ORIGINAL ARTICLE

ASSESSMENT OF NUTRITIONAL STATUS ON THE BASIS OF THE MINI NUTRITONAL ASSESSMENT QUESTIONNAIRE IN PATIENTS ON THE INTERNAL MEDICINE WARD

Katarzyna Gołąbek[1], Anna Mandecka[1], Angelika Chachaj[2,3], Katarzyna Drożdż[2,3], Andrzej Szuba[2,3], Bożena Regulska- Ilow[1]

[1]Wroclaw Medical University, Faculty of Health Sciences, Department of Dietetics, Wroclaw, Poland
[2]4th Military Hospital in Wroclaw, Department of Internal Medicine, Wroclaw, Poland
[3]Wroclaw Medical University, Department of Angiology, Wroclaw, Poland

ABSTRACT

Background. The inadequate nutritional status of hospitalized patients leading to the malnutrition is one of the crucial clinical problems.
Objective. The aim of the study was to assess nutritional status of patients on the basis of the mini nutritional assessment (MNA) questionnaire.
Material and Methods. The study group included 120 patients staying on the internal medicine ward. The average age for female and male was 65±9.7 and 63±8.4 years, respectively. To assess malnutrition the anthropometric measurements and the MNA questionnaire was conducted.
Results. The average MIS (Malnutrition Indicator Score) value in female and male was 25.0 ± 3.0. Among 29% of women and 18.2% of men the risk of malnutrition occurrence was noted. The incorrect values of BMI (body mass index) were observed more frequently in male compared to female (84.0% *vs*. 67.0%). Incorrect values of the MAC (mid arm circumference) and CC (calf circumference) were found respectively in 6.6 % and 10.5% of female and in 2.3% of male. 55.3% of women and 75% of men declared taking more than 3 prescription drugs a day. In women were observed a significantly higher deficiency of dairy products, meat, fish, or poultry as well as meals containing legume plants or eggs per week compared to men (21.0% *vs*. 4.5%). An insufficient daily intake of vegetables was declared by 20.4% of men and 15.8% of women.
Conclusions. The occurrence of malnutrition or its risk was observed in about a quarter of studied hospitalized patients. The malnutrition was worsened by a reported loss of appetite, a significant number of drugs being taken, and inadequate nutrition among the patients.

Key words: *nutritional status, MNA questionnaire, malnutrition, obesity*

STRESZCZENIE

Wprowadzenie. Nieprawidłowy stan odżywienia, w populacji pacjentów hospitalizowanych, prowadzący do rozwoju niedożywienia, należy do istotnych problemów klinicznych.
Cel badań. Celem badania była ocena stanu odżywienia pacjentów na podstawie ankiety MNA (Mini Nutritional Assessment).
Materiały i Metody. Badaniem objęto 120 pacjentów hospitalizowanych na oddziale chorób wewnętrznych. Średnia wieku dla kobiet i mężczyzn wynosiła odpowiednio 65 ± 9,7 i 63 ± 8,4 lat. Aby ocenić stan odżywienia przeprowadzono badania antropometryczne i dokonano oceny stanu odżywienia na podstawie kwestionariusza MNA.
Wyniki. Średnia wartość wskaźnika MIS (ang. Malnutrition indicator score) u kobiet i mężczyzn wynosiła 25,0 ± 3,0. Spośród 29% kobiet i 18,2% mężczyzn odnotowano ryzyko wystąpienia niedożywienia. Nieprawidłowe wartości BMI (body mass index) obserwowano częściej u mężczyzn niż u kobiet (84,0% w porównaniu z 67,0%). Nieprawidłowe wartości MAC (ang. Mid arm circumference) i CC (ang. Calf circumference) stwierdzono odpowiednio u 6,6% i 10,5% kobiet oraz u 2,3% mężczyzn. 55,3% kobiet i 75% mężczyzn deklarowało przyjmowanie więcej niż 3 leków na receptę dziennie. U kobiet obserwowano znacznie większy niedobór produktów mlecznych, mięsa, ryb lub drobiu, a także posiłków zawierających rośliny strączkowe lub jaja w tygodniowej diecie, w porównaniu z mężczyznami (21,0% vs. 4,5%). Niewystarczające dzienne spożycie warzyw deklarowało 20,4% mężczyzn i 15,8% kobiet.

