Acta Medica Alanya

RESEARCH ARTICLE

ARAŞTIRMA MAKALESI

Acta Medica Alanya

2024;8(2): 143-148

DOI: 10.30565/medalanya.1491463

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

Ezgi Toptaş Bıyıklı[1], Ali Emrah Bıyıklı[1]*

1.Faculty of Health Sciences, Department of Nutrition and Dietetics,Alanya Alaaddin Keykubat University, Antalya, Türkiye

ABSTRACT

Aim: This study aimed to evaluate the nutritional status of hospitalized patients according to Nutritional Risk Screening-2002 (NRS-2002) and to examine the effects of various variables on nutritional status.

Methods: The sample of the cross-sectional study consisted of 469 inpatients reached by simple random sampling method. Data was collected from hospitalized patients with a survey form using face-to-face interview method between January and March 2024. Personal information and hospital stay characteristics form, NRS-2002 form was used in the survey used to collect data.

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. 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. No statistically significant difference was found between patients' malnutrition risk and gender, education level, hospital diets, hospital clinics ($p>0.05$). However, a statistically significant difference was found between the malnutrition risk of the patients and their age, body mass index (BMI) and length of hospital stay ($p<0.05$).

Conclusion: Nutrition screening tools should be applied more frequently to these patients, especially since the risk of malnutrition is higher in patients who are elderly, have a long hospital stay, and have a low BMI.

Keywords: Malnutrition, Nutritional status, Nutritional Risk Screening

ÖZ

Amaç: Bu çalışmada, hastanede yatan hastaların beslenme durumlarının Nütrisyonel Risk Taraması-2002 (NRS-2002)'ye göre değerlendirilmesi ve çeşitli değişkenlerin beslenme durumu üzerindeki etkilerinin incelenmesi amaçlandı.

Yöntem: Kesitsel tipte yapılan araştırmanın örneklemini basit tesadüfi örnekleme yöntemiyle ulaşılan 469 yatan hasta oluşturmuştur. Veriler, Ocak-Mart 2024 tarihleri arasında hastanede yatan hastalardan yüz yüze görüşme yöntemi kullanılarak anket ile toplandı. Verilerin toplanmasında kullanılan ankette kişisel bilgilervehastanede kalış özellikleri formu, NRS-2002 formu kullanıldı.

Bulgular: Çalışmaya alınan hastaların yaş ortalaması 59,8±18,1 yıl olarak 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 olarak sınıflandırıldı. Hastaların malnütrisyon riski ile cinsiyet, eğitim düzeyi, hastane diyeti ve hastane klinikleri arasında istatistiksel olarak anlamlı bir farklılık bulunamadı ($p>0,05$). Ancak hastaların malnütrisyon riski ile yaş, beden kütle indeksi (BKİ) ve hastanede kalış süresi arasında istatistiksel olarak anlamlı bir farklılık bulundu ($p<0,05$).

Sonuç: Özellikle yaşlı, hastanede yatış süresi uzun ve BKİ düşük olan hastaların malnütrisyon riskinin daha yüksek olması nedeniyle bu hastalara beslenme tarama araçlarının daha sık uygulanması gerekmektedir.

Anahtar Sözcükler: Malnütrisyon, Beslenme durumu, Nütrisyonel Risk Taraması

RECEIVED: 28.05.2024 ACCEPTED: 04.07.2024 PUBLISHED (ONLINE): 30.08.2024

*Corresponding Author: Ali Emrah BIYIKLI, PhD, Alanya Alaaddin Keykubat University, Faculty of Health Sciences, Department of Nutrition and Dietetics, Antalya, Türkiye. Phone: +90 505 914 64 08 / mail: emrah.biyikli@alanya.edu.tr,

ORCID: 0000-0003-2254-2348

To cited: Toptaş Bıyıklı E, Bıyıklı AE. Evaluation of nutritional status (Nutritional Risk Screening-2002) of hospitalized inpatients and comparison with various variables. Acta Med. Alanya 2024;8(2): 143-148 doi: 10.30565/medalanya.1491463

Introduction

One 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 ≥ 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 (α=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/m² using the formula body weight (kg)/height (m²) 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, Il, USA) was used. Frequencies, percentages (%), mean, standard deviation (± 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 salt-free diet (26.3%, 22.0% and 14.9%, respectively). The average hospital stay of the patients was 10.7±5.2 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)
Hospital diets, n (%)	Clear liquid diet (regimen1)	45 (9,6)
	Full liquid diet (regimen 2)	59 (12,6)
	Normal diet (regimen 3)	123 (26,3)
	Salt-free diet	70 (14,9)
	Diabetic diet	103 (22,0)
	Other diets	69 (14,8)
Hospital clinics, n (%)	General surgery	80 (17,0)
	Orthopedy	53 (11,3)
	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±10.84 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 (n = 469).

