BODY COMPOSITION OF FEMALES IN TWO AGE GROUPS

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***Abstract**:*

Studies in a variety of countries have shown increases in the prevalence of overweight among women in recent years. These increases have given rise to concern about women's health and well-being. The purpose of this paper was to prove the differences in body composition between women aged 19-20 and 21-28 years old, respectively to prove whether the age has an impact on body composition on women. For the realization of the purpose of the work, the sample included 52 women aged 19-28 years. The sample was divided into two groups, Group 1 (N = 25) - Females 19-20 years and Group 2 (N = 27) - Females 21-28 years. The parameters of the body composition applied in this research were: calendar age (age), height of the body (height), body weight (weight), body fat, muscle mass (muscle), daily calorie intake (kcal), metabolic age, total body water (water), internal fat (visceral fat), and body mass index (BMI). The basic statistical and distribution parameters that have been ++applied in this paper are Minimum, Maximum, Mean, Std. Deviation, Skewness, Kurtosis, Max-D and Kolmogorov-Smirnov test (K-S). To verify the difference between the arithmetic averages of the groups, independent samples T-test was applied. The results obtained showed that there were differences in arithmetic averages in all parameters of body composition between group 1, females 19-20 years and group 2, females 21-28 years. However, a significant statistical difference between these two groups has been obtained in the metabolic age variable, which shows that from the age of 21, women begin a decrease in daily physical movements.

***Key Words**: obesity, body composition, women, T-test*

Introduction

Overweight and obesity are the fifth leading risk of deaths all around the world. At least 2.8 million adults die each year as a result of being overweight or obese (Ahmed, Ginawi, Elasbali, Ashankyty & Al-hazimi, 2014). Obesity is a global problem and it should be tackled as such. According to the World Health Organization, (1997) obesity is a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired. According to Fock and Khoo (2013) the main cause of obesity is an imbalance between calories consumed and calories expended. Based on Scherrer, Randin, Tappy, Vollenweider, Jequier, & Nicod (1994) obesity is a major health problem in industrialized societies, is associated with a high incidence of cardiovascular complications such as hypertension, ischemic heart disease, and stroke. There is no doubt that the prevention of obesity would require an integrated approach, involving actions in all sectors of society. Thoughts and recommendations for body fat go so far that inexperienced people will think that fat indicates a high level of health associated with a good lifestyle. Therefore, recognizing the characteristics of fat, their function in the body, especially during physical work, the role in the development of overweight is important for a rational attitude to this problem. Furthermore, promoting health when it comes to fats is based on a good knowledge of their importance and role in the body and the absorption of good habits in their consumption of food. Subcutaneous fat belongs to the order of those human characteristics in which it can be affected during life. Anyone can and should regulate this anthropological feature with sports food activity. In our profession, body composition is usually seen as a two-component model, which consists of non-fat body mass and body fat mass. This division allows us to calculate the optimal weight, which gives us guidelines for future treatments both through sports activities and diet. According to Shukova-Stojmanovska and Gontarev (2018) the combination of diet and regular exercise of five times per week, lead to decrease in body mass and the percentage of body fat, both in female and male. One of the modern methods to determine the composition of the body is the method of complete bioelectrical resistance (MRBE), which is based on the assumption that electric current rapidly passes through tissues which in their composition have a large amount of water. Given that fat in its composition has the least water, the body's resistance to the flow of current is consistent with the amount of fat in the body. Therefore electrical resistance represents the overall body fat index and based on different formulas the percentage of non-fat body mass and fat mass is calculated. Body composition is the percentage of fat, water, muscle and bone tissue in the total body mass. Knowing the weight of the subjects, these sizes can be expressed in kilograms. Of greater importance in practice is the percentage of fat and muscle tissue. Correction of body composition is often equated with weight loss, which is wrong. It is predicted that a decrease in body mass does not mean a decrease in the percentage of adipose tissue at the same time, as a decrease can also occur due to a decrease in muscle tissue, which is not good. The essence of programs in which body composition is corrected is to reduce adipose tissue by maintaining or enlarging muscle tissue (Bozoljac, 2019). Research on determining body composition in women as a parameter of lifestyle in Kosovo and the world is partial in terms of both number and age, so various researches do not give us much space to be able to compare our results. The measure of obesity has traditionally been the Body mass index (BMI). Based on Nuttall, (2015) BMI is the metric currently in use for defining the anthropometric height and weight characteristics in adults and for classifying them. BMI is a formula used to estimate body weight relative to height. For epidemiological studies, the body mass index (BMI), defined as body weight divided by height squared (kg/m2), is regarded as the most suitable indicator for overweight and obesity (Deurenberg, Yap & Van Staveren, 1998). Based on National Heart, Lung, Blood Institute, National Institute of Diabetes, Digestive, & Kidney Diseases, (1998) individuals with a BMI of 25 to 29.9 are considered overweight, while individuals with a BMI ≥30 are considered obese.

