CLINICAL SCIENCE OF NUTRITION

Original Article

Clin Sci Nutr 2020; 2(3): 97-102 • DOI: 10.5152/ClinSciNutr.2020.21-2-3

Malnutrition Prevalence Measurement and Nutritional Interventions in Internal Medical Departments of Turkish Hospitals: Results of the LPZ Study

Bülent Saka[1], Mustafa Altınkaynak[1], Sebile Nilgün Erten[1], Sibel Akın[2], Firuzan Fırat Özer[2], İlker Taşçı[3], Sumru Savaş[4], Özge Kayhan Koçak[4], Pınar Tosun Taşar[5], Aslı Tufan[6], Hakan Yavuzer[7], Deniz Suna Erdinçler[7], Cafer Balcı[8], Mert Eşme[8], Mustafa Cankurtaran[8], Zeynel Abidin Öztürk[9], Murat Varlı[10], Gülbüz Sezgin[11], Selim Nalbant[11], Mehmet Akif Karan[12]

[1]Department of Internal Medicine, İstanbul University, İstanbul Faculty of Medicine, İstanbul, Turkey
[2]Division of Geriatrics, Erciyes University, Faculty of Medicine, Kayseri, Turkey
[3]Gülhane Medical School & Gülhane Training and Research Hospital, Health Sciences University, Ankara, Turkey
[4]Division of Geriatrics, Ege University, Faculty of Medicine, İzmir, Turkey
[5]Department of Internal Medicine, Atatürk University, Faculty of Medicine, Erzurum, Turkey
[6]Division of Geriatrics, Marmara University, Faculty of Medicine, İstanbul, Turkey
[7]Division of Geriatrics, İstanbul University-Cerrahpaşa University, Cerrahpaşa Faculty of Medicine, İstanbul, Turkey
[8]Division of Geriatrics, Hacettepe University, Faculty of Medicine, Ankara, Turkey
[9]Division of Geriatrics, Gaziantep University, Faculty of Medicine, Gaziantep, Turkey
[10]Division of Geriatrics, Ankara University, Faculty of Medicine, Ankara, Turkey
[11]Department of Internal Medicine, Maltepe University, Faculty of Medicine, İstanbul, Turkey
[12]Division of Geriatrics, İstanbul University, İstanbul Faculty of Medicine, İstanbul, Turkey

Cite this article as: Saka B, Altınkaynak M, Erten SN, Akın S, Fırat Özer F, Taşçı İ, et al. Malnutrition Prevalence Measurement and Nutritional Interventions in Internal Medical Departments of Turkish Hospitals: Results of the LPZ Study. Clin Sci Nutr 2020; 2(3): 97-102.

ABSTRACT

Objective: The Landelijke Prevalentiemeting Zorgkwaliteit (LPZ), or National Care Indicators Prevalence, study is an annual international multicenter cross-sectional prevalence measurement of care problems on the institution, department, and patient level across Europe. The aim of this study was to measure the prevalence of malnutrition (MN) and examine nutritional interventions in internal medical departments of Turkish hospitals.

Methods: A multicenter, cross-sectional study was performed using a standardized and tested questionnaire. Data were collected from adult patients (18 years and over) who were hospitalized in internal medical departments of the hospitals. The cross-sectional study was done in 12 different centers from six big cities in the country in every November of three consecutive years (2017–2019).

Results: A total of 1,764 patients (60.9% men, 39.1% women; mean age, 62.6±0.4 years; range, 18–99 years) from 12 centers were enrolled in the study. The main diagnoses were cardiovascular disease (35.8%), diabetes (29.3%), cancer (20.2%), respiratory diseases (20.0%), infectious diseases (18.7%), gastrointestinal diseases (18.5%), endocrine diseases (17.3%), neurological diseases (15%; dementia, 6%), and hematological diseases (9.3%). Mean weight and body mass index of the patients were 71.9±16.5 kg (range, 30–153 kg) and 27.0±5.1 kg/m^2 (range, 10.6–51.3 kg/m^2). MN risk prevalence was 44.2%, according to the malnutrition universal screening test (MUST), and 46.5% in elderly patients. Of the patients, 43.4% indicated unintentional weight loss in the last 6 months. Nutritional interventions to treat MN were referral to a dietitian (57.2%), oral nutrition supplements (40.7%), energy/protein–enriched diet (38%), energy/protein–enriched snacks (18.1%), parenteral nutrition (16.7%), support at mealtimes (15.8%), and tube enteral feeding (10.4%). No interventions were given to 5.4% of patients. Regular audits were made to ensure compliance with the protocol/guidelines in 88.5% of patients, and 68.5% of patients were discussed with multidisciplinary teams at the hospitals.

