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The morbidity and nutritional status in people 65 years and older hospitalized in medical ward

Chorobowość a stan odżywienia osób powyżej 65. roku życia hospitalizowanych na oddziale chorób wewnętrznych

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Key words

albumin, anthropometric measurements, cholesterol, elderly, morbidity

Słowa kluczowe

albuminy, badania antropometryczne, cholesterol, ludzie starsi, chorobowość

Summary

Introduction. Nutritional status plays an important role in maintaining elderly people's health.

Aim. The aim of the study was to compare the morbidity and nutritional status of people 65 years and older, hospitalized in medical ward.

Material and methods. A total of 104 individuals hospitalized on medical ward were included. The study used a questionnaire method and the nutritional status was assessed using anthropometric measurements and laboratory tests.

Results. Relying on BMI criteria, 31.7% of participants were found overweighted and 45.2% were obese, what was in fact more than results revealed in other polish studies. Between four BMI groups, there were found statistically significant differences in terms of having metabolic and endocrine and hematology diseases. No significant correlation of BMI with participants' age, education, marital status nor laboratory tests was found. Polypathology was observed in 88.5% of participants. The mean number of chronic diseases was 3.5 ± 1.6 (1-8). There was not confirmed that number of chronic diseases significantly differed in the groups with different BMI values. The assessment of laboratory indexes known to reflect the nutritional status (concentration of albumin, cholesterol, TLC in serum) did not show statistically significant differences among participants.

Conclusions. The obesity and polypathology were shown to be a problem in elderly. The present study showed that obesity may play some role in having metabolic and endocrine diseases but not cardiovascular problems. Nevertheless, further studies aimed at determining the relationship between nutritional status and morbidity of elderly people are needed.

Streszczenie

Wstęp. Stan odżywienia odgrywa ogromną rolę we wzmacnianiu stanu zdrowia osób starszych.

Cel pracy. Celem niniejszej pracy było porównanie chorobowości i stanu odżywienia osób powyżej 65. roku życia hospitalizowanych na oddziale chorób wewnętrznych.

Materiał i metody. Do badania zakwalifikowano 104 osoby starsze hospitalizowane na oddziale chorób wewnętrznych. Wykorzystano metodę sondażu diagnostycznego i technikę wywiadu kwestionariuszowego. Stan odżywienia oceniono na podstawie badań antropometrycznych i wybranych badań laboratoryjnych.

Wyniki. Biorąc pod uwagę kryteria BMI, u 31,7% badanych stwierdzono nadwagę, a u kolejnych 45,2% otyłość, co stanowi większy odsetek niż podawany w doniesieniach z innych polskich badań. Porównując badanych zakwalifikowanych na podstawie wyników BMI do jednej z czterech grup, stwierdzono istotne statystycznie różnice w zapadaniu na choroby metaboliczne i endokrynne oraz krwi. Nie potwierdzono istotnego związku BMI z wiekiem, wykształceniem, stanem cywilnym badanych czy wynikami ich badań laboratoryjnych. U 88,5% badanych stwierdzono wielochorobowość. Średnia liczba chorób wynosiła 3,5 ± 1,6 (1-8) i nie miała istotnego związku z wartościami BMI. Ocena badań

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określanych jako markery stanu odżywienia (poziom albumin, cholesterolu, TLC w osoczu krwi) nie wykazała istotnych różnic pomiędzy badanymi.

Wnioski. Otyłość i wielochorobowość są znaczącymi problemami u osób starszych. Potwierdzono, iż otyłość może mieć związek z zapadaniem na choroby metaboliczne i endokrynne, ale nie potwierdzono tego związku dla chorób układu sercowo-naczyniowego. Niezbędne jest prowadzenie dalszych badań oceniających związek pomiędzy chorobowością i stanem odżywienia u osób starszych.

INTRODUCTION

One of the significant factors influencing both the Polish and the global health situation is the process of demographic and epidemiological transition of societies. Polish society has already crossed the threshold for old age (12%) and joined the ranks of the so-called "demographically old societies". The Polish Central Statistic Office projects that due to decreased population growth, decreased mortality and increased average life expectancy, the number of people 65 years and older in Poland will increase to 22% by 2025 (1).