Material & methods

For the realization of the purpose of this paper, samples from 52 women were included, with students of the Faculty of Education in Pristina at University of Pristina "Hasan Prishtina". The women were divided into two groups. The first group consisted of N = 25 - Females 19-20 years, and the second group N = 27– Females 21-28 years. The parameters of the body composition applied in this research were: calendar age (age), height of the body (height), body weight (weight), body fat, muscle mass (muscle), daily calorie intake (kcal), metabolic age, total body water (water), visceral fat, and body mass index (BMI). Measurements were performed in accordance with the International Biological Programme (IBP) standards. Body composition was measured with the TANITA BC-601 apparatus by the bioelectrical impedance method (BIA). The method of bioelectrical impedance is based on the assumption that the electrical resistance is greater in adipose tissue (containing 14 - 22% water), as the conductivity depends on the percentage of water in the tissue, which is higher in fat-free mass. Data on gender and on date of birth were collected together with anthropometry. Height was measured to the nearest 0.1 cm with a portable stadiometer with students standing in bare feet. All measurements of body composition were performed by analysis of body composition with "TANITA" BC-601. The data entered in TANITA apparatus to continue with the measurements of all body compositions for each individual have been height, weight, age, and gender. The bio-impedance component of the measurements took 30 to 40 seconds per subject. The basic statistical and distribution parameters that have been applied in this paper are Minimum, Maximum, Mean, Std. Deviation, Skewness, Kurtosis, max-D and Kolmogorov-Smirnov test (K-S). To verify the difference between the arithmetic averages of the groups, independent samples T-test was applied. All data processing is done (performed) with the statistical packages SPSS for Windows, Version 22.0 in the Centre for Analysis and Processing of Data working at the Faculty of Physical Education, Sport and Health, at University "St. Cyril and Methodius" – Skopje.

Results

For all body composition variables for Group1 (N = 25) - Females 19-20 years, the following values are calculated: arithmetic mean (Mean), standard deviation (Std. Deviation.), minimum value (Minimum) maximum value (Maximum), coefficient of asymmetry of the distribution of results (Skewness) and the coefficient of curvature of the distribution of results (Kurtosis), (Max-D) and the Kolmogorov-Smirnov test (K-S).

Table 1 shows the central and dispersion parameters of body compositions of Group1 (N = 25) - Females 19-20 years. Based on the value of the skewness asymmetry test, a pronounced asymmetry was obtained in the variables of body composition: age, weight, muscle, kcal, metabolic age and visceral fat. Normal asymmetry in the distribution of results is considered when the asymmetry test values (skewness) in the body composition variables are in the range between +/- 1.00 (Malacko and Popović, 1997).The normal asymmetry of body composition variables is found in height, body fat, water, and BMI. Negative value of skewness (hypocurtic) indicates that the distribution of results is shifted to the right i.e., the largest number of results achieved is under the arithmetic mean value. Negative asymmetry is obtained in body composition on total body water. The positive value of the skewness (epicurtic) indicates that the distribution of the results is shifted to the left i.e., the largest number of results achieved is above the arithmetic mean value. Positive asymmetry is obtained in these variables of body composition: age, weight, muscle mass, kcal, metabolic age, and visceral fat. Max-D values indicate that the results of the calendar age (Age) and Visceral fat have a deviation from the normal distribution which is confirmed by the Kolmogorov-Smirnov test $p<0.01$.