Conclusion: MN is highly prevalent the in internal medical departments of our hospitals. Although MN awareness is increasing, different interventions are in use according to national and international protocols/guidelines, and the number of active multidisciplinary teams is increasing. MN is still a big problem that needs further national plans.

Keywords: Malnutrition, prevalence, inpatients, internal medicine, treatment

Corresponding Author: Bülent Saka, drsakab@yahoo.com

Submitted: January 18, 2021 **Accepted:** April 16, 2021

Introduction

Malnutrition (MN) increases both morbidity and mortality rates and healthcare costs in hospitals related to nosocomial infections and hospital length of stay (1).

In 2005, Korfalı et al. (2) conducted a multicenter study in 34 Turkish hospitals from 19 cities to assess nutritional risk at hospital admission. They included 29,139 patients in the study and found 15% MN risk during hospital admission. MN risk was 25% in those over 60 years of age. They used Nutrition Risk Screening-2002 (NRS-2002) to evaluate MN risk. Intensive care units had the highest MN risk prevalence with 52%, followed by medical oncology departments (43.4%), neurology (23.9%), radiation oncology (19.5%), gastroenterology (19.1%), gastrointestinal surgery (18.3%), thoracic surgery (18.2%), nephrology (18.1%), pulmonary diseases (17.8%), and general internal medicine wards (16.4%). Pirlich et al. (3) reported 56.2% MN in geriatric patients, followed by medical oncology (37.6%), gastroenterology (32.6%), and cardiology (22%).

The LPZ (Landelijke Prevalentiemeting Zorgproblemenstudy) is a tool that is based on a prevalence measurement of care problems in both acute and chronic care settings originally performed in the Netherlands. Since 1998, the occurrence of six basic care problems in healthcare institutions have been surveyed in the Netherlands on one specific day each year in April by means of the National Prevalence Measurement of Care Problems (LPZ) (4). Later, five more countries were included in the study; the LPZ has also been carried out in Turkey since 2016. The LPZ tool allows measurement of prevalences and risk of different care problems, such as MN, pressure ulcer, falls, urinary and fecal incontinence, pain and restraints using the same definition, screening instruments, and methodology in different healthcare institutions (hospitals, care homes, homecare) (4). LPZ provides insight into differences in the quality of basic care in different healthcare facilities because it involves an annual measurement.

Main Points

- Malnutrition (MN) prevalence varies from 20% to 60% in hospitalized patients.
- This study provided information about the prevalence of MN risk, together with care facilities, preventive measures, and interventions for MN prevention/treatment in the internal medical departments of Turkish hospitals.
- MN risk is highly prevalent (42.2%) in internal medical departments of our hospitals.
- MN risk is most prevalent in Emergency Medicine (84.6%), Medical intensive care unit (83.3%), and Palliative Care (54.2%) units.
- The main preventive nutritional interventions were MN risk screening, referral to a dietitian, and an energy/protein–enriched diet. The main nutritional interventions to patients with MN were referral to a dietitian, regular MN risk screening, and oral nutritional supplements.

The aim of this study was to measure MN risk prevalence in internal medical departments in Turkish hospitals with the existing preventive and treatment interventions using the LPZ tool.

Materials and Methods

This cross-sectional, multicenter prevalence measurement study was conducted in November of 2017, 2018, and 2019. Maastricht University is responsible for the central coordination of the study, and a national coordinator in each participating country organizes the measurement in their own country. In each center, one coordinator was responsible for the measurement. The coordinators were trained by the research group to manage the survey, apply the standardized questionnaire, use an internet data-entry program, and train the healthcare professionals who would perform the measurement within the organizations. Two healthcare professionals (nurses, dietitians, or doctors who worked in the patient's ward) assessed each patient in the hospitals.

