

The Influence of Nutrition on the Percentage of Fat Tissue among Students of University of Physical Education in Krakow

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

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Summary

Introduction: Adequate nutrition is one of the most important environmental factors that have an influence on human development and maintaining good health condition. It consists in meeting the demand of an organism 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) in Bronisław Czech University of Physical Education in Kraków. The average age of the surveyed students was 21. The Tanita scales were applied to define the value of BMI and to calculate the percentage of fat tissue in the organism.

Results: The research results have revealed that the respondents represent an average and good manner of nutrition. The majority of the subjects (73.1%) had a normal percentage of fat tissue. While examining the relations between the way of nutrition and fat percentage, it was found that 50% of females who fed themselves well had a low FAT%. Only 13.7% of males representing an average interval of nutrition manner 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 was more frequent among males than females, whereas underweight vice versa.

Conclusions: The majority of the surveyed students feed themselves in an average manner. The manner of nutrition had a significant influence on body fat only among females. The majority of respondents' BMI level was within the norm.

Keywords: nutrition, fat tissue, students

Introduction

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

The proper functioning of an organism is ensured with nutrients included in food. They are: carbohydrates, proteins, fats, vitamins, fibre, minerals and water. Protein is the main building element of cells and tissues in our organism. 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 organism. 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 organism with the sufficient amount of energy, proper quantity and proportion of nutrients, in planning a proper number of meals which are served at a suitable time with the consideration of physical activity [2]. Adequate nutrition should take into account five meals daily. They are: breakfast, the second breakfast, dinner, afternoon snack and supper. One should also observe constant hours of 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 adequate nutrition. They allow the organism to use the nutrients reasonably. The interval 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 c. 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 organism. 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. In 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 aim of this work was to try to assess the influence 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 aim the following research questions have been formulated:

1. What level of nutrition manner was preferred by the surveyed students?
2. What was the BMI level?
3. Did the level of nutrition manner 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) – (\bar{X})	167.4	179.5	173.3
Body mass (kg) – (\bar{X})	60.1	77.4	68.5

The *Tanita* scales were applied to define the value of BMI and to calculate the percentage of fat tissue in the organism. 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 organism 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 manner *Healthy Nutrition Questionnaire* of own design was applied. 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 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 manner

Assumed numerical intervals	Nutrition manner
0–11 points	Bad
12–22 points	Average
23–33 points	Good

The following statistical techniques were used in the research:

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 research regarding nutrition revealed that the respondents show the average (59.1%) and good (40.9%) manner of nutrition. There has been no case of bad nutrition recorded (Table 3). Among men higher percentage values were found in the interval “average”, whereas among women in the interval

(77.8%). The differences in the results between women and men turned out to be 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 manner of nutrition and the percentage of fatness, it was found that women

Table 3.

The level of nutrition manner of the surveyed students

Nutrition manner	Sex				Total		Statistical significance analysis
	F		M		N	%	
	N	%	N	%			
Bad	0	0.0	0	0.0	0	0.0	$\chi^2(1) = 1.02$ $p = 0.314$
Average	26	54.2	29	64.4	55	59.1	
Good	22	45.8	16	35.6	38	40.9	
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	$\chi^2(2) = 9.90$ $p = 0.007$
Norm	39	81.3	35	77.8	74	79.6	
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	$\chi^2(2) = 12.42$ $p = 0.002$
Norm	29	60.4	39	86.7	68	73.1	
High	3	6.3	4	8.9	7	7.5	
Total	48	100	45	100	93	100	

“good”. The diversity of results was not statistically significant.

The research 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 correct BMI value was characteristic of more women (81.3%) than men

who fed themselves well in 50% had a low FAT%. The other half of this group had a normal percentage of fatness. As regards female students feeding themselves in an average manner, the majority of them (69.2%) had a normal percentage of fat tissue. Among women the correlation between the way of nutrition and FAT% was statistically significant (Table 6).

Table 6.
Nutrition manner and FAT% among females

FAT%	Nutrition manner						Total		Statistical significance analysis
	Bad		Average		Good		N	%	
	N	%	N	%	N	%			
Low	0	0.0	5	19.2	11	50	16	33.3	$chi^2(2) = 6.65$ $p = 0.036$
Norm	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	

Among a vast majority of men (93.7%) who fed themselves well normal fatness was observed (Table 7). The normal percentage of fatness was also recorded among those with an average manner of nutrition (82.8%). A small percentage of the respondents representing the average interval of nutrition (13.7%) had a high percentage of fat tissue. In the case of men the examined correlations were statistically insignificant.

son 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 research reveals that the majority of students demonstrate an average manner of nutrition. It should be emphasised, however, that a considerable number of respondents fed themselves well. It is particularly visible in the number of meals eaten daily. A vast majority of the

Table 7.
Nutrition manner and FAT% among males

FAT%	Nutrition manner						Total		Statistical significance analysis
	Bad		Average		Good		N	%	
	N	%	N	%	N	%			
Low	0	0.0	1	3.5	1	6.3	2	4.4	$chi^2(2) = 2.53$ $p = 0.282$
Norm	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 Centre for Public Opinion Research, the majority of adult Poles eat minimum three meals daily and in their view they have a balanced diet (CBOS). As some studies show the student population in Poland feed themselves in a proper manner, however, it should be noted that adequate nutrition is more characteristic of women than men [3, 4]. On the other hand, the research conducted by Rasińska [5] showed that despite the fact that the respondents knew the principles of adequate 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. Myszowska-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, too few meals and unbalanced diet. In compari-

respondents are within the range regarded as adequate, i.e. they eat 3 and more meals daily. 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 research of Wołos et al. [14] revealed overweight or obesity at 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, among female students underweight was observed far more frequently. 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 manner of nutrition 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 fed themselves in an average manner.
2. The BMI level among the majority of respondents was in norm, and the differences in results between females and males turned out to be statistically significant.
3. The manner of nutrition 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.

Material 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
