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ORIGINAL ARTICLE

QUALITATIVE EVALUATION OF DIETS OF STUDENTS AT THE UNIVERSITY OF THE THIRD AGE AT KOSZALIN UNIVERSITY OF TECHNOLOGY

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ABSTRACT

Background. Nutrition plays an important role in the elderly stage of life. A proper proportion of the individual nutritional ingredients in a diet may positively impact the ageing body. This positive influence consists in slowing down the undesired and unfavourable physiological alterations leading inevitably to the general weakness of the body.
Objective. The aim of the paper was to perform a qualitative analysis with the *Starzyńska* scoring system for diets, the daily food rations (DFR), among students of the University of the Third Age at the Koszalin University of Technology (Poland).
Material and methods. The studied materials consisted of the 7-day current records made by 79 students (16 males and 63 females) of the University of the Third Age at the Koszalin University of Technology and the measurements of body weight, height and waistline. The records were qualitatively evaluated with *Starzyńska'*s test.
Results. It was found that approximately half of the students were overweight or obese. The majority consumed the recommended number of meals. About 44% of the students consumed animal protein with all meals. Milk and cheese were ingested daily with at least two meals by approximately 11% of the students. Fruit and vegetables are eaten on a daily basis by about 60% of the students. Almost 40% ate wholegrain bread, groats, and dried legumes. The statistical analysis of the means for the points of individual indicators did not reveal any statistically significant difference between women and men ($p>0.05$).
Conclusions. Approximately ¾ of the evaluated diets were inaccurately formulated and required radical modification. The low frequency of animal protein, milk and cheese, wholegrain bread, groats and dried legume consumption may result in deficiencies in certain nutrients. Nutritional education is recommended, focusing on the correct way to formulate meals. The recorded level of overweight and obesity in the students indicates a need for a quantitative assessment of consumption considering, among others, the energy input in their diets.

Key words: *score evaluation, Starzyńska's method, diets of the elderly*

STRESZCZENIE

Wprowadzenie. Żywienie odgrywa istotną rolę w wieku podeszłym. Odpowiedni udział poszczególnych składników pokarmowych w diecie może pozytywnie oddziaływać na starzejący się organizm. Pozytywne oddziaływanie polega na spowalnianiu niekorzystnych zmian fizjologicznych prowadzących nieuchronnie do ogólnego osłabienia organizmu.
Cel. Celem pracy była jakościowa ocena diet (całodziennych racji pokarmowych) uczestników Uniwersytetu Trzeciego Wieku Politechniki Koszalińskiej metodą punktową według *Starzyńskiej*.
Materiał i metody. Materiał stanowiły zapisy siedmiodniowego bieżącego notowania od 79 uczestników (16 mężczyzn i 63 kobiety) Uniwersytetu Trzeciego Wieku Politechniki Koszalińskiej oraz pomiary masy, wysokości ciała i obwodu talii. Zapiski poddano ocenie jakościowej testem *Starzyńskie*j.
Wyniki. Stwierdzono, że około połowa słuchaczy charakteryzowała się nadwagą i otyłością. Większość spożywa zalecaną ilość posiłków. Około 44% słuchaczy spożywa białko zwierzęce w wszystkich posiłkach. Mleko i sery spożywa codziennie przynajmniej w dwóch posiłkach około 11% słuchaczy. Warzywa i owoce codziennie w 3 i 2 posiłkach spożywa większość słuchaczy. W postaci surowej warzywa i owoce spożywa codziennie około 60% słuchaczy. Niecałe 40% słuchaczy spożywa codziennie razowe pieczywo, kasze i strączkowe suche. Analiza statystyczna średnich dla punktów poszczególnych wyróżników nie wykazała istotnie statystycznej różnicy pomiędzy kobietami i mężczyznami ($p>0.05$).
Wnioski. Około ¾ ocenionych diet jest źle skomponowanych i wymaga gruntownych zmian. Wykazana niska częstotliwość spożywania białka pochodzenia zwierzęcego, mleka i serów oraz pieczywa razowego, kasz i strączkowych suchych może

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prowadzić do niedoborów określonych składników pokarmowych. Zaleca się edukację żywieniową w zakresie prawidłowego komponowania posiłków. Odnotowany poziom nadwagi i otyłości u słuchaczy wskazuje na potrzebę ilościowej oceny spożycia uwzględniając między innymi podaż energii w ich dietach.