Corresponding author: Anna Mandecka, Wroclaw Medical University, Faculty of Health Sciences, Department of Dietetics, 51-616 Wroclaw, Parkowa 34, Poland, phone: +48 667 421 235, e-mail: anna.mandecka@umed.wroc.pl

Wnioski. Występowanie niedożywienia lub jego ryzyko obserwowano u około jednej czwartej pacjentów hospitalizowanych. Niedożywienie pogarszało się powodu zgłoszonej utraty apetytu, znacznej liczby przyjmowanych leków i nieprawidłowego odżywiania wśród pacjentów.

Słowa kluczowe: *stan odżywienia, ankieta MNA, niedożywienie, otyłość*

INTRODUCTION

Inadequate nutrition, leading to the development of malnutrition, is one of the significant clinical problems of hospitalized patients on all hospital wards. According to the World Health Organization (WHO) in the years 2010-2012 the problem of malnutrition concerned about 12.5% of the world population [16]. The authors of the multi-center study, conducted in six European countries including Poland during the period 2006-2012, observed an occurrence of malnutrition in over 23% of the Polish seniors [18].

Adequate nutrition adjusted to metabolic and clinical conditions constitute a very significant yet still unappreciated element of treatment. The occurrence of malnutrition, as well as overweight and obesity, resulting in numerous quality deficiencies, is connected with inadequate nutrition in hospitals and at patients' homes. It can also result from the severity of disease and the method of treatment, thus adversely affecting a patient's prognosis [22].

The occurrence of malnutrition in hospitalized patients with underweight or obesity is significantly more costly for the public healthcare system than treating patients having a normal weight. It is estimated that the cost of treatment of a person who is overweight is 10% higher, while in an obese person it is 36% higher than in a person with normal body weight. Moreover, the occurrence of obesity significantly increases the risk for the development of complications and mortality [3].

Excess body weight is given as a reason accounting for 80% of type 2 diabetes, 55% of high blood pressure and 35% of ischemic heart disease [21]. Obesity does not exclude protein-energy malnutrition (PEM). In the elderly with overweight and obesity, seemingly well nourished, quality malnutrition is prevalent. Deficiencies of macro-nutrients as well as vitamins and minerals aggravate concomitant diseases [21, 29].

Standards of treatment on hospital wards should take into account the adequate nutritional status and the diet of patients with underweight as well as overweight and obesity. The European Society for Clinical Nutrition and Metabolism (ESPEN) recommends the MNA questionnaire to assess nutritional status in patients after the age of 60 years [4]. By the MNA questionnaire, it is possible to predict the occurrence of malnutrition before deficiencies and concentrations of proteins appear in the blood serum. The occurrence of malnutrition in hospitalized patients not only depends on current nutritional status but also the severity of the disease, pharmacotherapy, eating habits and the patient's mental state. The MNA questionnaire enables a broad evaluation of the nutritional status and the psycho-physical condition of the patient [8, 27].

The aim of the study was to assess nutritional status in hospitalized patients on the basis of the MNA questionnaire and selected anthropometric parameters.

The research received the approval of the Bioethics Commission at the Wroclaw Medical University, Poland.

MATERIAL AND METHODS

The study group included 120 patients (76 women; 44 men) hospitalized in the Internal Medicine Clinic of the 4th Military Hospital with Policlinic in Wroclaw. The average age of female and male participants was 65 ± 9.7 years (min- 50; max- 84) and 63 ± 8.4 years (min- 50; max- 84), respectively. The characteristic of the study population is shown in Table 1.