The LPZ tool includes three questionnaires, the first for the institution, the second for the ward/section, and the third for patient information. The third form includes questions involving patient demographic characteristics, medical history, dependency, prevalence and risk of care problems, interventions for prevention, and management (4).

LPZ data included a malnutrition universal screening tool (MUST) (5) to assess MN risk in hospitals. MUST includes body mass index (BMI, kg/m^2), unintentional weight loss, and acute disease effect for scoring. Each parameter is scored as 0, 1, or 2 points. Overall risk for MN was established as low (total score = 0), medium (total score = 1), or high (total score ≥2) (Table 1). LPZ data also included preventive measures and interventions for MN.

The study was done in 12 different hospitals from six big cities in Turkey. The Istanbul Faculty of Medicine Ethical Committee at Istanbul University approved the study. All patients or their relatives gave informed consent.

Statistical analysis

Statistical analysis was done using SPSS 21.0 (IBM SPSS Statistics, Version 21). Data were expressed as mean±SD. Categorical variables were compared by chi-square anal-

Table 1. Malnutrition universal screening tool (MUST)					
STEP 1		**STEP 2**		**STEP 3**	
BMI (kg/m²)	**Score**	**Weight loss % (3–6 months)**	**Score**	**Acute disease/ low oral intake**	**Score**
>20	0	<5	0	No	0
18.5–20	1	5–10	1	Yes	2
<18.5	2	>10	2		
STEP 4					
Score 0: Low risk		Score 1: Medium risk		Score ≥2: High risk	
STEP 5					
Low risk: Screening weekly No intervention		Medium risk: Screening weekly No intervention		High risk: Screen weekly Treat malnutrition	

Table 2. Types of internal medical departments	
Department	**Number of patients (%)**
Internal medicine	1,271 (72.1)
Palliative care	182 (10.3)
Geriatrics	116 (6.6)
Physical rehabilitation	54 (3.1)
Neurology	30 (1.7)
Medical ICU	28 (1.6)
Emergency medicine	22 (1.2)
Others	61 (3.4)
Total	1,764 (100.0)
ICU: intensive care unit.	

Table 3. Medical diagnosis of patients during admission	
Medical diagnosis	**Number (%)**
Cardiovascular disease	631 (35.8)
Diabetes	516 (29.3)
Cancer	356 (20.2)
Respiratory diseases	350 (20.0)
Infectious diseases	330 (18.7)
Gastrointestinal diseases	326 (18.5)
Endocrine diseases	306 (17.3)
Genitourinary diseases	267 (15.1)
Neurological diseases	264 (15.0)
Musculoskeletal diseases	201 (11.4)
Hematological diseases	164 (9.3)
Others	122 (6.9)

ysis. Mann-Whitney U test, Student t-test, and Wilcoxon test were used to analyze differences between variables.

Results

A total of 1,764 patients (mean age, 62.6±0.4 years; range, 18–99 years; 60.9%: men, mean age 62.8±17.8 years; 39.1% women, mean age 63.4±17.0 years) from 12 centers were included in the study. Types of internal medical departments are given in Table 2. The main diagnoses were cardiovascular disease, diabetes, cancer, respiratory diseases, infectious diseases, and gastrointestinal diseases (Table 3). Mean weight and BMI of the patients were 71.9±16.5 kg (range, 30–153 kg; men: mean, 71.3±16.4 kg; women: mean, 72.3±17.7 kg) and 27.0±5.1 kg/m² (range, 10.6–51.3 kg/m²; men: mean, 25.8±5.8 kg/m², women: mean, 29.8±6.5 kg/m²).

MN risk prevalence was 44.2% according to MUST. Overall, 43.4% of the patients indicated unintentional weight loss in the last 6 months, and 45% of the patients experienced a decreased appetite over the last month. MN risk prevalence in different departments is given in Table 4. A total of 17.1% of the patients had swallowing problems.

Preventive nutritional interventions for all patients were regular MN risk screening every week, referral to a dietitian, energy/protein–enriched diet, monitorization of fluid intake, and oral nutritional supplements (ONSs). No intervention was given to 18.1% of the patients (Table 5). Main nutritional interventions for patients with MN risk were re-

Table 4. Malnutrition risk prevalence in different departments

Department	MN risk according to MUST (%)
Emergency medicine	84.6
Medical ICU	83.3
Palliative care	54.2
Geriatrics	43.8
Internal medicine	43.7
Neurology	45.0
Physical rehabilitation	15.6

ICU: intensive care unit; MUST: malnutrition universal screening test.