Słowa kluczowe: *ocena punktowa, metoda Starzyńskiej, diety osób starszych*

INTRODUCTION

The elderly are a heterogeneous group of people in terms of health. Some of them, with good physical and intellectual capacities, prevent their own social exclusion by creating associations for seniors. These persons undertake social, cultural or intellectual activities in such groups. The Universities of the Third Age are one of such organizations providing educational services and satisfying the psychosocial and health needs of students [10].

However, negative physiological changes take place in an aging body at the cell, tissue and organ levels. These alterations inevitably lead to the general weakness of the body and the presence of chronic diseases [19]. Lifestyle significantly impacts health status, namely, such factors as physical activity and nutrition. In itself, nutrition is an important determinant of both the proper development and maintenance of each living organism in a good condition. By providing the proper dose of energy and all essential nutrients, it is possible to delay many unfavourable changes in the human body progressing with age [8]. The lack of a varied diet results in not all of the nutrients being delivered in sufficient amounts [15]. Higher-calorie foods should constitute a minor part of the overall diet. The predominant part should consist of products rich in minerals, vitamins and trace elements [7]. Therefore, elderly people should pay extra attention to ensuring that their daily food contains a proper amount of protein, carbohydrates, fats, vitamins and minerals according to the current standards and health status [6]. Regular research on nutrition in this age group will enable identifying nutritional errors [21] which, in turn, will indicate how to modify the diets to secure the input of all essential nutrients according to health status [1].

The aim of this paper was to perform a qualitative analysis with the *Starzyńska* scoring system for the diets, the daily food rations (DFR), of students of the University of the Third Age at the Koszalin University of Technology in Poland.

MATERIAL AND METHODS

The materials consisted of the data obtained by recording the food intake for seven days on a report sheet. The records of the food intake for seven consecutive days were taken in spring 2015. An analysis was performed of the records obtained from 79 students, i.e. 16 males and 63 females of the University of the Third Age at the Koszalin University of Technology. A qualitative assessment using the *Starzyńska* scoring system was used to verify the degree of nutritional correctness with which the diets, over seven consecutive days, were formulated (daily food rations) [4]. This assessment included the number of meals, frequency of animal protein, milk and cheese, fruit and vegetables, bread, groats and dried legume consumption. Furthermore, the degree of nutrition of the studied group of students was determined with the basic anthropomorphic parameters (height, body weight, and waistline) and Quetelet's index, namely, BMI (*Body Mass Index*) was calculated: [body weight (kg)]:[height B-v (m^2)]. Body weight and height measurements were taken in the morning before the first meal with a Seca 711 mechanical medical column scale and the waistline was measured with Seca 203 tape measures. The anthropometric examinations were performed according to the generally approved standards in anthropometry. BMI interpretation was performed according to the WHO classification (Table 1) [23]. The statistical analysis of anthropometric parameters and point differences for the individual discriminants, depending on the gender, was carried out with *Mann-Whitney's U* test and the Statistica PL 10 software package [20]. The confidence level of p=0.05 was assumed for all calculations.