		No risk of malnutrition (n=410)	Risk of malnutrition (n=59)	p-value
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**
Education level, n (%)	Literate	61 (82,4)	13 (17,6)	0,066*
	Primary education	221 (85,7)	37 (14,3)	
	High school	86 (94,5)	5 (5,5)	
	University	42 (91,3)	4 (8,7)	
BMI, (kg/m2)mean±SD		27,32±5,31	22,46±5,36	<0,001**
Hospital diets, n (%)	Clear liquid diet (regimen1)	38(84,4)	7(15,6)	0,171*
	Full liquid diet (regimen 2)	50(84,7)	9(15,3)	
	Normal diet (regimen 3)	113 (91,9)	10 (8,1)	
	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)	
Hospital clinics, n (%)	General surgery	72 (90,0)	8 (10,0)	0,412*
	Orthopedy	47 (87,0)	6 (13,0)	
	Internal medicine	66 (85,7)	11 (14,3)	
	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), mean±SD		6,21±10,84	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 meta-analysis 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.

Conflict of interest: The authors declare no conflict of interest related to this article.

Funding sources: The authors declare that this study has received no financial support.

Ethics committee approval: Alanya Alaaddin Keykubat University Non-invasive Clinical Research Ethics Committee on 9 January 2024, Number:01/11 (10/2024).

ORCID and Author contribution: E.T.B. (0000-

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.

Peer-review: Externally peer reviewed.

Acknowledgement: We wish to express our gratitude to the participants; without their contribution, this study would not have been possible.