This appears to be a global tendency. Older people in Europe currently represent around 20% of the total population and the proportion is expected to increase to 29% by 2025. The proportion of the population aged 60 and over is expected to reach 25% in North America, 21% in eastern Asia, 14% in Latin America and 11% in south and central Asia as well (2).

An ageing society poses a major challenge to health care systems as it is integrally connected with increased demand for medical and care services. In view of the fact that older people are often afflicted by multiple diseases and disabilities, the priority of geriatric care should be to take action towards maintaining independent living amongst this population. Appropriate nutritional monitoring of elderly people, in particular those hospitalized in medical institutions can significantly improve their health status.

Elderly individuals are at increased risk of both obesity and undernutrition. Obesity, especially obesity distributed predominantly in the abdominal area, is one of the most serious public health problems in Europe and across the globe. It is associated with insulin resistance, which can in turn cause diabetes and may also play a role in hypertension and hyperlipidemia (2-4).

However, current data does not support conjectures that mild to moderate overweight is associated with higher mortality or disability in the elderly (5, 6).

In populations of elderly people there is a strong inverse relationship between their disability, morbidity and as a consequence poor quality of life and poor nutritional status (7-9).

Elderly persons are vulnerable to undernutrition, especially protein-energy malnutrition (PEM), which is associated with infections, falls, pressure sores, fractures, reduced autonomy and it may worsen the progression of several age-related diseases as well (10-12).

A number of factors related to physiology and pathology of ageing can increase the risk of improper nutrition in elderly people (13-17).

In Poland there are still very few studies regarding the nutritional status of elderly hospitalized patients, but international findings are indeed cause for concern. According to number of authors, undernutrition can affect up to 50% of elderly people hospitalized in short-term care wards and significantly higher, up to 85%, of people living in long-term care wards.

AIM

The aim of this study was to compare the morbidity and nutritional status of people 65 years and older, hospitalized in medical ward in south Poland.

MATERIAL AND METHODS

Study design and population

The study was carried out between November 2008 and July 2010, in Bielsko-Biała district, in South Poland. Data was collected in one medical ward (The Public Railwaymen's Hospital in Wilkowice Bystra). The study involved people who were at least 65 year old on the day of the examination. Initially, the overall number of people hospitalized on medical ward fulfilling the age criterion was 176. Eligibility for participation in the study was assessed based on the initial interviews and analysis of medical documentation. All participants were informed that they could refuse to participate at any stage of the study.

The following non-inclusion criteria were implemented:

- < 65 years,
- lack of subject's consent to participate in all stages of the study,
- active phase of neoplastic disease on course of chemo- or radiotherapy,
- patients with severe cognitive impairment,
- physical condition hindering anthropometric examination (such as immobile patients, contraindication to lifting or amputation of both lower extremities),
- period of hospitalization on the medical ward longer than 10 days.

Ethics

The procedure of the study was approved by the local Bioethical Commission (the opinion number 26/01/2008).

Instruments and data collection

The study used a questionnaire method and was conducted by means of direct interview. The nutritional status was assessed anthropometric measurements

and laboratory tests. All measurements were recorded by one individual on the patient information form. It contained sociodemographic (age, gender, marital and educational status) and clinical data (morbidity).

Anthropometry measurements

The baseline body weight was obtained by weighing all patients in a state of fasting, using the same calibrated electronic wheelchair scale (SECA-EC, type approval D 05-09-024). The height was calculated using the patients age and knee height (KH) measured in centimeters in accordance with Chumlea's formula:

for men: H (cm) = 64.2-0.04 x age + 1.83 x KH,

for women: H (cm) = 84.9-0.24 x age + 1.83 x KH.

KH is a surrogate measurement employed to estimate the height of elderly and non-ambulatory patients (18-22).

Body Mass Index (BMI) is an index of weight-for--height that is commonly used to classify overweight and obesity in adults as well as describe the degree of undernutrition (23). It is calculated using the formula: Wt(kg)/Ht(m^2).

Laboratory tests

Blood samples for serum albumin, cholesterol concentration and total lymphocytes count (TLC) were analyzed according to standard protocol in the clinical laboratory at The Public Railwaymen's Hospital in Wilkowice Bystra, which operates a rigorous quality control program (Quality Control Service, Roche).