Table 5. Nutritional interventions for all patients

Nutritional intervention	%
Regular MN risk screening	51.6
Referral to a dietitian	48.4
Energy/protein–rich diet	23.6
Oral nutritional supplements	20.4
Monitorization of fluid intake	15.6
Adjustment of mealtime ambiance	10.2
Informing patients and/or relatives	10.1
Energy/protein–enriched snacks	9.4
Support at mealtime	9.5
Food desired by the patient	9.1
Parenteral nutrition	8.6
Tube feeding	7.5
Plate protocol (monitoring)	6.9

MN: malnutrition.

ferral to a dietitian, regular MN risk screening, ONSs, energy/protein–rich diet, monitorization of fluid intake, and parenteral nutrition. No intervention was given to 5.4% of the patients with MN risk (Table 6).

MN risk prevalence was 46.5% in old-aged patients (≥65 years old; n=923, 52.3%). The main diagnosis of the old-aged patients were cardiovascular diseases (45.3%), diabetes (31.7%), respiratory diseases (24.5%), infectious diseases (22.2%), cancer (19.9%), gastrointestinal diseases

Table 6. Nutritional interventions for those with MN risk

Nutritional intervention	%
Referral to a dietitian	57.2
Regular MN risk screening	51.6
Oral nutritional supplements	40.7
Energy/protein–rich diet	38.0
Energy/protein–enriched snacks	18.1
Monitorization of fluid intake	18.1
Parenteral nutrition	16.7
Food desired by the patient	16.3
Support at mealtime	15.8
Adjustment of mealtime ambiance	14.9
Adjustment of meal consistency	14.0
Informing patients and/or relatives	11.3
Tube feeding	10.4
Plate protocol (monitoring)	7.9
No interventions	5.4

MN: malnutrition.

(19.0%), endocrine diseases (18.0%), genitourinary tract diseases (15.9%), dementia (11.4%), and other neurological diseases (8.2%). The main nutritional interventions to treat MN risk in old-aged patients were referral to a dietitian (57.0%), ONSs (45.7%), energy/protein–enriched diet (43.0%), monitorization of fluid intake (24.0%), energy/protein snacks (23.1%), parenteral nutrition (21.7%), support at mealtimes (21.3%), adjustment of the consistency of the meal (19.9%), and tube feeding (14.9%). Overall, 22.6% of the old-aged patients had swallowing problems.

When care facilities were taken into consideration, regular audits were done in 88.5% of the wards to ensure compliance with national and international protocol/guidelines. A total of 68.5% of patients with MN risk were discussed with a multidisciplinary team. In 80.6% of the wards, risk assessment was reported in each patient's file, and in 88% of the wards, all caregivers had followed a refresher course for nutrition in the last 2 years.

Discussion

MN prevalence varies from 20% to 60% in hospitalized patients in different European countries and from 22% to 84% in the elderly (6, 7). Several factors are responsible for

the increased MN rates in hospitals. Infections, acute and chronic diseases and their complications, old age, and trauma are known risk factors for MN (8, 9). Eglseer et al. (10) showed that MN risk prevalence was between 14.5% and 33.7% in three European countries. In the elderly population, changes in body composition, chronic diseases, decreased food intake, immobility, sarcopenia, mood changes, and cognitive disorders are the main causes of MN (11). Leij-Halfwerk et al. (12) showed a 28% MN risk prevalence among elderly patients in European hospitals.

In a recent study, Marinho et al. (13) showed a very high prevalence of MN (73%) in internal medical departments of Portuguese hospitals. Marco et al. (14) reported a 1.4% MN rate in the internal medical wards of hospitals in a study with over 1.5 million participants. Most of those patients were old aged; had a greater degree of comorbidity; resided in nursing homes; and had dementia, cancer, HIV, and chronic kidney disease (14). Different MN prevalences may be related to different definitions, instruments, and populations (15).