Table 1. Central and dispersion parameters of body compositions – Group 1 (N=25) – Females 19-20 years

	Mean	Std. Deviation	Minimum	Maximum	Skewness	Kurtosis	max D	K-S
Age	19,28	0,46	19,00	20,00	1,04	-1,00	0,45	p < ,01
Hight	1,68	0,06	1,55	1,85	0,68	2,12	0,17	p > .20
Weight	60,02	11,19	43,20	92,10	1,15	1,82	0,20	p > .20
Body fat	26,20	5,56	18,70	39,50	0,81	0,29	0,15	p > .20
Muscle %	42,19	7,62	32,10	65,70	1,74	4,07	0,22	p < ,15
Kcal	2186,92	358,63	1713,00	3263,00	1,60	3,16	0,24	p < ,15
Metabolic age	18,48	7,64	12,00	35,00	1,09	0,04	0,22	p < ,20
Water	54,52	3,44	47,00	60,60	-0,32	0,07	0,11	p > .20
Visceral fat	1,64	1,47	1,00	7,00	2,57	6,91	0,47	p < ,01
BMI	21,45	3,28	16,50	30,10	0,88	0,75	0,17	p > .20

Table 2 presents central and dispersion parameters of distributions body compositions of Group 2 (N = 27) - Females 21-28 years. Based on the value of the skewness asymmetry test, a pronounced asymmetry was obtained in the variables of body composition: age, weight, muscle mass, visceral fat, and BMI. Normal asymmetry in the distribution of results is considered when the asymmetry test values (Skewness) in the body composition variables are in the range between +/- 1.00 (Malacko and Popović, 1997).The normal asymmetry of body composition variables is found in: height, body fat, kcal, metabolic age and water. Negative value of Skewness (hypocurtic) indicates that the distribution of results is shifted to the right, i.e., the largest number of results achieved is under the arithmetic mean value. Negative asymmetry is obtained in body height and total body water. Max-D values indicate that the results of the age and visceral fat have a deviation from the normal distribution which is confirmed by the Kolmogorov-Smirnov test $p < 0.01$ and $p < 0.05$.

Table 2. Central and dispersion parameters of body compositions Group2 - (N=27)– Females 21-28 years

	Mean	Std. Deviation	Minimum	Maximum	Skewness	Kurtosis	max D	K-S
Age	22,85	2,32	21,00	28,00	1,04	-0,44	0,31	p < ,01
Hight	1,66	0,06	1,52	1,80	-0,24	0,18	0,11	p > .20
Weight	62,33	13,04	44,80	102,70	1,49	2,68	0,17	p > .20
Body fat	27,76	6,98	15,40	45,00	0,31	0,36	0,10	p > .20
Muscle %	41,59	7,09	26,60	60,50	1,00	2,05	0,23	p < ,10
Kcal	2171,85	351,85	1596,00	2952,00	0,92	0,10	0,22	p < ,15
Metabolic age	24,07	9,85	12,00	43,00	0,32	-1,31	0,14	p > .20
Water	52,37	5,54	37,00	62,00	-0,86	1,47	0,11	p > .20
Visceral fat	2,22	1,83	1,00	9,00	2,22	6,36	0,27	p < ,05
BMI	22,59	4,06	17,07	34,80	1,20	1,93	0,16	p > .20

Table 3 shows the values of the arithmetic mean differences between the G1: G2 group of women aged 19-20 years and 21-28 years. The values of the t-test as well as the significance indicate that among the arithmetic averages of the variables of body composition, calendar age (Age) t = -7.57; sig = 0.00 and Metabolic age t = -2.28; sig = 0.03 have a statistical significant difference. Although there aren't statistical significant differences in other variables, it can be seen that all variables have worse results with aging. Further, we will discuss the results of all variables. Based on the results of means of the body weight between two groups (N = 25) = 60.02 and (N = 27) = 62.33 – (t = -0.68), we can conclude age has an impact in weight increase. Based on the results of body fat means between two groups (N = 25) = 26.20 and (N = 27) = 27.76 – (t = -0.89), we can conclude that age have an impact on body fat increase of women. Based on the results of muscle percentage means (N = 25) = 42.19 and (N = 27) = 41.59 – (t = 0.29) we can conclude that age have an impact on muscle percentage decrease on women. Based on the results of kcal means (N = 25) = 2186.92 and (N = 27) = 2171.85 – (t = 0.15) we can conclude that as age increases the number of kcal spent is decreased. Based on the results of metabolic age means (N = 25) = 18.48 and (N = 27) = 24.07 – (t = -2.28) the average age of (N = 27) is 22, but the metabolic age is 24, we can conclude that metabolic age increases with aging. Based on the results of total body water means (N = 25) = 54.52 and (N = 27) = 52.37 – (t = 1.66) we can conclude that there exist a decrease on total body water with aging. Based on the results of visceral fat means (N = 25) = 1.64 and (N = 27) = 2.22 – (t = -1.26), we can conclude that there exist an increase of visceral fat with aging. Based on the results of body mass index means (N = 25) = 21.45 and (N = 27) = 22.59 – (t = -1.11), we can conclude that there exist an increase of body mass index with aging.