In order to assess malnutrition the Mini Nutritional Assessment (MNA) questionnaire was conducted. On its basis the Malnutrition Indicator Score (MIS) was determined. The score of the MNA questionnaire is comprised by four parts: anthropometric measures (body mass index (BMI), mid arm circumference (MAC), calf circumference (CC), general assessment, nutrition and the patient's subjective self-evaluation (self-esteem). The final score qualifies the patients to one of the 3 groups: normal nutritional status, at risk of malnutrition or malnourished. Based on the MIS results, the research patients were divided accordingly:

MIS < 17.5 points - patients malnourished

MIS: 17.5-23.5 points – patients at risk of malnutrition

MIS > 23.5 – patients with normal nutritional status

Waist measurement was taken at the narrowest place of the torso and as reference values the following were taken: ≤ 80 cm in women and ≤ 94 cm in men [34]. MAC was measured half-way between the coracoid process and the elbow in the non-dominant limb. The MAC reference value was assumed to be 23 cm (according to the values assumed in the MNA questionnaire) .

On the basis of achieved anthropometric parameters the average value of BMI and the average value of waist to hip ratio (WHR) were calculated.

The average WHR was calculated for patients with confirmed overweight or obesity measured by the BMI [33, 34].

The measurement of blood pressure was taken twice, after a previous 5-minute-rest of the patient, in the sitting position with the blood pressure shoulder monitor Omron M6 Comfort (HEM-7000- E(V)). In order to determine irregular values of blood pressure the 2013 ESH/ESC guidelines were assumed [10].

Statistical analysis was perform using the "Statistica v 12.0 PL" program by StatSoft Inc. USA. The obtained results were summarized by average (*X*), standard deviation (SD) and median (M). Assessment of the significance of differences between average values in the studied groups, in order to compare two independent samples, was conducted applying the U *Mann-Whitney* test. The statistically significant differences between the categorical variables was assessed by the *Chi²* test. In case of fewer than 5 observations, Yates' correction, in the *Chi²* test was applied. The level of statistical significance was assumed at p<0.05.

RESULTS

The percentage of malnourished female and male participants, at risk of malnutrition or with normal nutritional status according to the results of the MNA questionnaire was shown in Fig. 1.
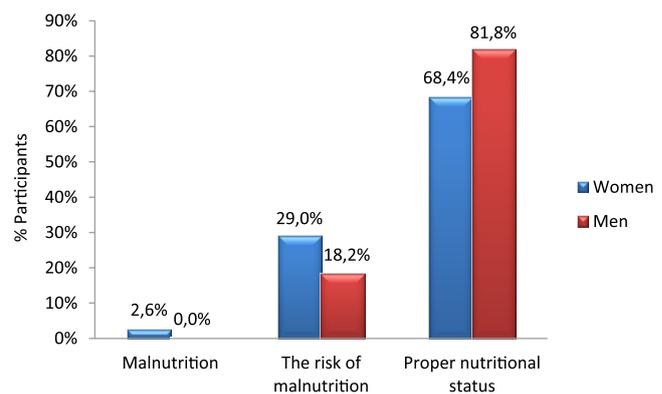

Figure 1. The prevalence of malnutrition, assessed on the basis of the MNA questionnaire, in the study population of women and men

The average value of the MIS index in the research population equaled 25.0 ± 3.0. Among 2.6% of female the malnutrition was observed. In 29% of women and 18.2% of men the risk of malnutrition was noted. The majority of participants, i. e. about 68% of women and about 82% of men were considered to have proper nutritional status.

Average values of body mass, height and waist circumference were significantly higher in the group of men, in comparison to the group of women. Incorrect average values of the WHR were observed in patients with overweight or obesity, indicating the occurrence of visceral obesity (Table 1.).

