The Impact of Nutrition on the Percentage of Fat Tissue among Students of University of Physical Education in Kraków

Wpływ sposobu odżywiania na procentową zawartość tkanki tłuszczowej wśród studentów Akademii Wychowania Fizycznego w Krakowie

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Abstract

Introduction: Proper nutrition is one of the most important environmental factors that have an impact on human development and maintaining good health condition. It consists in meeting the demand of a body for energy and all the necessary nutrients completely.

Material and methods: The survey was conducted in 2014. It covered 93 second year Physiotherapy and Physical Education students (48 females and 45 males) at Bronisław Czech University of Physical Education in Kraków. The average age of the surveyed students was 21. The Tanita weighing scales were used to define the value of BMI and to calculate the percentage of fat tissue in a body.

Results: The study results have revealed that the respondents represent an semi-healthy and good nutrition habit. The majority of the subjects (73.1%) had a normal percentage of fat tissue. While examining the relations between the nutrition habit and fat percentage, it was found that 50% of females who ate well had a low FAT%. Only 13.7% of males representing an average healthy nutrition habit were found to have a high percentage of fat tissue. Among the majority of the respondents (79.6%) the BMI level was within the norm. Overweight affected more frequently males than females, whereas underweight vice versa.

Conclusions: The majority of the surveyed students ate in an semi-healthy manner. The nutrition habit had a significant impact on body fat only among females. The majority of respondents' BMI level was within the norm.

Keywords: nutrition, fat tissue, students

Introduction

Proper nutrition is one of the most important environmental factors that have an impact on human development and maintaining good health condition. It consists in meeting the demand of a body for energy and all the necessary nutrients completely [1].

The proper functioning of a body is ensured with nutrients included in food. They include: carbohydrates, proteins, fats, vitamins, fibre, minerals and water. Protein is the main building element of cells and tissues in our body. Both carbohydrates and fats are the basic source of energy necessary for the proper functioning of our system. Minerals and vitamins regulate the processes, metabolic reactions that take place in cells and tissues. Whereas water has a very important role in the transport of nutrients, takes part in biochemical reactions and maintaining the constant temperature of a human body. The main task of fibre is to regulate the work of the digestive system [1].

All the nutrients should be delivered systematically, in proper quantities and proportions. That is why a balanced diet is so important. It consists in providing the body with the sufficient amount of energy, proper quantity and proportion of nutrients. It consists in planning a proper number of meals which are served at a suitable time with the consideration of physical activity [2]. Proper nutrition should take into account five meals daily. They include: breakfast, the second breakfast, dinner, afternoon snack and supper. One should also observe fixed times of eating meals and suitable time intervals between them. According to Jarosz "breakfast should constitute 25–30% of the daily food ration energetic value, the second breakfast 5–10%, dinner 30–35%, afternoon snack 5–10% and supper 20–25%" [1].

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Regular meals are essential in proper nutrition. They allow the body to use the nutrients reasonably. The intervals between meals should not exceed 3–4 hours. What is also extremely important is the correct proportion between the main nutrients. It has been assumed that protein intake for an adult person should be 0.8–2 g/kg body mass/daily (which can also be presented as 15% of energy provided with protein). Whereas fats should provide approximately 15–20% of energy (WHO, FAO) or as EFSA experts claim, this range should be from 20% to 35%. The recommended level of carbohydrates in a diet is from 50% to 70%, including 10–20% of sugars. The norm of water intake for males amounts to min. 2500 ml/daily, whereas for females min. 2000 ml/daily. The said norms have been worked out by the experts of Panel on Dietetic Products, Nutrition and Allergies (NDA), European Food Safety Authority (EFSA) [1].