In Turkey, Turkoglu et al. (16) reported a 26%–31% MN risk rate in hospitals according to four different screening methods, MUST, NRS-2002, Malnutrition Screening Tool (MST), and Short Nutrition Assessment Questionnaire (SNAQ). In another study, MN risk prevalence varied significantly between 18.4% and 86% according to different screening tools in old-aged hospitalized patients (17). Celik et al. (18) found 24.7% MN risk using NRS-2002 in 162 hospitalized patients. To the best of our knowledge, our data are the first from Turkey indicating MN risk prevalence in internal medical departments of hospitals, together with data about interventions and care quality. Our MN risk prevalence was 44.2% (46.5% in the elderly), which was in accordance with the previous data. MN risk was significantly higher in emergency and intensive care units (84.6% and 83.3%, respectively), followed by palliative care units (54.2%) and geriatric medicine units (43.8%). Internal medicine wards constituted 72.1% of all cases, and MN risk prevalence in those wards was 43.7%. A high MN risk rate was related to the comorbidities of the patients, such as cardiovascular diseases; diabetes; cancer; and respiratory and neurological diseases, including neurodegenerative disorders (Table 3).

MN screening and/or assessment are recommended during hospital admission to diagnose MN risk and/or MN. Either MN or MN risk indicates a treatment plan including referral to a dietitian (or nutrition expert) (19, 20). A study has shown that applying nutritional care strategies (such as using a malnutrition screening tool) increased dietician referrals (21). Other treatment strategies are enriched diets/snacks, personalized diets, oral and tube enteral feeding, and parenteral nutrition, according to the daily energy/protein needs of the patient (22). According to our data, the main preventive measures for MN were regular MN risk screening, referral to a dietitian, energy/protein–rich diet, support at mealtime, giving information to patients and relatives, and enteral or parenteral nutrition. The main interventions to treat MN were referral to a dietitian, regular MN risk screening, oral or tube enteral nutrition, energy/protein–rich diet and/or snacks, and parenteral nutrition. More than 50% of patients with MN risk were referred to a dietitian and/or had energy/protein diet or snacks, over 40% had ONSs, and 16.7% had parenteral nutrition; these rates were similar in old-aged patients, except parenteral nutrition, which was more prevalent in the elderly (21.7%).

Although regular audits were done in 88.5% of the wards to ensure compliance with national and international protocol/guidelines, regular MN risk screening was only done to half of the patients with MN risk, which was not in accordance with the international guidelines. Two thirds of the patients had a consultation with the multidisciplinary teams.

Conclusion

This study provided information about the prevalence of MN, care facilities, preventive measures, and interventions for MN in internal medical departments of Turkish hospitals. MN is highly prevalent in internal medical departments of our hospitals. Although MN awareness, interventions, and the number of active multidisciplinary teams are increasing, it is still a big problem and needs further national plans.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Istanbul University Istanbul Faculty of Medicine (Date and approval no: 29.01.2016 and 2016/71).

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

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – All Authors; Design – All Authors; Supervision – All Authors; Resources – All Authors; Materials – All Authors; Data Collection and/or Processing – B.S., M.A., S.N.E., S.A., F.Ö., İ.T., S.S., Ö.K.K., P.T., A.T., H.Y., D.S.E., C.B., M.E., M.C., Z.A.Ö., M.V., G.S., S.N., M.A.K; Analysis and/or Interpretation – B.S., M.A., S.N.E., M.A.K.; Literature Search – All Authors; Writing Manuscript – All Authors