REFERENCES

1. Kondrup J, Allison SP, Elia M, Vellas B, Plauth M. Educational and Clinical Practice Committee, European Society of Parenteral and Enteral Nutrition (ESPEN). ESPEN guidelines for nutrition screening 2002. Clin Nutr. 2003;22(4):415–21. doi: 10.1016/s0261-5614(03)00098-0.
2. Correia MITD, Perman MI, Waitzberg DL. Hospital malnutrition in Latin America: A systematic review. Clin Nutr. 2017;36(4):958-67. doi: 10.1016/j.clnu.2016.06.025.
3. Sahli L, Hagenbuch N, Ballmer PE, Rühlin M, Imoberdorf R. NRS-2002 components, nutritional score and severity of disease score, and their association with hospital length of stay and mortality. Swiss Med Wkly. 2021;14:151:w20517. doi: 10.4414/smw.2021.20517.
4. Wooley JA. American Dietetic Association endorses A.S.P.E.N. enteral nutrition practice recommendations. J Am Diet Assoc 2010;110(5):683-5. doi: 10.1016/j.jada.2010.02.024.
5. Kondrup J, Rasmussen HH, Hamberg O, Stanga Z, Group AHEW. Nutritional risk screening (NRS 2002): A new method based on an analysis of controlled clinical trials. Clin Nutr. 2003;22(3):321-36. doi: 10.1016/s0261-5614(02)00214-5.
6. Field LB, Hand RK. Differentiating malnutrition screening and assessment: a nutrition care process perspective. J Acad Nutr Diet 2015;115(5):824-8. doi: 10.1016/j.jand.2014.11.010.
7. Thomas MN, Kufeldt J, Kisser U, Hornung HM, Hoffmann J, Andraschko M, et al. Effects of malnutrition on complication rates, length of hospital stay, and revenue in elective surgical patients in the G-DRG-system. Nutrition. 2016;32(2):249–54. doi: 10.1016/j.nut.2015.08.021.
8. Sanson G, Sadiraj M, Barbin I, Confezione C, De Matteis D, Boscutti G, et al. Prediction of early- and long-term mortality in adult patients acutely admitted to internal medicine: NRS-2002 and beyond. Clin Nutr. 2020;39(4):1092–100. doi: 10.1016/j.clnu.2019.04.011.
9. Tangvik RJ, Tell GS, Eisman JA, Guttormsen AB, Henriksen A, Nilsen RM, et al. The nutritional strategy: four questions predict morbidity, mortality and health care costs. Clin Nutr. 2014;33(4):634–41. doi: 10.1016/j.clnu.2013.09.008.
10. Mercadal-Orfila G, Lluch-Taltavull J, Campillo-Artero C, Torrent-Quetglas M. Association between nutritional risk based on the NRS-2002 test and hospital morbidity and mortality. Nutr Hosp. 2012;27(4):1248–54. doi: 10.3305/nh.2012.27.4.5791.
11. Waitzberg DL, Caiaffa WT, Correia MI. Hospital malnutrition: the Brazilian national survey (IBRANUTRI): a study of 4000 patients. Nutrition. 2001;17(7-8), 573–580. doi: 10.1016/s0899-9007(01)00573-1.
12. Barker LA, Gout BS, Crowe TC. Hospital Malnutrition: Prevalence, Identification and Impact on Patients and the Healthcare System. Int J Environ Res Public Health. 2011;8:514–527. doi: 10.3390/ijerph8020514.
13. World Health Organization (WHO). BMI classification, Global database on Body Mass Index. (2004): http://www.assessmentpsychology.com/icbmi.htm. erişim; 17 Nisan 2024.
14. Bolayir B, Arik G, Yeşil Y, Kuyumcu ME, Varan HD, Kara Ö, et al. Validation of Nutritional Risk Screening-2002 in a Hospitalized Adult Population. Nutr Clin Pract. 2019;34(2), 297–303. doi: 10.1002/ncp.10082.
15. Pirlich M, Schütz T, Norman K, Gastell S, Lübke HJ, Bischoff SC,et al. The German hospital malnutrition study. Clin Nutr. 2006:25(4), 563–572. doi: 10.1016/j.clnu.2006.03.005.
16. Korfalı G, Gündoğdu H, Aydıntuğ S, Bahar M, Besler T, Moral AR, et al. Nutritional risk of hospitalized patients in Turkey. Clin Nutr. 2009;28(5):533- 7. doi: 10.1016/j.clnu.2009.04.015.
17. Nişancı Kılınç, F., Özenir, Ç., Eşer Durmaz, S., Bayındır Gümüş, A., et al. Determination of Malnutrition and Quality of Life at the Time of Hospitalization of Patients. BSJ Health Sci. 2023;6(4):640-9. doi: 10.19127/bshealthscience.1329255.
18. Güngör AE, Kılınç FN, Alparslan I, Çakır B, Asil E, Esatoglu AE, et al. Being "Nutritionally at Risk": Its Effect on Health Expenses and Length of Hospital Stay. Progr Nutrit, 2022;24(2):e2021320. doi: 10.23751/pn.v24i2.12057.
19. Ruiz AJ, Buitrago G, Rodríguez N, Gómez G, Sulo S, Gómez C, et al. Clinical and economic outcomes associ-ated with malnutrition in hospitalized patients. Clin Nutr 2019;38(3):1310-6. doi: 10.1016/j.clnu.2018.05.016.
20. Ongun N. Nutritional status of the patients in neurology clinic and its relation with polypharmacy and length of hospital stay. Pam Tıp Derg. 2019;12(3):467-73. doi: 10.31362/patd.535646.
21. Kroc L, Fife E, Piechocka-Wochniak E, Sołtysik B, Kostka T. Comparison of nutrition risk screening 2002 and subjective global assessment form as short nutrition assessment tools in older hospitalized adults. Nutrients. 2021;13(1):1-10. doi: 10.3390/nu13010225.
22. Simsek H, Meseri R, Sahin S, Ucku R. Prevalence of food insecurity and malnutrition, factors related to malnutrition in the elderly: A community-based, cross-sectional study from Turkey. European Geriatric Medicine. 2013;4(4):226-30. doi: 10.1016/j.eurger.2013.06.001.
23. Zhang Z, Pereira SL, Luo M, Matheson EM. Evaluation of blood biomarkers associated with risk of malnutrition in older adults: a systematic review and meta-analysis. Nutrients. 2017;9(8):829. doi: 10.3390/nu9080829.