used, 14 (8%) patients were malnourished. According to the

Table 1. Characteristics of the study participants

Variables	Study participants (n=173)
Sex (%)	
Female	108 (62%)
Male	65 (38%)
Age (IQR)	75 (71-81)
Laboratory values	
Albumin (g/L) (IQR)	43 (41-44)
CRP (mg/L) (IQR)	4 (2-7)
Anthropometric measurements	
Height (cm) (IQR)	160 (153-168)
Weight (kg) ± SD	70.9±13.5
BMI (kg/m²) (IQR)	27.1 (24.3-30.6)
Comprehensive geriatric assessment	
Katz ADL score (IQR)	6 (5-6)
Lawton and Brody scale (IQR)	8 (5-8)
MMSE (IQR)	28 (24-29)
GDS (IQR)	2 (0-5)
Nutritional screening	
MNA-SF score (IQR)	12 (11-14)
GNRI score (IQR)	104.2 (101.2-107.2)
Comorbidities	
Diabetes mellitus	74 (43%)
Hypertension	135 (78%)
Coronary artery disease	65 (38%)
COPD	37 (21%)
Dementia	18 (10%)

n: Number, IQR: Interquartile range, CRP: C-reactive protein, SD: Standard deviation, BMI: Body mass index, ADL: Activities of daily living, MMSE: Mini-mental state examination, GDS: Geriatric depression scale, GNRI: Geriatric nutritional risk index, MNA-SF: Mini nutritional assessment-short form, COPD: Chronic obstructive pulmonary disease

GNRI, 3 (2%) patients were at high risk of malnutrition. Nutritional information of the patients is given in Table 2.

Correlation analysis revealed that GNRI had a moderate correlation with MNA-SF scores (r=0.282, p<0.001). BMI did not correlate with GNRI or MNA-SF (r=0.069 and r=0.129, p=0.367 and p=0.091). Moderate agreement was found between GNRI and MNA-SF after categorization according to the newly defined cut-off value (kappa value =0.250). The results are presented in Table 3. According to the ROC curve test, the cut-off point of GNRI was 103.5 (Figure 1). Compared with MNA-SF, GNRI had lower specificity, lower positive predictive value (PPV), higher sensitivity and higher negative predictive value (NPV) (Table 4).

Discussion

In this study, we found that the population malnutrition cut-off point for GNRI was 103.5. Correlation and kappa analyses revealed that GNRI had moderate correlation and agreement with MNA-SF. GNRI had lower specificity, but higher sensitivity, and lower PPV than MNA-SF. For diagnostic purposes, it is important for the tool to be specific, whereas for screening, the tools should be sensitive (21). In this study, GNRI has high sensitivity, making it suitable for screening; but lower specificity, making it unsuitable for diagnostic purposes. As the sensitivity of the nutritional status screening tool increases, the probability of missing malnourished patient decreases. However, this increases the false positive rate in diagnosing malnutrition and can lead to overnutrition interventions (22). GNRI had lower PPV but higher NPV in our study. This suggests that patients may be mistakenly classified as malnourished, but it is unlikely that those who are identified as well nourished are misclassified. There are studies in the literature comparing GNRI with other screening tools in hospitalized and older outpatient patients. In 2019, Abd Aziz et al. (23) studied hospitalized older patients. There were 134 patients, and GNRI and MNA were compared with the subjective global assessment. In this study, the sensitivity of GNRI was 0.622, specificity was 0.977, PPV was 0.982, and NPV was 0.558. The sensitivity of MNA-SF was determined as 0.611, specificity as 0.909, PPV as 0.932, and NPV as 0.533. The cut-off point of GNRI for detecting malnutrition was 94.95. In 2015, Baek and Heo (24) studied hospitalized older patients. There were 141 patients in the study, and the following screening tools were used to determine nutritional status: malnutrition universal screening tool, nutritional risk screening 2002, MNA, MNA-SF, and GNRI. In this study, GNRI had high sensitivity (95.2%) but lower specificity (67.1%). Saghafi-Asl et al. (14) studied GNRI in non-hospitalized older patients. In that study, 164 patients were included and GNRI was compared with MNA-SF and mini nutritional assessment-

Table 2. Nutritional assessment of patients according to MNA-SF and GNRI

Nutritional status assessed by MNA-SF		
Normal nutrition (%)	**At risk of malnutrition (%)**	**Malnourished (%)**
104 (60%)	55 (32%)	14 (8%)
Nutritional status assessed by the GNRI		
Normal nutrition (%)	**Moderate or low risk of malnutrition (%)**	**High risk of malnutrition (%)**
158 (91%)	12 (7%)	3 (2%)