Statistical analysis

All data was analysed and verified statistically using Statistica software (version 10). Quantitative features have been presented with the arithmetic mean and standard deviation. The Mann-Whitney non-parametric U test was used in the assessment of differences between the groups of independent variables. The Kruskal-Wallis test was used to compare variables in study participants with different nutritional statuses. In order to measure the statistical dependence between variables the Spearman's rank correlation test was performed. P-values below 0.05 were considered significant.

RESULTS

A total of 104 individuals hospitalized on medical ward, aged 65 years and older were included in the study. Their sociodemographic characteristics are summarized in table 1.

The study group consisted of 26 men and 78 women. The age of participants ranged from 65 to 89 years (75.8 ± 6.0). A significant majority of the study population (65.4%) were divorced or widows(ers) while 25% of them were married and 9.6% were single. Over half the participants had completed only primary school (51%) or had no formal education (1.9%). The mean length of the hospital stay was 3.2 ± 2.5 days (range 1-8) and the mean number of chronic diseases was 3.5 ± 1.6 (1-8).

Nutritional data according to gender

Distribution of anthropometric and laboratory variables in the study group is shown in the table 2. The average weight in study participants was 72.0 ± 14 kg and the height was 159.9 ± 8.4 cm. Males were significantly higher than females ($p < 0.001$). The average BMI value of the subjects was 28.9 ± 5.4 kg/m^2 (16-42.8 kg/m^2). There was no significant correlation between BMI scores and the participants' gender.

Serum concentration of laboratory indexes known to reflect the nutritional status (albumin, cholesterol, TLC) did not show statistically significant differences among participants. The average level of albumin was 4.1 ± 0.6 g/dl, level of serum cholesterol was 190.9 ± 45.9 g/dl and level of TLC was 2042.7 ± 673.2/mm^3. TLC values in females were found to be slightly below the recommended norm; its average value was assessed as 1974 ± 604.5/mm^3.

Table 1. Sociodemographic characteristics of the study group according to the gender, mean ± SD (range), n (%).

Variables	Females	Males	Total	p-value*
Number	78	26	104	0.46
Age (years)	76.1 ± 5.8 (65-89)	75.2 ± 6.9 (65-89)	75.8 ± 6.0 (65-89)	
Marital status:				0.26
Single	7 (9.0)	3 (11.5)	10 (9.6)	
Married	17 (21.8)	9 (34.6)	26 (25.0)	
Divorced/Widow(er)	54 (69.2)	14 (53.8)	68 (65.4)	
Education:				0.02**
None	2 (2.6)	0	2 (1.9)	
Primary school	44 (56.4)	9 (34.6)	53 (51.0)	
Vocational school	8 (10.3)	3 (11.6)	11 (10.5)	
College	21 (26.8)	9 (34.6)	30 (28.9)	
High school	3 (3.9)	5 (19.2)	8 (7.7)	
Length of stay in medical ward (days)	2.9 ± 2.4 (1-8)	3.8 ± 2.5 (1-8)	3.2 ± 2.5 (1-8)	0.10
Number of chronic diseases	3.6 ± 1.6 (1-8)	3.0 ± 1.5 (1-6)	3.5 ± 1.6 (1-8)	0.11

*Mann-Whitney test

**statistically significant differences

Table 2. The distribution of participants' nutritional data according to gender, mean ± SD (range).

	Females	Males	Total	p-value*
Number	78	26	104	
Weight (kg)	73.7 ± 14.7 (38-115)	78.9 ± 15.5 (51.5-104)	72.0 ± 14.0 (38-115)	0.10
Height (cm)	156.9 ± 6.7 (141-174)	168.7 ± 6.5 (153-178)	159.9 ± 8.4 (141-178)	< 0.001**
BMI (kg/m^2)	29.2 ± 5.4 (16-42.8)	27.9 ± 5.4 (17-37)	28.9 ± 5.4 (16-42.8)	0.29
Serum albumin (g/dl)	4.0 ± 0.5 (2.7-5.1)	3.8 ± 0.7 (2.3-4.9)	4.0 ± 0.6 (2.3-5.1)	0.09
Serum cholesterol (g/dl)	195.4 ± 49.6 (99-322)	177.5 ± 29.0 (111-237)	190.9 ± 45.9 (99-322)	0.12
TLC (per mm^3)	1974 ± 604.5 (775-4114)	2248.9 ± 826.3 (992-4118)	2042.7 ± 673.2 (775-4118)	0.20

