Assessment of nutritional status in geriatric inpatients

Jaroslav Madleňák, Ivana Bóriková

Ústav ošetrovateľstva, Univerzita Komenskeho v Bratislave, Jesseniova lekarska fakulta v Martine

Aim: To find out the nutritional status in hospitalized geriatric patients in the internal ward, and to find out if there is a statistically significant correlation between selected demographic data, health characteristics, and measurement tool. Sample and methods. Geriatric patients aged ≥ 65 years hospitalized in the internal department. The design of the study is quantitative, descriptive, and correlational. The research protocol included monitored variables: demographic data, health characteristics, laboratory parameters, and a measurement tool to assess the nutritional status of MNA®. Empirical data was processed using of descriptive and inductive statistics methods.

Results: In the sample of n = 137 (100%) patients, 48% were men and 52% were women, the average age of the sample was 76.2 years. According to MNA®-FF, 9% of patients had normal nutritional status, up to 74% were at risk of malnutrition and 17% were malnourished; 99% had polymorbidity and 96% had polypharmacotherapy. We found statistical significance between the resulting MNA®-FF score and BMI ($p < 0.001$) and weight loss in the last 6 months ($p < 0.001$) and haemoglobin value ($p = 0.033$).

Conclusions: Hospitalized geriatric patients have an increased risk of malnutrition or already present malnutrition. Part of the comprehensive assessment of nutritional status is also the administration of a valid and reliable measuring tool that can quickly detect nutritional disorders when the patient is admitted to the hospital. Early identification of the disorder is the starting point for a targeted nutritional intervention.

Keywords: assessment, geriatric patient, hospitalization, MNA® tool, nutritional status.

Posúdenie nutričného stavu u hospitalizovaných geriatrických pacientov

Cieľ: Zistiť stav výživy u hospitalizovaných geriatrických pacientov na internom oddelení; zistiť, či existujú štatisticky významné korelácie medzi vybranými socio-demografickými údajmi, zdravotnými charakteristikami a meracím nástrojom.

Súbor a metódy. Geriatrickí pacienti vo veku ≥ 65 rokov hospitalizovaní na internom oddelení. Dizajn štúdie kvantitatívny, deskriptívny, korelačný. Výskumný protokol obsahoval sledované premenné: demografické údaje, zdravotné charakteristiky, laboratórne parametre a merací nástroj na posúdenie stavu výživy MNA®. Empirické údaje boli spracované metódami deskriptívnej a induktívnej štatistiky.

Výsledky: V súbore n = 137 (100 %) pacientov bolo 48 % mužov a 52 % žien, priemerný vek súboru bol 76,2 roka. Podľa MNA®-FF malo 9 % pacientov normálny nutričný stav, až 74 % malo riziko podvýživy a 17 % malo podvýživu. Polymorbiditu malo 99 % a polyfarmakoterapiu 96 % pacientov. Štatistickú významnosť sme zistili medzi výsledným skóre MNA®-FF a BMI ($p < 0,001$) a úbytkom na hmotnosti za posledných 6 mesiacov ($p < 0,001$) a hodnotou hemoglobínu ($p = 0,033$).

Záver: Hospitalizovaní geriatrickí pacienti majú vo zvýšenej miere prítomné riziko malnutrície alebo už prítomnú malnutríciu. Súčasťou komplexného posudzovania stavu výživy je aj administrácia valídneho a reliabilného meracieho nástroja, ktorý je schopný rýchlo detekovať poruchu výživy už pri príjme pacienta na hospitalizáciu. Včasná identifikácia tejto poruchy je východiskom pre cielenú nutričnú intervenciu.

Kľúčové slová: geriatrický pacient, hospitalizácia, nástroj MNA®, posúdenie, stav výživy.