Table 1. BMI classification [22]

Interpretation of the indicator	BMI [kg/m^2]
Underweight	<18.50
Standard	18.5–24.99
Overweight	25.0–29.99
Obesity I°	30.0–34.99
Obesity II°	35.0–39.99
Obesity III°	> 40

RESULTS

The data for the average age, waistline circumference, height, body weight and body mass index (BMI) of the students is given in Table 2. A detailed analysis of the waistline circumference and the BMI of the students are presented in Table 3. As the data indicates, the average age of the respondents was about 66 years. The average height was 1.65 m, and the average body weight was approximately 72 kg. In analysing the data

Table 2. Characteristics of the students

	Total / n=79					Men / n=16					Women / n=63				
		SD	Min.	Max.	Med.		SD	Min.	Max.	Med.		SD	Min.	Max.	Med.
Age (years)	66.09	5.28	57.00	75.00	65.00	62.75	4.34	57.00	67.00	63.5	68.00	5.03	63.00	75.00	66.00
Hight (m)	1.65	0.07	1.53	1.76	1.65	1.72*	0.02	1.69	1.76	1.73	1.61	0.05	1.53	1.70	1.64
Weight (kg)	72.68	12.20	59.00	91.00	69.50	81.37	10.78	69.50	91.00	82.5	67.71	10.53	59.00	90.00	66.00
Waist (cm)	92.27	11.09	74.00	114.00	92.00	101.25	9.91	92.00	114.00	99.5	87.14	8.45	74.00	98.00	88.00
BMI (kg/m^2)	26.27	2.72	23.33	31.14	25.09	27.21	2.93	24.33	30.07	27.21	25.74	2.67	23.33	31.14	24.53

* statistically significant difference; significance level p=0.05

by gender, it is clear that the men were taller and heavier than the women. The statistical analysis revealed that height significantly distinguished the males from the females ($p<0.05$). When the waistline measurements were analysed in a detailed manner, it was shown that approximately ¾ of the assessed students were at risk of metabolic derangements and complications. The BMI values, when analysed specifically, demonstrated that the problem of quantitative malnourishment did not affect this group of people, although it was found that about half of the students were overweight or obese. Considering the gender, it was shown that obesity and overweight were more common among the men than the women.

Table 3. A detailed analysis of the waistline circumference and the BMI of the students

	Total / n=79	Men / n=16	Women / n=63
	n (%)	n (%)	n (%)
Waist $\geq 80^{x}/\geq 94^{xx}$	57 (72.15)	12 (75.00)	45 (71.42)
BMI (<18.5)	-	-	-
BMI (18.5-24.99)	40 (50.63)	4 (25.00)	36 (57.14)
BMI (25-29.99)	26 (32.92)	8 (50.00)	18 (28.58)
BMI (30-34.99)	13 (16.45)	4 (25.00)	9 (14.28)
BMI (35-39.99)	-	-	-
BMI (>40)	-	-	-

^{x} - women , ^{xx} - men

The numerical values representing the qualitative assessment, performed with *Starzyńska's* method, of the daily food rations over seven consecutive days among the students are compiled in Table 4 and the interpretation of the results is given in Table 5. As the data reveals, over a half of the students consumed the recommended number of meals a day. This is reflected by the high number of points recorded for this discriminant (4.27 out of 5). Almost half of all respondents (both men and women) consumed animal protein products at each meal. It was found, however, that the level of milk and cheese consumption was very low. Since only approximately 14% of the women eat these products daily with two meals, the number of points was merely 1.54 out of 5 for the whole group of students. Fruit and vegetables were consumed with at least 3 and 2 meals, respectively, by almost 80% of the respondents. However, these food products were commonly a part of 2 rather than 3 meals in the total population while approximately 11% of the population consumed them more rarely. The average number of points for this discriminant was 2.91 out of 5. Over a half of the students ate raw fruit and vegetables. Considering the gender, men more often consumed these products in a raw form than women. The average score for this discriminant was 3.36 out of 5. The daily consumption of fibre source products was reported in less than 40% of the students, of whom such products were eaten daily more often by women than men. The average number of points for this discriminant was 2.00 out of 5. The statistical analysis of the means for the scores of individual discriminants did not reveal any statistical difference between women and men ($p>0.05$). The detailed analysis of the scores (Table 5) demonstrated that none of the 7-day menus was scored as good while almost ¾ of the evaluated 7-day menus of all the students had an excessively high number of errors, indicating the need to reformulate them.