Table 1. Characteristics of the study population of women and men

Parameter	Women (W) n = 76		Men (M) n = 44		U M-W W vs M
	X±SD	**M**	**X±SD**	**M**	p
Age [yrs]	65±9.7	64.0	63±8.4	62	Ns
Body mass [kg]	72.7±16.7	72.0	86.8±17.0	86.5	0.00001
Height [cm]	158.5 ± 6.4	158.0	171.5 ± 7.6	172.0	0.00000
Waist circumference [cm]	92.4±15.7	94.0	104.5±11.9	104.8	0.00006
Hips circumference [cm]	104.6±16.5	103.5	105.2±8.5	105.5	Ns
WHR*	1.0±0.8	0.9	0.95±0.1	0.95	0.00
SBP [mmHg]	126.5±30.0	126.5	139.7±22.2	139.5	0.02279
DBP [mmHg]	77.7±17.3	78.8	86.7±13.0	86.8	0.00000

n- number of people studied; M- median; X±SD - average ± standard deviation; BMI- Body Mass Index; WHR*- waist to hip ratio assessed for women (n=51) and men (n=37) with overweight and obesity; SBP- systolic blood pressure; DBP- diastolic blood pressure; U M-W - statistical test of U Mann-Whitney; *p*<0.05- the value statistically important; Ns - non-statistically important value

It was evaluated that average values of systolic blood pressure (SBP) and diastolic blood pressure (DBP) were significantly higher in the group of male, in comparison to females (SBP: 139.7±22.2 mmHg *vs.* 126.5±30.0 mmHg, p=0.02279;DBP: 86.7±13.0 mmHg *vs.* 77.7±17.3 mmHg, p=0.000). Improper values of the blood pressure ($\geq$ 140/90 mmHg) were found in 47.7% of men and 34.2% of women.

The average values of anthropocentric parameters and the incidence of occurrence of irregular values of the researched parameters on the basis of the MNA questionnaire in the research population were presented in Table 2.

Average values of BMI indicated the occurrence of overweight both in women and men. Significantly more frequently the occurrence of abnormal values of BMI were observed in men compared to women (84.0% *vs.* 67.0%, p=0.0000). Incorrect values of MAC and CC were found respectively in 6.6% and 10.5% of women and in 2.3% of men.

Table 2. The average values and the prevalence of abnormal values of the analyzed parameters, based on a questionnaire MNA, in a study population of women and men

Mini Nutritional Assessment	Women (W) n = 76		Men (M) n = 44		W vs M* p
Anthropometric parameters	**X±SD**	**n (%)**	**X±SD**	**n (%)**	
BMI ≥ 25.0 kg/m²	29.1±6.3	51 (67.0)	29.8±4.3	37(84.0)	0.0000
MAC < 23 cm	29.5±4.7	5 (6.6)	30.5±3.4	1 (2.3)	Ns
CC < 31 cm	36.2±4.0	8 (10.5)	37.5±3.9	1 (2.3)	Ns
Weight loss during the last 3 months	*n (%)*		*n (%)*		
	16 (21.0)		8 (18.2)		Ns
Overall assessment	**n (%)**		**n (%)**		
Lives independently (not in nursing home or hospital)	63 (82.9)		33 (75.0)		Ns
Takes more than 3 prescription drugs per day	42 (55.3)		33 (75.0)		0.0314
Has suffered psychological stress or acute disease in the past 3 months	32 (42.1)		8 (18.2)		0.0074
Mobility- patient moves without any problems	76 (100.0)		44 (100.0)		Ns
No neuropsychological problems	73 (96.0)		43 (97.7)		Ns
Pressure sores or skin ulcers	1 (1.3)		2 (4.5)		Ns
Nutrition	**n (%)**		**n (%)**		
< 3 meals per day	5 (6.6)		7 (15.9)		Ns
In the daily diet no dairy products. meat. fish or poultry and food containing eggs or legumes per week	16 (21.0)		2 (4.5)		0.0147
Fruits and vegetables < 2 p/ day	12 (15.8)		9 (20.4)		Ns
Patients with decreased of appetite	19 (25.0)		10 (22.7)		Ns
Fluids < 5 cup's/ day	16 (21.0)		6 (13.6)		Ns
Patient unable to eat without assistance or self-fed with some difficulty	3 (3.9)		0 (0.0)		Ns
Self - view of nutritional status	**n (%)**		**n (%)**		
Patient views self as:					
- being malnourished	4 (5.3)		0 (0.0)		Ns
- is uncertain of nutritional state	11 (14.5)		0 (0.0)		0.0081
- having no nutritional problem	61 (80.3)		44 (100.0)		0.0016
In comparison with other people of the same age. the patient consider his / her health status is:					
- not as good	21 (27.6)		5 (11.4)		0.0371
- does not know	12 (15.8)		8 (18.2)		Ns
- as good	25 (32.9)		16 (36.4)		Ns
- better	18 (23.7)		15 (34.1)		Ns