Mgr. Jaroslav Madleňák
Ustav ošetrovateľstva, Martin, SK
madlenak5@uniba.sk

Introduction

The WHO defines malnutrition as the lack of proper nutrition resulting from inadequate intake and insufficient nutrition for physical or psychological reasons (1). In Slovakia, malnutrition is defined as the patient's nutritional status conditioned by the balance of nutritional received with the nutritional needs of the organism, while malnutrition occurs when the supply of energy and building substrates is reduced compared to its output (2). Malnutrition can be the result of starvation, disease, or advanced age (> 80 years), alone or in combination with other health problems. A weight loss of 10-15 % in 6 months, a drop in BMI below 19 kg/m^2 and a low albumin level below 30 g/l are the parameters that define malnutrition according to ESPEN (3). The incidence of malnutrition is generally less than 10 % in independent living seniors and increases by up to 2/3 in hospitalized geriatric patients (4). An increased prevalence of malnutrition is present in frail seniors with comorbidities (5). Malnutrition has a negative impact on the general health of the patient and causes an increased incidence of infections, worsens wound healing, prolongs hospitalization and convalescence after acute illness, and increases costs associated with health care (6). In geriatric patients, malnutrition is considered one of the most important factors contributing to the complex aetiology of sarcopenia, osteopenia, and frailty (4). The studies on the issue under consideration emphasize the clinical positives of early identification of malnourished patients after admission to the hospital environment with subsequent individualized nutritional interventions. The clinical need for nutritional screening in hospitalized patients is emphasized given that rapid screening tools are available to identify patients at nutritional risk (7). The progression to malnutrition is often insidious and often undetected. Health care staff play a key role in the prevention and early intervention of nutritional problems (8).

Aim

The aim of the study was to find out the nutritional status in hospitalized geriatric patients in the internal ward, and at the same time, to find out if there is a statistically significant correlation between selected demographic data, health characteristics, and measurement tool.

Sample and methods

In the research, we used a quantitative, descriptive, and correlational study. Inclusion criteria included the patient's age ≥ 65 years, the patient's hospitalization in the internal medicine department, and the patient's signed informed consent to the implementation of

the research. The excluded criteria included the presence of impaired consciousness in the patient, and the expressed disagreement of the patient with the implementation of the research. The collection of empirical data took place between November 2022 and June 2023.

The research protocol containing: 1. demographic data of the respondent (sex, age) was filled out; 2. health characteristics: BMI classification according to WHO (9), weight loss in the last 6 months, number and duration of hospitalizations, presence of other diseases (comorbidities) and polypharmacotherapy, number of medications/24 hours; 3. laboratory parameters: albumin, transferrin, haemoglobin, C-reactive protein (CRP), total cholesterol, and lymphocytes; were searched from the patient's medical records; 4. Mini Nutritional Assessment (MNA®). The screening version (MNA®-SF) used as a short form to identify patients at risk of malnutrition, consists of six items (food intake item, two anthropometric parameters, and three general parameters). Each item was scored between 0 and 3, resulting in a score of normal nutritional status (12-14 points), risk of malnutrition (8-11 points), and malnutrition (0-7 points). If patients get a score less than 12 points, it is recommended to complete the full version MNA® to avoid diagnostic accuracy errors (10). The MNA®-FF has twelve items in four groups (anthropometric, general, dietary, and subjective assessment). The resulting MNA®-FF score identifies nutritional status as with adequate nutrition (≥ 24 points), risk of malnutrition (17.5-23.5 points), and malnutrition (< 17 points) (11,12).

According to MNA®-SF, we found that in the entire group of patients n = 200 (100 %) 63 (31.5 %) had a normal nutritional status, 102 (51 %) were at risk of malnutrition and 35 (17.5 %) were malnourished. Subsequently, for these 137 patients, we performed an assessment according to the MNA-FF®, which specified the number of patients at risk of malnutrition n = 101 (74 %) and with malnutrition n = 23 (17 %). The Ethics Committee of the Jessenius Faculty of Medicine of Comenius University in Martin (EK 45/2022), as well as the management of the internal ward at the University Hospital in Martin, where the study was conducted, approved the implementation of the research, including the research protocol.