The most frequent nutritional mistake is exceeding the daily energy demand or its deficiency. Such a situation causes the disturbance of the homeostasis of the metabolic processes that take place in our bodies. Unfortunately, the excessive intake of meals including nutrients in inadequate proportions can be observed more and more frequently. The main mistake made by humans is eating excessive amounts of animal fat, simple sugars and sodium. What is also neglected is the regularity of meals, their variety and the quality of the ingredients they contain. From the point of view of nutrition, it is important for a diet not to be monotonous. The inadequately balanced diet results also from eating too little complete protein, unsaturated fats, complex carbohydrates, fibre, macro and microelements, i.e. potassium and calcium. Nutritional mistakes pose a risk of the occurrence of both the deficiency of the required nutrients and the development of overweight and obesity, which can result further in e.g. cardiovascular diseases, type II diabetes and osteoporosis [1].

The purpose of this paper was to try to assess the impact of nutrition on the percentage of fat tissue among students of University of Physical Education in Kraków.

Additionally, the BMI level was defined.

On the basis of the above objective the following study questions have been formulated:

1. What level of nutrition habit was preferred by the surveyed students?
2. What was the BMI level?
3. Did the level of nutrition habit influence the fatness of the surveyed students?
4. To what extent the examined variables varied depending on the sex?

Material and methods

The survey conducted in 2014 covered the total of 93 second year Physiotherapy and Physical Education students (48 females and 45 males) in Bronisław Czech University of Physical Education in Kraków. The average age of the surveyed students was 21.

The average height of the surveyed males was 179.5 cm and females 167.4 cm. As far as the average body mass is concerned, for the male students it was 77.4 kg and for the female students 60.1 kg (Table 1).

Table 1.

Contingency table of average values of somatic characteristics with sex distinction

Somatic characteristics	Sex		Total
	F	M	
Body height (cm) – ($\overline{X}$)	167.4	179.5	173.3
Body mass (kg) – ($\overline{X}$)	60.1	77.4	68.5

The *Tanita* weighing scales were used to define the value of BMI and to calculate the percentage of fat tissue in the body. The scales were also used to measure the students' body mass with an accuracy of ± 100 g.

The measurement of the percentage of fat in the body consisted in using the electrical signal which runs through the whole body from one foot to the other. Muscles consist of water to a large extent, whereas fat does not contain it. Therefore, the difference in the time of the electrical pulse flow through tissues defines the degree of fatness. The longer the time of the pulse flow the bigger the content of fat tissue (tanita.com).

In order to define the level of nutrition habit *Healthy Nutrition Questionnaire* of own design was used. The questionnaire consisted of 26 closed-ended questions. The said questions had ready made scales of answers, from which the respondent chose one or gave his/her own answer. 11 out of 26 questions were given scores. The respondent could score: 1 point answering *Yes* to questions: 20, 22, 24; from 1 to 3 points for the answers to questions 9, 15, 23, 26; 1–4 points answering questions 8 and 19; 1–10 points answering question 10. The respondent could score the total of 0–33 points, which constituted the basis for defining numerical intervals (Table 2).

Table 2.

Levels of nutrition habit

Assumed numerical ranges	Nutrition habit
0–11 points	Bad
12–22 points	Semi-healthy
23–33 points	Good

The following statistical techniques were used in the study:

1. For statistical description of qualitative data: contingency and percentage tables.

2. For the analysis of the relation between qualitative data: *chi*-square test of statistical significance. Statistically significant correlations: at the level $p < 0.05$.

Results

The results of the study regarding nutrition revealed that the respondents show the semi-healthy (59.1%) and good (40.9%) nutrition habit. There has been no case of bad nutrition recorded (Table 3). Among men higher percentage values were found in the semi-healthy" range, whereas among women in the "good" range. The diversity of results was not statistically significant.

The percentage of fat tissue among the majority of the subjects (73.1%) was within the norm (Table 5). The normal FAT% level particularly dominated among men and was 86.7%. The said level was much lower among women (60.4%). Every third female student had a low percentage of fatness. A statistically significant difference regarding the percentage of fat tissue was also recorded between sexes.

While examining the correlations between the nutrition habit and the percentage of fatness, it was found that women who ate well in 50% had a low FAT%. The other half of this group had a normal percentage of fatness. As regards to female students

Table 3.