n- number of people studied; *X*±SD- average ± standard deviation; BMI- Body Mass Index; MAC (Mid- arm Circumference); CC (Culf Circumference); p - portion; *W vs M - Chi² statistical test; p<0.05 - the value statistically important; *Ns*- non- statistically important value

The loss of body mass within the last 3 months was observed in 21% of women and 18.2% of men. In the general assessment of the MNA questionnaire a significantly more frequent intake of more than three prescription drugs recommended by the doctor was found in men compared to women (75% *vs.* 55.3%, p=0.0314). The percentage of the patients who underwent severe stress or a serious illness within the previous 3 months was significantly higher in the group of women comparing to men (42.1% *vs.*18.2%, p= 0.0074).

16% of men and 7% of women declared having fewer than 3 meals a day in their daily diet. Among diet of women, the insufficient intake of dairy products, meat, and also meals containing legumes or eggs weekly was observed significantly more frequently compared to men (21% *vs.* 4.5%, p=0.0147). Insufficient intake of vegetables in the diet (<2 portions/day) was declared by 20.4% of men and 15.8% of women. There was observed a significant percentage of the studied patients in whom the loss of appetite was caused by an illness (25% of women, 22.7% of men).An incorrect fluid intake (< 5 cups/a day) was observed in 21.0% of womendiet and 13.6% of men. It was noted that only about 4% of women were incapable of eating without assistance or had meals with difficulties.

In self-perception of health and nutrition the 14.5% of women declared a worse nutritional status than men. About 20% of studied women declared problems with nutritional status. Additionally, 27.6% of the women assessed their nutritional status as worse in comparison to their peers. The percentage of men evaluating their health condition in such a way was significantly lower and equaled 11.4%.

Table 3 and Table 4 present a comparison of the average values of selected anthropometric parameters and the blood pressure in the group of female and male participants, depending on the score of the MNA questionnaire.

Table 3. Comparison of mean values of selected parameters (anthropometry, body composition analysis, blood pressure) between the examined women with malnutrition or risk of malnutrition and women with proper nutritional status, according to MNA questionnaire

Parameter	Incorrect value	Women G1 MNA ≤ 23.5 points (n=24)			Women G2 MNA > 23.5 points (n=52)			U M-W GI vs GII p	Chi² GI vs GII p
		$X \pm$ SD	M	n (%)	$X \pm$ SD	M	n (%)		
Body mass [kg]	-	67.2±15.9	64.4	-	75.2±16.6	74.5	-	Ns	-
WC	≥ 80 cm	87.5±14.8	84.5	15(62.5)	94.7±15.6	95.0	38 (73.1)	Ns	Ns
CC	< 31.0 cm	35.3±3.8	35.7	4 (16.7)	36.7±4.1	37.0	4 (7.7)	Ns	Ns
MAC	< 23.0 cm	28.1±5.0	28.5	4 (16.7)	30.1±4.4	29.5	1 (1.9)	Ns	0.0160
BMI	≥ 25.0 kg/m²	26.8±6.0	25.7	13(54.2)	30.1±6.1	30.7	38 (73.1)	0.0288	0.0421
WHR*	>0.85	0.85±0.1	0.84	13(100)	1.4±1.2	0.90	34 (89.5)	Ns	Ns
SBP	≥ 140 mmHg	136.2±23.7	127.5	7 (29.2)	123.9±31.4	126.5	13 (25.0)	Ns	Ns
DBP	≥ 90 mmHg	78.4±11.6	78.3	3 (12.5)	77.3±20.0	80.7	6 (11.5)	Ns	Ns