Statistical analysis

We evaluated empirical data using descriptive statistics methods: absolute (n) and relative (%) frequencies, mean values (median), variability characteristics (interquartile range, IQR). In the case of a comparison of mean values between three or more groups, we used a non-parametric version of the analysis of variance, i.e., Kruskal-Wallis analysis (KW-χ^2), which compares the medians of different groups. In the case

Tab. 1. *Demographic characteristics of the sample according to MNA®-FF (n = 137)*

Variable		MNA®-FF n/%	Normal nutritional status n/%	At risk of malnutrition n/%	Malnourished n/%	χ^2	p value
		137/100	13/9	101/74	23/17		
Gender	Male	66/48	5/8	52/79	9/14	1.745	0.43
	Female	71/52	8/11	49/69	14/20		
Age	65-74	70/51	6/9	53/76	11/16	2.111	0.715
	75-89	49/36	5/10	37/76	7/14		
	≥ 90	18/13	2/11	11/61	5/28		

of comparing the observed frequencies with the predicted frequencies between different groups, we used Pearson's χ^2 test. The results were evaluated as statistically significant at $p < 0.05$.

Results

In the sample of n = 137 (100 %) patients, 48 % were men and 52 % were women, the average of the entire sample was 76.2 years, most of the patients (51 %) were 65-74 years old. According to MNA®-FF, 9 % of patients had a normal nutritional status, up to 74 % were at risk of malnutrition and 17 % were malnourished (tab. 1). The average hospitalization duration was 4 days, the average number of hospitalizations was 1.5/year, the average BMI in the sample was 27.6, and the average weight report for the last 6 months was 2 kg; 99 % had polymorbidity and 96 % had polypharmacotherapy, with an average number of drugs of 12 in 24 hours (tab. 2). Regarding laboratory parameters, the patients had lower mean limit values of albumin and haemoglobin and an increased CRP value (tab. 3).

We found statistical significance between the resulting MNA®-FF score and the BMI value (p < 0.001) and between the weight loss in the last 6 months (p < 0.001) (tab. 2) and between the resulting MNA®-FF score and the haemoglobin value (p = 0.033) (tab. 3).

Discussion

In our sample of geriatric patients, after administration of the MNA®-FF tool, we identified up to 91 % of patients who were at risk of developing malnutrition or already had malnutrition. With the global demographic transition towards to an aging population, malnutrition in older age has become a global challenge as a major contributor to the morbidity and mortality of the geriatric patient (13). Malnutrition is caused by a variety of factors, including developmental changes, inadequate or unbalanced food intake, the presence of both acute and chronic diseases, and the extent and quality of health care (8). Many factors and methods are involved in the evaluation of nutritional status and an inaccurate or absent assessment of nutritional status by health care professionals can also have an impact on the emergence and development of malnutrition (14). BMI is important, but definitely not a decisive parameter for assessing the obesity index in individual patients. BMI analyzes weight categories that may lead to health problems, but does not diagnose an individual's body fat or health (15). Additionally, standardized "normal" BMI values may not be objective, as this index does not take into account body structure or subcutaneous fat thickness, nor sex and age (16). The optimal BMI for the senior population does not correspond to the optimal BMI for the

Tab. 2. *Health characteristics of the sample according to MNA®-FF (n = 137)*

Variable	MNA®-FF Median/IQR	Normal nutritional status Median/IQR	At risk of malnutrition Median/IQR	Malnourished Median/IQR	KW-χ^2	p value
Length of hospital stay	4/2-7	2/1-6	5/2-7	5/3-10	1.721	0.422
Number of hospitalizations/last year	1.5/1-2	2/1-2	2/1-2	2/1-2	1.213	0.545
BMI	27.6/23.9-30.8	27.9/26.6-33.8	27.5/24.3-29.7	20.6/18.5-22.8	35.898	<0.001***
Weight loss/past 6 months	2/0-5	2/0-3	4/1-7	10/5-15	29.107	<0.001***
Number of drugs/24 hours	12/8-18	12/9-14	12/9-18	13/8-17	0.326	0.849
	n/%	n/%	n/%	n/%	χ^2	p
Polymorbidity ≥ 5 chronic diseases	136/99	13/10	100/74	23/17	0.359	0.835
Polypharmacy ≥ 5 prescribed drugs	131/96	13/10	95/73	23/18	2.236	0.326