*Mann-Whitney test
**statistically significant differences

Morbidity according to gender

All study participants suffered from various diseases, mostly cardiovascular (84.6%), metabolic and endocrine (36.5%) and gastrointestinal (31.7%). Having cardiovascular diseases was statistically significant connected to female gender (p = 0.02). Polypathology (having more than one illness simultaneously) was observed in 88.5% participants (tab. 3).

Table 3. The distribution of participants' morbidity data according to gender, n (%).

Variables	Females	Males	Total	p-value*
Number	78	26	104	
Polipathology	70 (89.7)	22 (84.6)	92 (88.5)	0.11
Cardiovascular	72 (92.3)	16 (61.5)	88 (84.6)	0.02**
Respiratory	17 (21.8)	8 (30.8)	25 (24.0)	0.50
Gastrointestinal	26 (33.3)	7 (26.9)	33 (31.7)	0.63
Renal and Urinary	5 (6.4)	8 (30.8)	13 (12.5)	0.06
Metabolic and Endocrine	27 (34.6)	11 (42.3)	38 (36.5)	0.56
Musculosceletal	21 (26.9)	2 (7.7)	23 (22.1)	0.14
Sensorineural	12 (15.4)	0	12 (11.5)	0.24
Hematology	6 (7.7)	4 (15.4)	10 (9.6)	0.56
Cancer	4 (5.1)	3 (11.5)	7 (6.7)	0.63

*Mann-Whitney test
**statistically significant differences

Association of BMI with morbidity

The morbidity parameters in the study participants with different nutritional status according to the BMI scores are shown in the table 4.

Having analyzed the BMI results in accordance with the criteria proposed by WHO, it was found that only 18.3% of the subjects fell within the "normal" BMI range, whereas a significant majority (76.9%) exceeded this range to varying degrees: 31.7% of subjects were found to be overweight and 45.2% were obese. Between those four groups, there were found statistically significant differences only in terms of having metabolic and endocrine diseases (p < 0.001) and hematology diseases (p = 0.02). The obese study participants significant often suffered from diabetes (p < 0.01). The correlation of BMI and serum albumin with other parameters is showed in table 5.

DISCUSSION

Currently, there is unfortunately no consensus on the best method to assess nutritional status. Most authors have stressed the need for a combination of indirect methods, such as anthropometric or biochemical measurements together with assessment tools, which give the subjective and objective evaluation of nutritional status such as for example MNA (2, 24-25).

The simple height and weight measurement is a good starting point in the nutritional screening. However, they are unsatisfactory if they stand alone, especially in elderly people, for whom physiological changes are a normal part of ageing and should be considered as such. The most apparent age-related change occurs in height. Height decreases as people get older, approximately 1 cm/10 years during the period of 30 to 70, and subsequently 0.5 cm/year. In elderly people it is difficult to correctly estimate their stature, since they frequently cannot stand erect or are chair-or bedfast due to injury or disease. A better estimate of their stature is therefore to measure their height using surrogate measurements, for instance knee height (5, 18, 24, 26).

Weight tends to increase into mid-life (in women until 60, in men until about 50) and decrease progressively thereafter. It is important to note that loss of weight is caused mainly by loss of water and muscle tissue. Moreover the distribution of body compartments shifts, so that subcutaneous fat decreases while truncal fat increases, with fat deposition around the organs becoming denser. Therefore, skinfold thicknesses and circumference measurements from the limbs decrease but abdominal circumference increases (18, 24, 26).

Because of changes in body composition with aging, the BMI is often described as a less reliable indicator of fatness in older people. It does not take fat distribution into account, which is known to influence health, and cannot distinguish between loss of lean body mass and loss of fat mass (22, 27). Additionally, there is lack of agreement among experts upon the age-specific BMI cut-offs. According to WHO definitions, overweight is defined as BMI of 25 to 29.9 kg/m^2 and obesity as BMI of 30 kg/m^2 or more (19, 23, 28).