n- number of people studied; M- median; X±SD- average ± standard deviation; WC - waist circumference; MAC - Mid- arm Circumference; CC - Culf Circumference; BMI - Body Mass Index; WHR*- waist to hip ratio assessed for women (n=51) and men (n=37) with overweight and obesity; SBP- systolic blood pressure; DBP- diastolic blood pressure; U M-W- statistical test of U *Mann-Whitney*; p<0.05 - the value statistically important; *Ns*- non-statistically important value

Table 4. Comparison of mean values of selected parameters (anthropometry, body composition analysis, blood pressure) between the examined men with malnutrition or risk of malnutrition and men with proper nutritional status, according to MNA questionnaire

Parameter	Incorrect value	Men G1 ≤ 23.5 points (n= 8)			Men G2 > 23.5 points (n= 36)			U M-W GI vs GII p	Chi² GI vs GII p
		X ± SD	M	n (%)	X ± SD	M	n (%)		
Body mass [kg]	-	74.8 ± 24.0	72.8	-	89.5 ± 14.2	89.5	-	0.0319	-
Waist circumference	≥ 94 cm	100.4 ± 12.6	95.5	6 (75.0)	105.4 ± 11.7	105.0	30 (83.3)	Ns	Ns
CC	< 31.0 cm	36.2 ± 5.0	36.0	0 (0.0)	37.8 ± 3.6	38.0	1 (2.8)	Ns	Ns
MAC	< 23.0 cm	28.7 ± 5.0	29.0	1 (12.5)	30.8 ± 2.8	30.0	0 (0.0)	Ns	0.0319
BMI	≥ 25.0 kg/m²	26.7 ± 5.1	24.4	4 (50.0)	30.53.9	30.1	33 (91.7)	0.0308	0.0036
WHR*	>0.90	1.04±0.1	1.06	3 (75.0)	1.00±0.1	1.00	15 (45.4)	Ns	Ns
SBP	≥ 140 mmHg	126.0 ± 24.1	135.0	3 (37.5)	142.8 ± 23.2	141.0	18 (50.0)	Ns	Ns
DBP	≥ 90 mmHg	81.7 ± 14.5	80.0	1 (12.5)	88.1 ± 12.8	89.0	16 (44.4)	Ns	Ns

n- number of people studied; M- median; X±SD - average ± standard deviation; MAC- Mid- arm Circumference; CC - Culf Circumference; BMI- Body Mass Index; WHR*- waist to hip ratio assessed for women (n=51) and men (n=37) with overweight and obesity; SBP- systolic blood pressure; DBP- diastolic blood pressure; U M-W - statistical test of U *Mann-Whitney*; p<0.05- the value statistically important; Ns- non-statistically important value

The occurrence of improper values of the MAC (< 23 cm) was observed significantly more frequently in the group of malnourished women in the study in comparison with the women in whom malnutrition was not found (16.7% *vs.* 1.9%; p=0.0160). A similar relationship was found in groups of men (G1 *vs.* G2; p=0.0319). Moreover, in the group of malnourished men having significantly lower average values of body mass were noted in comparison to the participants with normal nutritional status (74.8 ± 24.0 kg *vs.* 89.5 ± 14.2 kg; p=0.0319).

Average values of BMI were incorrect both in the groups of female and male and were significantly higher in the group of female and male participants who were not found to be malnourished in comparison with the malnourished participants. The percentage of participants with abnormal values of the BMI was significantly higher in women and men with proper nutritional status, in comparison to the malnourished women and men (73.1% *vs* 54.2%; p=0.0421 and 91.7% *vs* 50.0%; p=0.0036).