From the results obtained we can conclude that all variables have worse results with aging.

Table 3. T-test - G1:G2

	Groups	N	Mean	t	Df	Sig.
Age	1	25	19,28	-7,57	50	0,00*
	2	27	22,85			
Height	1	25	1,68	1,03	50	0,31
	2	27	1,66			
Weight	1	25	60,02	-0,68	50	0,50
	2	27	62,33			
Body fat	1	25	26,20	-0,89	50	0,38
	2	27	27,76			
Muscle %	1	25	42,19	0,29	50	0,77
	2	27	41,59			
Kcal	1	25	2186,92	0,15	50	0,88
	2	27	2171,85			
Metabolic age	1	25	18,48	-2,28	50	0,03*
	2	27	24,07			
Water	1	25	54,52	1,66	50	0,10
	2	27	52,37			
Visceral fat	1	25	1,64	-1,26	50	0,21
	2	27	2,22			
BMI	1	25	21,45	-1,11	50	0,27
	2	27	22,59			

Table 4. The difference in metabolic age

	19-20 years	21-28 years	Difference
Age	19,28	22,85	-3,57
Height	1,68	1,66	0,02
Weight	60,02	62,33	-2,31
Body fat	26,2	27,76	-1,56
Muscle %	42,19	41,59	0,6
Kcal	2186,92	2171,85	15,07
Metabolic age	18,48	24,07	-5,59
Water	54,52	52,37	2,15
Visceral fat	1,64	2,22	-0,58
BMI	21,45	22,59	-1,14

The difference in metabolic age indicates that in women aged 21-28 years the lifestyle begins to change compared to women aged 19-20 years. The metabolic age of women in this paper also shows a decrease in movement and greater consumption of energy. This is related to higher values of other parameters of body composition in women aged 21-28 years. This research is in line with the research of other authors where after 20 years of age there is an increase in body weight and an increase in adipose tissue, where the relative increase in the amount of intra-abdominal adipose tissue is greater than subcutaneous and total. According to Elia, Ritz & Stubbs (2000) the aging process is accompanied by a decrease in basal metabolic rates and the level of physical activity. The results of the BMI of this research (22.59 kg / m2), are lower compared to the values of BMI in Vojvodina (26.6 kg / m2) and Serbia (26.6 kg / m2) (Radić, 2016). Compared to the world average values of BMI 24.4 kg / m2 for women), women in Kosovo have lower BMI values (Bixby et al., 2019), which means that all this changes are even more highlighted in female in other countries.

Discussion

For each individual, regardless of age or gender, within the morphological characteristics (body composition), there are exactly certain percentages of muscle tissue, adipose tissue and bone tissue that are the basis for good functional status of the organism, i.e., for good health. In this paper, the two-component model was used, which divides the whole body into total body fat (fat mass) and fat-free mass. Considering the importance of quality of life in the context of the growth of overweight in the population of any age and gender, this study was conducted in order to investigate and confirm the difference between women aged 19-20 and 21-28 years. We took these two ages in research thinking that from the age of 19-20 years as the age of late adolescence with greater physical activity is passed to the age of 21-28 years with a different lifestyle. Based on the Office of Disease, Prevention and Health Promotion, (2020) health-related quality of life is a multidimensional structure that includes physical, emotional, mental and social well-being. This well-being is influenced by various internal and external factors, the most important of which is the lifestyle. The results obtained after statistical processing indicate two important statistical differences in the variables of body composition, calendar age (Age) which has been consistent because even for the purposes of this paper we have divided the sample according to the age that was expected to be obtained one significant statistical difference and in the variable of metabolic age. If we look at the difference in calendar age (-3.57) and the difference in metabolic age (-5.59) we see that we have a higher difference in metabolic age.