Table 4. The comparison of morbidity parameters between the different BMI groups, mean ± SD (range), n (%).

	BMI (kg/m²) classes				p-value*
	< 18.5	**18.5-24.9**	**25-29.9**	**≥ 30**	
Number (%)	5 (4.8)	19 (18.3)	33 (31.7)	47 (45.2)	
Number of chronic diseases	2.8 ± 2.2 (1-6)	3.5 ± 1.4 (1-6)	3.5 ± 1.7 (1-8)	3.5 ± 1.6 (1-7)	0.79
Cardiovascular	3 (60)	17 (89.5)	29 (87.9)	39 (83.0)	0.39
Hypertension Atherosclerosis Cardiac failure	2 (40) 1 (20) 1 (20)	11 (57.9) 7 (36.9) 3 (15.8)	22 (66.7) 7 (21.2) 6 (18.2)	29 (61.7) 11 (23.4) 8 (17)	0.70 0.62 0.99
Respiratory	2 (40)	5 (26.3)	7 (21.2)	11 (23.4)	0.82
Asthma/COPD	2 (40)	4 (21.1)	49 (12.1)	6 (12.8)	0.35
Gastrointestinal	1 (20)	4 (21.1)	12 (36.4)	16 (34.0)	0.62
Renal and Urinary	0	0	6 (18.2)	7 (55.3)	0.20
Metabolic and Endocrine	1 (20)	6 (31.6)	5 (15.2)	26 (55.3)	< 0.001**
Diabetes Hypothyoridism	0 0	5 (26.3) 0	4 (12.1) 0	22 (46.8) 2 (4.3)	< 0.01** 0.48
Musculosceletal	0	5 (26.3)	6 (18.2)	12 (25.5)	0.53
Sensorineural	1 (20)	2 (10.5)	4 (12.1)	5 (10.6)	0.95
Hematology	2 (40)	2 (10.5)	5 (15.2)	1 (2.1)	0.02**
Cancer	0	3 (15.8)	3 (9.1)	1 (2.1)	0.19

*Kruskall-Wallis test
**statistically significant differences

Table 5. Spearman's correlations of the BMI and serum albumin with other parameters.

Variables	Correlation coefficient	p-value
Age/BMI	-0.19	0.06
Education/BMI	0.01	0.10
Marital status/BMI	-0.01	0.86
Number of diseases/BMI	0.05	0.60
Albumin/BMI	0.16	0.11
Cholesterol/BMI	-0.01	0.92
TLC/BMI	0.18	0.07
Age/Albumin	-0.24	0.01*
Education/Albumin	-0.02	0.24
Marital status/Albumin	-0.10	0.29
Number of diseases/Albumin	-0.05	0.64
Cholesterol/Albumin	0.37	< 0.001*
TLC/Albumin	0.22	0.02*

*statistically significant differences
BMI – Body Mass Index; TLC – Total Limphocyte Count

The majority of authors used these BMI ranges in their studies; studies of elderly participants notwithstanding. Panasiuk et al. in the study of the rural population in eastern Poland diagnosed underweight in 2.8%, overweight in 37.6% and obesity in 33.8% of participants aged 60 and over (29). All studies conducted in Poland in the years 1983-2005, reviewed by Jarosz and Rychlik, used WHO criteria as well (30). They indicate the incidence of overweight among 41-45.5% of elderly men and 28.7-35.5% of elderly women, while obesity was recorded among 20.8-37.2% of elderly study participants.

In a study conducted by Dzieniszewski et al., the nutritional status of patients hospitalized in Poland was investigated. The authors used WHO recommendations for BMI criteria as well and found that in the group of participants aged 61-70 years, the mean value of BMI in men was 26.40 kg/m² and in women 28.36 kg/m². In participants aged 70 years and over it was slightly higher in men (27.77 kg/m²) and lower in women (28.35 kg/m²). In our study the mean value of BMI upon admission to hospital was 28.9 ± 5.4 kg/m² and there were no statistically significant differences between males and females (31).

However, some authors have stressed the fact that the BMI reference range proposed by WHO is not appropriate for elderly subjects (7, 23, 26, 32). They underlined that elderly people have a scarce nutritional reserve and consequently heavier weight standards are recommended for this population (24-29 kg/m²).