DISCUSSION

Both excess and shortage of body mass negatively influence the patients' health. They lead to numerous disturbances in the body functioning, metabolism of drugs and regulation of food intake. Malnourished patients are at risk of qualitative and quantitative deficiencies in the diet. Disturbances in the nutritional status in hospitalized patients additionally deepen complex pharmacotherapy and periods of posts related to the diagnosis, affecting the metabolism of nutrients [14, 30].

In the study population malnutrition connected with underweight was not found. In the majority of the research participants the occurrence of overweight or obesity was noted. In the study conducted by *Skop-Lewandowska* et al. [26] in a group of patients with cardio-vascular diseases at the age over 39 years, the incorrect body weight was recognized in over 70%. *Kołtuniuk* and *Rosińczuk* et al. [17] recognized overweight and obesity in a majority of patients from surgical wards in the elderly. In that study, the occurrence of excessive body mass was confirmed in 38% of participants and obesity in 30% of them.

The occurrence of abdominal obesity is connected with a higher share of metabolically active visceral fat tissue. Numerous clinical studies indicate a positive correlation of the occurrence of abdominal obesity and the higher risk of metabolic disease [2, 6]. In the research population both in the group of women and men, average values of waist circumference and WHR index indicated existence of abdominal obesity. In the study conducted by *Gacek* et al. [11] among the patients suffering from diabetes type 2, at the average age of 55 years, the occurrence of abdominal obesity was indicated in 72% of women and 74% of men. Average values of waist circumference and WHR indicated the occurrence of abdominal obesity, as it was observed in our study.

In the study conducted by *Bator* et al. [1], among Wroclaw patients with recognized the metabolic syndrome the occurrence of abdominal obesity was indicated in 100% of women and 70% of men. Over 90% of all the participants had incorrect body waist. *Lakowska* et al. [20], conducted research in patients with hypertension. Abdominal obesity was found in 50% of women and 39.2% of men. Additionally, in the study conducted by *Goluch-Koniuszy* and *Fabianczyk* [12], in the group of persons aged 49-60 years, the percentage of persons with excess body mass and abdominal obesity was significantly higher (76% of women and 89% of men), in comparison with own research. In half of the participants, additional diseases were noted such as: hypertension, diabetes, rheumatoid arthritis, or hormonal disorders.

It can be anticipated that the increased incidence of obesity and the increased share of metabolically active abdominal fat tissue, worsens the course and treatment of the disease, resulting in hospitalization, and also affects the outcome of the final evaluation of the nutritional status of the patient. The incidence of overweight and obesity does not exclude deficiencies of nutrients and protein-caloric malnutrition, particularly frequently observed in the elderly [31].

The incidence of malnutrition in hospitalized patients depends not only on the current nutritional status, but also on the stage of the disease, the pharmacotherapy, dietary habits as well as of the mental condition [19]. In the research population, malnutrition was found in about 24% of the patients. The incidence of malnutrition was smaller in the group of women and it was not indicated in the group of men. The Swedish research study conducted by *Persson* et al. [25] indicated that assessment of the nutritional status with the MNA questionnaire significantly correlated with mortality. In malnourished patients, where the average MNA equaled < 17.5 points, the level of mortality after a year was 40% and after 3 years 80%. As regards the patients with normal nutritional status, where the MNA was on average > 23.5 points, after a year mortality equaled 20%, and after 3 years 50%. Moreover, in the study conducted by *Diekmann* et al. [9] it was indicated that the results of the MNA questionnaire correlated with the albumin concentration and predicted a longer hospitalization of patients, as opposed to the Subjective Global Assessment (SGA) and the Nutrition Risk Score (NRS) scale. The MNA questionnaire, out of the three, best specified the normal nutritional status and the patients' survive-ability.