DISCUSSION

A diet with an incorrectly balanced energy content results in disorders such as malnourishment or excessive fat tissue accumulation, i.e. overweight and obesity [22]. Among the students of the University of the Third Age at the Koszalin University of Technology, qualitative malnourishment was not observed, similar to the studies by *Krajewska-Pędzik* et al. [11]. In assessing the nutritional status of 66 female students, the authors did not record any persons at risk of malnutrition. An excessive accumulation of fat tissue due to a positive energy balance leads to overweight and obesity. This is associated with hyperlipidaemia, type-2 diabetes and arterial hypertension [12, 16]. The BMI evaluation performed by

Table 4. Diet assessment of students according to *Starzyńska's* method

Distinguishing feature	Max number of points	number of obtained points				People who obtained a certain number of points					
		Total	Men	Women	p	Total		Men		Women	
						n	%	n	%	n	%
Number of meals during the day as planned in the diet:											
- 4-5	5	4.27	4.00	4.42	p>0.05	53	67.08	8	50	45	71.42
- 3	3					26	32.91	8	50	18	28.57
- <3	0					-	-	-		-	-
Number of meals in which there are products containing animal proteins:											
- in all meals	5	2.63	2.75	2.57	p>0.05	35	44.30	8	50	27	42.85
- in 75% of all meals	3					17	21.51	8	50	9	14.28
- in a smaller number of meals	0					27	34.17	-	-	27	42.85
Frequency of consumption of milk or cheese:											
- every day in 2 meal	5	1.54	1.00	1.85	p>0.05	9	11.39	-	-	9	14.28
- every day in at least 1 meal and in 2 meals every other day	2					44	55.69	8	50	36	57.14
- less often	0					26	32.91	8	50	18	28.57
Frequency of consumption of raw vegetables and fruits:											
- every day in at least 3 meals	5	2.91	2.75	3.00	p>0.05	31	39.24	4	25	27	42.85
- every day in at least 2 meals	2					39	49.36	12	75	27	42.85
- less often	0					9	11.39	-	-	9	14.28
Frequency of consumption of raw vegetables and fruits:											
- every day	5	3.36	3.75	3.14	p>0.05	48	60.75	12	75	36	57.14
- on 75% of days	2					9	11.39	-	-	9	14.28
- less often	0					22	27.84	4	25	18	28.57
Frequency of consumption of wholemeal bread, groats and dry legumes:											
- every day at least one of the aforementioned products	5	2.00	1.75	2.14	p>0.05	31	39.24	4	25	27	42.85
- on 75% of days at least one of the aforementioned products	2					4	5.06	4	25	-	-
- less often	0					44	55.69	8	50	36	57.14
	Max. 30										
	Total	16.71	16.00	17.12							

* statistically significant difference; significance level α=0.05

Krajewska-Pędzik et al. [11] among the students of the University of the Third Age in Szczecin found obesity in 38.4% of all examined females. First degree obesity was found in approximately 30% of the students of the University of the Third Age in Szczecin. Similar to the previous study, second or third degree obesity was not demonstrated among the students in the study performed by *Krajewska-Pędzik* et al. [11]. Together with a waistline increase of over 80 cm in women and 94 cm in men, the risk of metabolic disorders and complications increases proportionally to the waistline circumference [9]. The previous study revealed that roughly ¾ of the students were affected with this problem. However, identifying overweight and obesity amount seniors using the body mass index (BMI) is associated with a risk of overestimating the number of individuals with this problem. This results from the fact that, together with age, the proportion of lean body mass decreases and is replaced by fat tissue. Moreover, a reduction in the body weight in this group should be attempted very cautiously, as negative consequences may follow, such as a further decrease in lean body mass and a reduction in bone density [16].