***p value < 0.001

Tab. 3. *Laboratory parameters in the sample (n = 137)*

Variable / reference value	MNA®-FF Median/IQR	Normal nutritional status Median/IQR	At risk of malnutrition Median/IQR	Malnourished Median/IQR	KW-χ^2	p value
Albumin (35-52 g/l)	35/30-38	38/36-40	35/29-38	31/26-34	5.824	0.054
Transferrin (2.0-3.6 g/l)	2.1/2.0-2.9	—	2.1/1.1-1.8	1.4/1.7-2.8	2.261	0.132
Haemoglobin (Male 135-175 g/l, Female 120-160 g/l)	126/108-139	135/130-145	124/103-136	126/98-136	6.777	0.033*
CRP (< 5.0 mg/l)	7.9/2.5-33.9	19.3/7.4-34.8	10.7/2.7-32.6	9.7/3.5-57	0.471	0.789
Cholesterol (< 5.00 mmol/l)	4.5/3.7-5.8	5/3.5-6.0	5/3.6-5.8	4.1/3.9-5.9	0.151	0.927
Lymphocytes (0.8-4.0 × 109/l)	1.4/1.0-2.0	1.4/1.1-1.8	1.5/1.1-2.2	1.2/0.8-1.8	2.674	0.262

*p value < 0.05

adult population; therefore, it is necessary to evaluate BMI as a separate anthropometric parameter. The ideal (protective) BMI for the elderly population is in the range of 24.0 to 30.9 kg/m2. The threshold value at which the risk of malnutrition is shown in patients older than 70 years is a BMI of 22 kg/m^2, while a patient with a BMI of 20 kg/m^2 is already considered malnourished (17), which was also confirmed in our group. Regardless of the BMI value, malnutrition occurs in geriatric patients during hospitalization also due to irregular food intake (for example, due to diagnostic or therapeutic procedures) in combination with reduced appetite, reduced ability to chew or swallow (18). Therefore, when using anthropometric indices to detect the nutritional status of a geriatric patient, it is necessary to include a physical examination in a comprehensive examination and evaluate laboratory findings (14). Older age (> 65 years) is one of the main risk factors for the onset and development of polymorbidity, and geriatric patients are particularly susceptible to weight loss associated with chronic diseases. Weight loss ultimately leads to the development of malnutrition, which can fundamentally affect the course of diseases and clinical outcomes (19). Subsequent changes in body composition due to malnutrition have a negative impact on the recovery of muscle mass (20). In patients with signs of developed catabolism, laboratory diagnostics is essential and includes complex parameters on energy need, mineral and protein turnover, nitrogen balance, ion balance. Basic laboratory parameters for assessing nutritional status include total protein, albumin, transferrin, cholesterol, haemoglobin, and absolute lymphocyte count (21). Haemoglobin values below the reference norm generally have a negative impact on nutritional status, the progression of malnutrition, an increase in the number of comorbidities, and on mental and functional capacity (22). Due to the high prevalence of malnutrition in hospitalized patients in internal wards (up to 70%), quick and simple recognition of the given condition is essential (23). A physician, nurse, or nutritional therapist is competent to administer a measurement tool to assess nutritional status as part of the geriatric screening (24). When choosing an appropriate tool, it is important to identify for which patient population (e.g., age category, specific disease) and for which environment (e.g., hospital, long-term care facility, community care) the tool has been validated (25). The European Society for Clinical Nutrition and Metabolism (ESPEN) recommends the use of the MNA® tool (26) to assess nutritional status in hospitalized adult/geriatric patients.