The level of nutrition habit of the surveyed students

Nutrition habit	Sex				Total		Statistical significance analysis
	F		M				
	N	%	N	%	N	%	
Bad	0	0.0	0	0.0	0	0.0	
Semi-healthy	26	54.2	29	64.4	55	59.1	$chi^2(1) = 1.02$
Good	22	45.8	16	35.6	38	40.9	$p = 0.314$
Total	48	100	45	100	93	100	

Table 4.

BMI level of the surveyed students

BMI	Sex				Total		Statistical significance analysis
	F		M				
	N	%	N	%	N	%	
Underweight	6	12.5	0	0.0	6	6.5	$chi^2(2) = 9.90$
Normal	39	81.3	35	77.8	74	79.6	$p = 0.007$
Overweight	3	6.2	10	22.2	13	13.9	
Total	48	100	45	100	93	100	

Table 5.

Fatness level of the surveyed students

FAT%	Sex				Total		Statistical significance analysis
	F		M				
	N	%	N	%	N	%	
Low	16	33.3	2	4.4	18	19.4	$chi^2(2) = 12.42$
Normal	29	60.4	39	86.7	68	73.1	$p = 0.002$
High	3	6.3	4	8.9	7	7.5	
Total	48	100	45	100	93	100	

The study results presented below showed that the majority of the respondents (79.6%) had the BMI level within the norm (Table 4). Overweight occurred more frequently among men rather than women, whereas underweight vice versa. The normal BMI value was more characteristic of women (81.3%) than men (77.8%). The differences in the results between women and men eating in a "semi-healthy" manner, the majority of them (69.2%) had a normal percentage of fat tissue. The correlation between nutrition habit and FAT% was statistically significant among women (Table 6).

Among a vast majority of men (93.7%) who ate well, normal fatness was observed (Table 7). The normal percentage of fat-

Table 6.

Nutrition habit and FAT% among females

FAT%	Nutrition habit						Total		Statistical significance analysis
	Bad		Semi-healthy		Good				
	N	%	N	%	N	%	N	%	
Low	0	0.0	5	19.2	11	50	16	33.3	$chi^2(2) = 6.65$ $p = 0.036$
Normal	0	0.0	18	69.2	11	50	29	60.4	
High	0	0.0	3	11.6	0	0.0	3	6.3	
Total	0	0.0	26	100	22	100	48	100	

ness was also recorded among those with a semi-healthy nutrition habit (82.8%). A small percentage of the respondents representing the semi-healthy range of nutrition (13.7%) had a high percentage of fat tissue. In the case of men, the examined correlations were statistically insignificant.

Table 7.

Nutrition habit and FAT% among males

FAT%	Nutrition habit						Total		Statistical significance analysis
	Bad		Semi-healthy		Good				
	N	%	N	%	N	%	N	%	
Low	0	0.0	1	3.5	1	6.3	2	4.4	$chi^2(2) = 2.53$ $p = 0.282$
Normal	0	0.0	24	82.8	15	93.7	39	86.7	
High	0	0.0	4	13.7	0	0.0	4	8.9	
Total	0	0.0	29	100	16	100	45	100	