MNA-SF: Mini nutritional assessment-short form, GNRI: Geriatric nutritional risk index

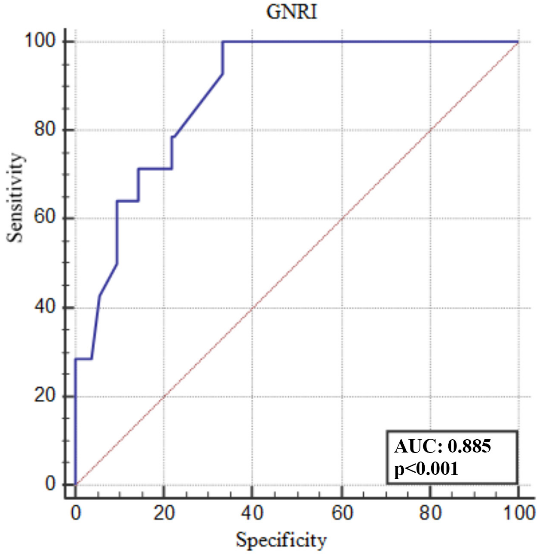

Figure 1. Receiver operating curve analysis examining the cut-off value of GNRI. (AUC: 0.885 cut-off: 103.5 p<0.001 sensitivity: 100% specifity: 66.67% Youden Index J: 0.6667)

GNRI: Geriatric nutritional risk index, AUC: Area under the curve

Table 3. Correlation and kappa test results for GNRI and MNA-SF

Correlation analysis results		
	r	**p**
GNRI, MNA-SF	0.282	<0.001
GNRI, BMI	0.069	0.367
MNA-SF, BMI	0.129	0.091
Kappa test analysis result		
	Kappa value	**p**
GNRI, MNA-SF	0.250	<0.001

GNRI: Geriatric nutritional risk index, MNA-SF: Mini nutritional assessment-short form, BMI: Body mass index

Table 4. Sensitivity, specificity, PPV, and NPV results

Sensitivity (95% CI)	100 (76.8-100)
Specificity (95% CI)	66.67 (58.8-73.9)
PPV (95% CI)	20.9 (17.5-24.8)
NPV (95% CI)	100

PPV: Positive predictive value, NPV: Negative predictive value, CI: Confidence interval long form. Lower sensitivity but optimal specificity of GNRI were found compared with both MNA results. Lower NPV but higher PPV were found with GNRI compared with both MNA results. The agreement between the GNRI and MNA scores was moderate. The malnutrition cut-off value for the GNRI was 110.33 in that study. Malnutrition is known to cause many adverse outcomes, especially in older people; therefore, it is important to identify malnourished older patients. MNA-SF is widely used for malnutrition screening in geriatric outpatient clinics in Turkey. To calculate MNA-SF, it is necessary to be in contact with the patient and wait for patients to answer the questions; however, older patients may have hearing and speech problems. Moreover, communication with patients with advanced dementia may not be possible. In addition, MNA-SF includes parameters such as BMI and calf diameter, which may have high values in obese patients. Therefore, the risk of malnutrition in obese patients can be ignored. Therefore, GNRI can be considered as an alternative tool to MNA-SF in older outpatients. According to our results, if GNRI is used in the evaluation of nutritional status in older outpatients, the cut-off value is 103.5.

Study Limitations

This study has some limitations. First, GNRI was only compared with MNA-SF. Studies including other screening methods can be conducted. Second, it is cross-sectional; therefore, nutritional outcomes are unknown. Third, the study was a single-center study. Multicenter studies can be conducted to generalize the results.

Conclusion

In conclusion, the agreement between MNA-SF and GNRI was moderate. Compared with MNA-SF, GNRI had lower specificity but higher sensitivity. Therefore, it may be suitable for malnutrition screening in non-hospitalized older patients. A new cut-off value of 103.5 with higher sensitivity but lower specificity than the original cut-off value is recommended when using the GNRI in the assessment of the nutritional status of older outpatients.

Ethics

Ethics Committee Approval: The ethical approval was taken from Gazi University Non-Interventional Research Ethics Committee (approval number: 150, date: 10.02.2020).

Informed Consent: Informed consent was provided by the patient after providing verbal and written information about the study.

Authorship Contributions

Surgical and Medical Practices: İ.İ., Ç.Ç., Concept: İ.İ., B.G., Design: Ç.Ç., B.C., Data Collection or Processing: İ.İ., B.C., Analysis or Interpretation: Ç.Ç., B.G., Literature Search: İ.İ., B.C., Writing: İ.İ., B.G.

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