The MNA®-FF version achieves 96 % sensitivity and 98 % specificity with a positive predictive value of 97 %. The diagnostic accuracy of the MNA®-SF version is even higher, reaching 98 % sensitivity, 100 % specificity, with a diagnostic accuracy of 99 % for the screening of malnutrition risk (11).

In Slovakia, in the care of elderly patients, complex geriatric assessment is considered the gold standard as a multidimensional, multidisciplinary procedure to diagnose somatic and mental health of older people, psychosocial status and functional abilities (or limitations), especially in frail or otherwise at-risk older people, and the MNA® tool is part of this diagnosis. Personalized medicine in this way is especially beneficial in the case of polymorbidity in conjunction with geriatric syndromes (such as malnutrition), when the priority of solutions may not always be clear and unambiguous (27). Nutritional screening should become a routine part of clinical practice, because MNA® is described as an effective, valid tool, applicable to the elderly population and geriatric patients.

Moreover, it is reliable, inexpensive, does not require laboratory investigation, and is used in all settings. It is also able to detect risks of malnutrition before the severe change in individuals' weight or serum albumin occurs, reports also indicated that it predicts mortality and length of stay in hospital. At least 22 expert groups included the MNA® in new clinical practice guidelines, national or international registries. MNA®-FF provides guidance for nutritional intervention; elderly with malnutrition or at risk of malnutrition should have a nutritional intervention with a multidisciplinary team to support adequate dietary intake, maintain or increase body weight and/or improve functional and clinical outcomes (28).

Conclusions

Hospitalized geriatric patients are at increased risk of malnutrition or already present malnutrition. Nutritional status is relatively easy to detect using standard methods within the competence of health professionals. Implementing of recommendations and standards into clinical practice will strengthen the early identification of nutritional status disorders. A comprehensive screening and assessment of the state of nutrition should already be carried out when a geriatric patient is admitted to the hospital, so that it is possible to plan and implement a targeted individual nutritional intervention in time.

REFERENCES

1. Development Initiatives. Global Nutrition Report: Shining a light to spur action on nutrition. Bristol. UK: Development Initiatives. 2018; p. 161.
2. Vestník Ministerstva zdravotníctva SR, 2009. Odborné usmernenie Ministerstva zdravotníctva Slovenskej republiky, ktorým sa mení a dopĺňa odborné usmernenie Ministerstva zdravotníctva Slovenskej republiky č. 13168/2006 – OZS organizácie klinickej výživy. Čiastka 1-3. (In Slovak)
3. Cederholm T, Barazzoni R, Austin P, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. Clinical Nutrition. 2017;36(1):49-64.
4. Volkert D, Beck AM, Cederholm T, et al. ESPEN practical guideline: Clinical nutrition and hydration in geriatrics. Clinical Nutrition. 2022;41(4):958-989.
5. Inoue T, Maeda K, Nagano A, et al. Undernutrition, sarcopenia, and frailty in fragility hip fracture: advanced strategies for improving clinical outcomes. Nutrients. 2020; 12(12):1-26.
6. Reber E, Gomes F, Vasiloglou MF, et al. Nutritional risk screening and assessment. Journal of Clinical Medicine. 2019;8(7):1-19.
7. Del Giorno R, Quarenghi M, Stefanelli K, et al. Phase angle is associated with length of hospital stay, readmissions, mortality, and falls in patients hospitalized in internal-medicine wards: A retrospective cohort study. Nutrition. 2021;85(1):1-7.
8. Sauer AC, Alish CJ, Strausbaugh K, et al. Nurses needed: Identifying malnutrition in hospitalized older adults. Nursing Plus Open. 2016;2(1):21-25.
9. WHO. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. World Health Organization technical report. 2000; p. 252.