Discussion

According to the results of the study conducted in 2014 by the Centre for Public Opinion Research, the majority of adult Poles eat minimum three meals a day and in their view, they have a balanced diet (CBOS). As some studies show, the student population in Poland eat in a proper manner, however, it should be noted that proper nutrition is more characteristic of women than men [3,4]. On the other hand, the study conducted by Rasińska [5] showed that despite the fact that the respondents knew the principles of proper nutrition, the majority of them did not observe the said principles and defined their eating habits as inadequate. Similar results were obtained by Seń [6], who surveyed, among others, students of Wrocław University of Science and Technology. Myszkowska-Ryciak et al. [7] came to interesting conclusions while studying the eating habits of female students of Warsaw University of Physical Education and Warsaw University of Life Sciences – SGGW. Contrary to the expectations, the female students of Warsaw University of Physical Education demonstrated more dietary mistakes such as irregular meals, not enough meals during the day and unbalanced diet. In comparison to students living abroad, Polish students show a very similar level of awareness regarding healthy nutrition and frequently make the same dietary mistakes [3,8]. Our own study reveals that the majority of students demonstrate a semi-healthy nutrition habit. It should be emphasized, however, that a considerable number of respondents ate well. It is particularly visible in the number of meals eaten daily. A vast majority of the respondents are within the range regarded as adequate, i.e. they eat 3 and more meals a day. At this point, it is worth mentioning that the opinions regarding this issue vary. According to Arciero et al. [9] eating 6 meals in comparison to 3 meals daily considerably reduces android adiposity, keeping lean body mass at the same time. Other authors, however, do not notice any relation between the frequency of meals and BMI [10–13].

Many authors conducted studies among students on BMI value, which defines the weight and height proportion. The study conducted of Wołos et al. [14] revealed overweight or obesity in every tenth student, far more frequently among male students. As Zuzda et al. [15] claim, every fifth male student of Białystok University of Technology and Białystok School of Economics is overweight or obese. Among the surveyed female students, only every twentieth was overweight or obese. However, underweight was observed far more frequently among female students. The results of other surveys with students as subjects are similar [16, 17]. In our own studies correct BMI values were recorded among the majority of respondents. Overweight occurred more frequently among males, whereas underweight among females. A similar tendency was observed considering the percentage of fat tissue.

The only statistically significant correlation was found between the nutrition habit and percentage of fat tissue (FAT%) among the surveyed women.

Conclusions

The following conclusions were formulated on the basis of the obtained survey results:

1. In the majority of cases the surveyed students ate in a semi-healthy manner.
2. The BMI level among the majority of respondents was normal, and the differences in results between females and males turned out to be statistically significant.
3. The nutrition habit had a significant impact on body fattening only among the surveyed women.

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Streszczenie

Wstęp: Prawidłowe żywienie jest jednym z najważniejszych czynników środowiskowych, wpływających na rozwój człowieka i utrzymanie przez niego dobrego stanu zdrowia. Polega ono na całkowitym pokryciu zapotrzebowania organizmu na energię i wszystkie niezbędne składniki pokarmowe.

Materiał i metody: Badania przeprowadzono w 2014 roku. Wzięło w nich udział 93 studentów (w tym 48 kobiet i 45 mężczyzn) II roku Fizjoterapii i Wychowania Fizycznego Akademii Wychowania Fizycznego im. Bronisława Czecha w Krakowie. Średnia wieku uczestników badań wyniosła 21 lat. Do określenia wartości wskaźnika BMI oraz obliczenia procentowej zawartości tkanki tłuszczowej w organizmie zastosowano wagę Tanita.

Wyniki: Wyniki badań dotyczące odżywiania wykazały, że respondenci prezentują przeciętny i dobry sposób odżywiania. U większości badanych (73,1%) procentowa zawartość tkanki tłuszczowej była w normie. Badając zależności między sposobem odżywiania a procentem otłuszczenia stwierdzono, że kobiety, które dobrze się odżywiały, w 50% miały niski FAT%. Tylko u 13,7% mężczyzn reprezentujących przeciętny przedział sposobu dożywiania odnotowano wysoki procent tkanki tłuszczowej. U większości badanych (79,6%) poziom wskaźnika BMI mieścił się w normie. Nadwaga występowała częściej u mężczyzn niż kobiet, a niedowaga odwrotnie.

Wnioski: Większość badanych studentów odżywia się na przeciętnym poziomie. Sposób odżywiania miał istotny wpływ na otłuszczenie ciała wyłącznie u kobiet. Poziom wskaźnika BMI u większości badanych był w normie.

Słowa kluczowe: odżywianie, tkanka tłuszczowa, studenci