Conclusions

Since overweight and physical inactivity are the main risk factors for chronic non-communicable diseases, reducing their incidence in the most vulnerable categories of the population (especially over the age of 21) would indirectly reduce existing health inequalities, which is one from the priorities in the field of public health. The results showed that the risk of gaining overweight starts at the age of 21, which in later periods can be followed by the appearance of various diseases due to physical inactivity and excessive consumption of energy substances. While our results have shown that body weight, body fat, metabolic age, visceral fat, and BMI increase with aging and on the other side the percent of muscle tissue, kcal spent and water percentage decrease with aging, we conclude that age is one of the factors that affects in worsening of good health. The results also showed that it is very important to develop a habit of exercising at a young age so that later it can be transformed into a way of life and affects the quality of life.

References:

Ahmed, H. G., Ginawi, I. A., Elasbali, A. M., Ashankyty, I. M., & Al-hazimi, A. M. (2014, 25 June). Prevalence of obesity in Hail region, KSA: in a comprehensive survey. *Journal of obesity*, (5 pages). http://dx.doi.org/10.1155/2014/961861.

Bozoljac, J. (2019). *Utvrdivanjje efekata različitih modela kinezioloških aktivnosti na transformaciju antropoloških dimenzija žena.*Doktorskadisertacija,Brčko – distrikt: Fakultetzdravstvenihnauka.

Bixby, H., Bennett, J. E., Taddei, C., Stevens, G. A., Lotufo, P. A., Manitto, A. M., et al. (2019). Rising rural body-mass index is the main driver of the global obesity epidemic in adults. *Nature*, *569*(7755), 260-264. doi:10.1038/s41586-019-1171-x

Deurenberg, P., Yap, M., & Van Staveren, W. A. (1998). Body mass index and percent body fat: a meta-analysis among different ethnic groups. *International journal of obesity*, *22*(12), 1164-1171.

Elia, M., Ritz, P., & Stubbs, R. J. (2000, Jun). Total energy expenditure in the elderly. *European journal of clinical nutrition*, *54*(Suppl. 3), 92-103.

Fock, K. M., &Khoo, J. (2013, Dec). Diet and exercise in management of obesity and overweight. *Journal of gastroenterology and hepatology*, *28*(Suppl. 4), 59-63.doi: 10.1111/jgh.12407.

Lohman, T. G., Roche, A. F., & Martorell, R. (1988). *Anthropometric standardization reference manual*. Chicago: Human Kinetics Books.

Malacko, J. iPopović, D. (1997). Metodologija kineziološko-antropoloških istraživanja (The methodology of kinesiological-anthropological researches). Priština: Fakultetfizičkekulture.
National Heart, Lung, Blood Institute (NHLBI), National Institute of Diabetes, Digestive, & Kidney Diseases (US). (1998, Sep.). *Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: the evidence report* (Report No.: 98-4083). Bethesda (MD): National Heart, Lung, and Blood Institute.
Nuttall, F. Q. (2015, May). Body mass index: obesity, BMI, and health: a critical review. *Nutrition today*, *50*(3), 117-128.
Office of Disease, Prevention and Health Promotion. (2020).Health-Related Quality of Life & Well-Being | Healthy People. Office of Disease Prevention and Health Promotion. Retrieved from: https://www.healthypeople.gov/2020/topics-objectives/topic/health-related-quality-of-life-well-being
Radić, I. (2016). *Gojaznost i fizička neaktivnost kao javno-zdravstveni problem odraslog stanovništva Vojvodine.*Doktorskadisertacija, Novi Sad: Medicinskifakultet.
Scherrer, U., Randin, D., Tappy, L., Vollenweider, P., Jequier, E., &Nicod, P. (1994). Body fat and sympathetic nerve activity in healthy subjects. *Circulation*, *89*(6), 2634-2640.
ShukovaStojmanovska, D., &Gontarev, S. (2018, January). Gender Differences in Decreasing of Body Mass and the Percentage of Body Fat with Body Building. *International Journal of Science and Research (IJSR), 7*(1), 1815-1822. doi: 10.21275/ART20179824.
World Health Organization (WHO). (1997). *Obesity-preventing and managing the global epidemic*. Report of WHO consultation on obesity. Geneve: 7-17.