According to the current nutritional recommendations for the elderly, the number of meals per day should range between four and six and their volume should be small [3]. In contrast to these studies, *Krajewska-Pędzik* et al. [11], while analysing the number of meals of the students, showed that about 90% of them consumed 4-5 meals per day and 3.3% of the women reported having three or less meals per day.

Table 5. Interpretation of the results using *Starzyńska's* method

Number of obtained points	Diet evaluation	Conclusion	Number of diets			% of diets		
			Total	Men	Women	Total	Men	Women
28-30	good	no mistakes	-	-	-	-	-	-
21-27	satisfactory	mistakes can be eliminated	18	-	18	22.78	-	28.57
12-20 without ratings of zero	only satisfactory	significant mistakes	4	4	-	5.06	25.00	-
< 12	failing	not possible to be corrected	57	12	45	72.16	75.00	71.43
		Total	79	16	63	100	100	100

Animal protein, as a nutrient, plays an important role in the elderly. Its deficiency in the consumed foods translates into a progressive loss of muscle mass and, thus, a reduction in fitness. The current recommendations stipulate the intake of 1.0 – 1.2 g of animal protein per kilogram of body weight to maintain lean body mass. For more intensive physical activity, it is advised to administer protein at a dose of 1.2 – 1.5 g per kilogram body weight, except for persons with a severe stage of renal failure [24]. The studies demonstrated that less than 50% of the examined students consumed this nutrient with all meals. Studies by other authors have shown that the protein intake in this age group is insufficient [17]. Milk and dairy products are the main source of calcium in the diet and a proper amount of this element helps to maintain optimal bone mass and prevents osteoporosis. In addition, the correct intake of calcium reduces blood pressure, decreases the risk of hypertension and prevents colon tumours [14]. Despite all of this, a significant reduction in the intake of this group of foods is observed among elderly people [18]. Previous studies confirmed a low frequency of milk and dairy product consumption. Among the students, only 58% of the women declared taking milk and dairy products daily in their diet. *Markiewicz* et al. [14] demonstrated that the intake of calcium with the diet did not cover the standards recommended for this age group. Fruit and vegetables constitute an important food group in human nutrition. *Krajewska-Pędzik* et al. [11] showed that 70% of the female students of the University of the Third Age in Szczecin consumed fruit daily and 78% did so with vegetables. Previous studies also revealed a high proportion of the students who consumed fruit and vegetables on a daily basis. Among the elderly people, there is a continuous deficiency of dietary fibre intake, which was confirmed by the studies carried out by, for example, *Ilow* et al. [5], *Stawarska* et al. [21], and *Różańska* et al. [17]. Previous studies have also confirmed a low frequency of consumption of foods as the source of this nutrient.

The individual situation of elderly people related to their health status, treatments for chronic diseases, social exclusion and financial situation are often causes of incorrect nutrition in this social group [1, 16]. The results of this study demonstrate that the daily food rations for a vast majority of the students are incorrectly composed. The inappropriate intake of specific groups of foods may be associated with an unfavourable nutritional status recorded based on the BMI values in the examined group. Even though quantitative malnutrition was not found, the demonstrated incorrect intake of certain groups of food products may result in deficiencies in specific nutrients and, thus, lead to qualitative malnourishment [2, 13, 25]. The progressive physiological alterations that occur in the body with age, together with an inappropriate intake of nutrients, may adversely impact the biological aging of the human body [1].

CONCLUSIONS

1. Approximately ¾ of the diets taken by the students were incorrectly composed and required profound changes.
2. The demonstrated low frequency of animal protein, milk and cheese, wholegrain bread, groats and dried legume consumption may result in the deficiencies of specific nutrients.
3. The recorded levels of overweight and obesity among the students points to the need for a quantitative assessment of consumption, including the intake of energy in their diets.
4. The results of 7-day consumption records kept by the students indicates that there is room for nutritional education, with a special emphasis on the correct composition of daily meals.

Conflict of interest

The authors declare no conflict of interest.

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