There are not many studies on the association between BMI and morbidity or mortality in elderly subjects. The data in the systematic review done by Heiat et al. does not support that the BMI range of 25 to 27 kg/m² is a risk factor for all-cause and cardiovascular mortality among elderly persons. Interestingly, the authors found that low BMI was more consistently associated with greater mortality risk compared with high BMI in elderly individuals (7).

In Poland, Jóźwiak et al. compared BMI and mortality in 1219 older hospitalized subjects and reported that increasing BMI reduced the risk of mortality by 22% for each decimal of BMI. Similarly to other authors, the highest mortality was found in the group with BMI < 25 kg/m², the lowest among those overweight and patients with moderate obesity (33).

The present study does not support either the thesis that being overweighted or obese is associated with having cardiovascular problems. However, our study suggests that high BMI values were associated with the high risk of metabolic and endocrine diseases. In agreement with findings of other researchers the present study confirmed that obese people have suffered significantly

more often with diabetes. It is noteworthy that the number of chronic diseases was not confirmed to significantly differ in the groups with different BMI values. No significant correlation between BMI and participants' age, education, marital status or laboratory tests was found.

The measurement of serum albumin is common in studies on malnutrition, but it is obviously also that the values may be related to the level of hydration and dehydration and by this understated or falsely overstated (24, 34).

In a study conducted by Kagansky et al., the authors confirmed that low serum albumin concentration was a significant risk factor for malnutrition (35). By contrast, in the study conducted by Feldblum et al. although the serum albumin level was slightly lower among malnourished participants, authors concluded that its utility as an indicator of nutritional status was limited (15). Our findings showed that the mean serum albumin level was 4.0 ± 0.6. There was found a significant positive correlation of serum albumin with the cholesterol level ($r = 0.37$; $p < 0.001$) and negative correlation with age of study participants ($r = -0.24$; $p = 0.01$).

Total lymphocyte count (TLC) is a measure of immune function. Because protein-calorie malnutrition impairs immunity by causing a decrease in the number of lymphocytes, a low TLC – when combined with other factors that indicate malnutrition (such as a decreased albumin level and weight loss) may suggest protein-calorie malnutrition. However it is important to bear in mind that severe stress, corticosteroid therapy, renal failure and cancer may lower TLC, while infections, leukemia and myeloma may increase it. Thus, TLC alone is not a reliable indicator of protein status (2, 13, 31, 36).

Serum cholesterol levels have received a great deal of attention in recent years. Although most of the attention has been focused on the relationship between serum cholesterol and heart and vascular disease, a depressed serum cholesterol in particular when combined with low albumin level, has been associated with poor health in older people (24, 37). Moreover, growing evidence suggests that among hospitalized disabled older adults, elevated levels of cholesterol are associated with increased rate of recovery from ADL disability (38).

In our study the mean values of laboratory indexes known to reflect the nutritional status (albumin, TLC, cholesterol) fluctuated within the proposed standard range for healthy elderly people and were not shown to be a reliable indicators of malnutrition.

Our study has some shortcomings which deserve comments. Firstly, the sample was relatively small, therefore one can not generalize the findings to be representative of the whole population of polish elderly people. Secondly, we lacked information from the demented patients. According to the literature, demented patients are at great risk of undernutrition due to physio-psychological deterioration. Assessment of their nutritional status could strengthen the research and make the findings more meaningful for clinical practice.

CONCLUSIONS

We conclude that a large part of study participants were overweight (31.7%) or obese (45.2%) what was in fact more than results revealed in other polish studies. All study participants suffered from various diseases, mostly cardiovascular, metabolic and endocrine and gastrointestinal. In 88.5% of study participants polypathology was observed but the number of chronic diseases was not confirmed to significantly differ in the groups with different BMI values. The high BMI values were associated with having metabolic and endocrine diseases but not with having cardiovascular problems. In agreement with findings of other researchers the present study confirmed that obese people have suffered significantly more often with diabetes.

The potential of elderly people is a powerful basis for the future development of every society. There is every reason therefore to improve their quality of life at least by enhancing their nutritional status. Further studies aimed at detecting and specifying the relationship between lifespan, quality of life, morbidity and nutritional status of elderly people are needed.

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