In the same area as in the own study *Wyka* et al. [35], in research among elderly, obtained similar results of assessment of the nutritional status with the MNA questionnaire as in our study. Malnutrition was not found in the participants who were found at risk of malnutrition constituted about 16% of the population. In the groups of patients with normal nutritional status, higher results of anthropometric parameters were noted: BMI, WHR, and waist in comparison to the groups with recognized risk of malnutrition. *Strugała* et al. [27], assessing the nutritional status in patients of the geriatric ward at the ages from 65 to 89 years, identified malnutrition in 7% of patients and a risk of malnutrition in 60%. *De Luis et al.* [7], in research among Spanish patients at ages over 70 years from internal medicine wards, indicated that 24% of the population constituted malnourished patients and 50% persons with a risk of malnutrition. In Brazil the risk of malnutrition was assessed in the elderly living in communal hostels in Rio de Janeiro with the MNA questionnaire. According to the MNA, 8.3% of the participants were malnourished, in 56% a risk of malnutrition was indicated and 36.1% of the participants had normal nutritional status. A significant correlation was found between the results of the MNA questionnaire and BMI (r=.391, p=0.000) [24].

Among the patients from our research the majority of the population took more than 3 drugs a day. *Saliburska*

and *Bogdanski* [28], in research conducted among the sick suffering from diabetes type 2, indicated that 60% of the patients take over 4 drugs a day and 9% over 3 drugs a day. Additionally, it was recognized that the eating habits of patients can affect correct metabolism and medication efficacy. It is believed that taking 2 drugs simultaneously by a patient can lead to the occurrence of adverse interactions in about 5,6% of people, 5 drugs at the same time in about 50%, and the intake of 8 pharmacological products increase the risk of the occurrence of adverse interactions in 100% patients [32].

Over 60% of the patients with a recognized risk of malnutrition indicated a significant or moderate loss of appetite. Loss of appetite is the result of many factors, such as: the disease stage, oral health, disturbances of taste and smell resulting from the disease and/or senility, disorders of the digestive system and the mental state of the patient. *Miwa* et al. [23] noted significant changes in the intake of food products, resulting from disturbances in smell and taste in the elderly. In this research, 36% of respondents pointed out that smell disturbances resulted in a more seldom choice of fresh food. Among 49% of the elderly, disturbances of smell determined the preparation of meals. In 75% they resulted in scorching meals and reducing the amount of food eaten. A chronic disease, limitations in physical activity, and the solitude of hospitalized elderly can cause depression which affects about 15% of persons after 65 years old. It is documented that depression can decrease the appetite of patients [15].

In our study, a smaller general number of MNA points was connected with lower self-evaluation of one's health condition. A higher percentage of patients evaluating their health as worse was noted in the group with a confirmed risk of malnutrition in comparison with persons with normal nutritional status. A similar regularity was noted by *Jachimowicz* et al. [13] in the research of students of the third age university, at the age over 65 years. Worse nutritional status was connected with a more frequent occurrence of emotional disturbances, reduction of life energy, increased pain perception and more frequent movement limitations.

The assessment of nutritional status on the basis of anthropometric parameters and the MNA questionnaire is a simple, non-invasive and effective screening tool administered to recognize malnutrition in the elderly, and is also recommended to identify the risk of malnutrition in this group of the population earlier. The results of the MNA questionnaire are reliable and can be easily interpreted by doctors and health-care professionals, in hospitals, nursing homes, or for early detection of threats connected with malnutrition [5]. Early recognition of malnutrition and the appropriate intervention in hospital patients may prevent later complications in treatment and convalescence.

CONCLUSIONS

1. The assessment of nutritional status on the basis of the MNA questionnaire indicated the occurrence of malnutrition or the risk of malnutrition in about a quarter of the study population.
2. The average values of anthropometric indices indicated the occurrence of overweight and obesity in women and men. It was pointed out that the diets of the patients contained an incorrect amount of products containing plant and animal protein, fruit and vegetables as well as fluids.
3. Hospitalized patients from the study require a multi-aspect assessment of nutritional status because a seemingly normal nutritional status resulting from excessive body mass may lead to incorrect assessment of the patient's health condition.

Conflict of interest
The authors declare no conflict of interest.

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