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Allison, S. P. Malnutrition, disease and outcome. Nutrition 2000; 16: 590-3. [Crossref]
2. 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: 533-7. [Crossref]
3. Pirlich M, Schütz T, Norman K, Gastell S, Lübke HJ, Bischoff SC, et al. The German hospital malnutrition study. Clin Nutr 2006; 25: 563-72. [Crossref]
4. Halfens RJ, Meesterberends E, van Nie-Visser NC, Lohrmann C, Schönherr S, Meijers JM, et al. International prevalence measurement of care problems: results. J Adv Nurs 2013; 69: e5-17. [Crossref]
5. Stratton RJ, Hackston A, Longmore D, Dixon R, Price S, Stroud M, et al. Malnutrition in hospital outpatients and inpatients: prevalence, concurrent validity and ease of use of the 'malnutrition universal screening tool'('MUST') for adults. Br J Nutr 2004; 92: 799-808. [Crossref]
6. Meijers JM, Schols JM, Dassen T, Janssen MA, Halfens RJ. Malnutrition prevalence in The Netherlands: results of the annual Dutch national prevalence measurement of care problems. Br J Nutr 2008; 101: 417-23. [Crossref]
7. Cereda E, Pedrolli C, Klersy C, Bonardi C, Quarleri L, Cappello S, et al. Nutritional status in older persons according to healthcare setting: a systematic review and meta-analysis of prevalence data using MNA®. Clin Nutr 2016; 35: 1282-90. [Crossref]
8. Sauer AC, Goates S, Malone A, Mogensen KM, Gewirtz G, Sulz I, et al. Prevalence of malnutrition risk and the impact of nutrition risk on hospital outcomes: results from nutritionDay in the US. JPEN J Parenter Enteral Nutr 2019; 43: 918-26. [Crossref]
9. Waitzberg DL, Caiaffa WT, Correia MI. Hospital malnutrition: the Brazilian national survey (IBRANUTRI): a study of 4000 patients. Nutrition 2001; 17: 573-80. [Crossref]
10. Eglseer D, Huppertz V, Kammer L, Saka B, Schols J, Everink I. The quality of nutritional care in hospitals: Austria, Switzerland, and Turkey compared. Nutrition 2020; 79: 110990. [Crossref]
11. Yeh SS, Schuster MW. Epidemiology of malnutrition in the elderly In: Mantovani G, Anker SD, Inui A, Morley JE, Fanelli FR, Scevola D, et al., editors. Cachexia and wasting: a modern approach. Springer Milan; 2006. Chapter 7.1.
12. Leij-Halfwerk S, Verwijs MH, van Houdt S, Borkent JW, Guaitoli PR, Pelgrim T, et al. Prevalence of protein-energy malnutrition risk in European older adults in community, residential and hospital settings, according to 22 malnutrition screening tools validated for use in adults≥ 65 years: a systematic review and meta-analysis. Maturitas 2019; 126: 80-9. [Crossref]
13. Marinho R, Pessoa A, Lopes M, Rosinhas J, Pinho J, Silveira J, et al. High prevalence of malnutrition in Internal Medicine wards-a multicentre ANUMEDI study. Eur J Intern Med 2020; 76: 82-8. [Crossref]
14. Marco J, Barba R, Zapatero A, Matía P, Plaza S, Losa JE, et al. Prevalence of the notification of malnutrition in the departments of internal medicine and its prognostic implications. Clin Nutr 2011; 30: 450-4. [Crossref]
15. Schönherr S, Halfens RJ, Meijers JM, Schols JM, Lohrmann C. Structural and process indicators of nutritional care: a comparison between Austrian hospitals and nursing homes. Nutrition 2012; 28: 868-73. [Crossref]
16. Türkoğlu I, Ilgaz F, Aksan A, Çerçi A, Yalçın T, Yürük AA, et al. MON-PP155: Comparison of Four Nutritional Screening Tools to Assess Malnutrition Risk in Hospitalized Adult Patients. Clin Nutr 2015; 34: S185-6. [Crossref]
17. Savas S. Comparison of revised mini nutritional assessment-short form with the three most popular malnutrition screening tools in hospitalized elderly patients. Ege Tıp Dergisi 2019; 58: 274-81.
18. Celik ZM, Islamoglu AH, Sabuncular G, Toprak HS, Gunes FE. Evaluation of malnutrition risk of inpatients in a research and training hospital: A cross-sectional study. Clin Nutr ESPEN 2021; 41: 261-7. [Crossref]
19. Cederholm T, Barazzoni RO, Austin P, Ballmer P, Biolo GI, Bischoff SC, Compher C, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. Clin Nutr 2017; 36: 49-64. [Crossref]
20. Baker 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: 514-27. [Crossref]
21. Leistra E, van Bokhorst-de van der Schueren MA, Visser M, van der Hout A, Langius JA, Kruizenga HM. Systematic screening for undernutrition in hospitals: predictive factors for success. Clin Nutr 2014; 33: 495-501. [Crossref]
22. Gomes F, Schuetz P, Bounoure L, Austin P, Ballesteros-Pomar M, Cederholm T, et al. ESPEN guidelines on nutritional support for polymorbid internal medicine patients. Clin Nutr 2018; 37: 336-53. [Crossref]