10. Kaiser MJ, Bauer JM, Ramsch C, et al. Validation of the Mini Nutritional Assessment short-form (MNA-SF): A practical tool for identification of nutritional status. Journal of Nutrition, Health and Aging. 2009;13(9):782-788.

11. Guigoz Y, Vellas B, Garry JP. Mini Nutritional Assessment: A practical assessment tool for grading the nutritional state of elderly patients. Vellas. 1994;2(1):15-59.

12. MNA® Forms. Nestlé Nutrition Institute. Dostupné z WWW: https://www.mna-elderly.com/mna-forms.

13. Vijewardane SC, Balasuriya A, Myint PK, et al. Determinants of undernutrition and associated factors of low muscle mass and high fat mass among older men and women in the Colombo District of Sri Lanka. Geriatrics. 2022;7(2):1-14.

14. Juhásová I, Pokorná A, Miklášová I, et al. Realizovanie nutričného skríningu sestrou v zariadení sociálnych služieb pre seniorov. Geriatrie a Gerontologie. 2016;5(3):122-127.

15. Division of Nutrition, Physical Activity, and Obesity. Body Mass Index (BMI). CDC. 2022. [cit. 2023–12–05]. Dostupné z WWW: <https://www.cdc.gov/healthyweight/ assessing/bmi/index.html>.

16. Golubnitschaja O, Liskova A, Koklesova L, et al. Caution, "normal" BMI: health risks associated with potentially masked individual underweight—EPMA Position Paper 2021. EPMA Journal. 2021;12(3):243-264.

17. Vágnerová T, Topinková E, Michálková H, et al. Výživa v geriatrii a gerontologii. Praha: Karolinum. 2020; p. 200.

18. Tappenden KA, Quatrara B, Parkhurst ML, et al. Critical role of nutrition in improving quality of care: an interdisciplinary call to action to address adult hospital malnutrition. Journal of Parenteral and Enteral Nutrition. 2013;37(4):482-497.

19. Norman K, Haß U, Pirlich M. Malnutrition in older adults—recent advances and remaining challenges. Nutrients. 2021;13(8):2764.

20. Lengelé L, Bruyère O, Beaudart C, et al. Impact of malnutrition status on muscle parameter changes over a 5-year follow-up of community-dwelling older adults from the SarcoPhAge Cohort. Nutrients 2021;13(1):407.

21. Hoozová, J. Malnutrition in elderly. Palliative Medicine and Pain Management. 2015; 8(1)6-12.

22. Saxena R, Sood N. Nutritional anaemia in geriatric population. World Journal of Anaemia. 2018;2(3-4):103-106.

23. Giorno RD, Quarenghi M, Stefanelli K, et al. Phase angle is associated with length of hospital stay, readmissions, mortality, and falls in patients hospitalized in internal-medicine wards: A retrospective cohort study. Nutrition. 2021;85(1):1-7.

24. Schippinger W. Comprehensive geriatric assessment. Wiener Medizinische Wochenschrift. 2022;172(5-6):122-125.

25. Stalder L, Kaegi-Braun N, Gressies C, et al. Prospective validation of five malnutrition screening and assessment instruments among medical inpatients: Secondary analysis of a randomized clinical trial. Clinical Nutrition. 2022;41(6):1307-1315.

26. Dent E, Hoogendijk EO, Visvanathan R, et al. Malnutrition screening and assessment in hospitalised older people: A review. Journal of Nutrition, Health & Aging. 2019;23(1):431-441.

27. Hoozová, J, Németh F, Leitmann T. Komplexné vyšetrenie geriatrické. Štandardný postup. Bratislava: Ministerstvo zdravotníctva Slovenskej republiky. 2021; p. 44.

28. Guigoz Y, Vellas B. Nutritional assessment in older adults: MNA® 25 years of a screening tool and a reference standard for care and research; What next? Journal of Nutrition, Health & Aging. 2021;25(4):528-583.