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***Body composition of children from suburban Wrocław society
– initial analysis***

Skład ciała dzieci ze społeczności podwrocławskiej – badania wstępne

Słowa kluczowe: skład ciała, rozwój dzieci

Key words: body composition, children's development

INTRODUCTION

Measurement and evaluation of the status of nourishment is a very important parameter to appreciate the condition of the individual – both to demonstrate the excessive alimentation (obesity, include pathological), as well malnutrition (simple malnutrition, starvation, cachexia, skeletization). Human body composition, particularly proportional contents among fat mass, total body water and fat-free dry solids, play important role in health human being, both in estimation singular person and whole population as well patients with endocrine disorders [3]. Analysis of human body composition is especially usefulness to estimate the initial condition of chil-

dren and to follow the individual development of child. After the end of sexual maturation in health human being lean body mass stays relatively constant, however significant differences related to sex and age can be observed. The increase in lean body mass composition in human being occurs just before the period of sexual maturation and continues in the course of this process, but in male it takes more time and the effects of this elongation can be saw in different body structure. That process starts from sixteen year of the live and lasts in adult person. The decrease in proportion between the lean body mass and the others compartments starts in adult females after the age of 50 and in male after 60 [1]. The highest proportional contribution of lean body mass in males takes place from the age of 19 through 22. In females the same compartment grows gradually till the age of 40. It is cause by increase in fat tissue.

Trying to choose the best method of measurement of the human body composition we can use one of several types of analysis: total body electrical conductivity, computer tomography, magnetic resonance, hydrometry (deuterium oxide dilution), isotope methods (isotope dilution analysis, isotopic composition of potassium), total concentration of calcium and nitrogen, bioelectrical impedance analysis (BIA) and dual-energy X-ray absorptiometry (DXA) [2, 5, 8, 13, 14, 15, 21]. It should be underline, that this mentioned methods are very expensive and inaccessible in routine medical practice, otherwise are much more accurate than wide used anthropometric analysis and skin-fold measurements. Very popular and often applied methods – circumferences measurements, body weight and height, skin folds measurements – are very popular because of the repeatability and facility, but they have got many inconveniences and restrictions. Anthropometric analysis is used to estimate the initial state of nutrition of patients and in following the progress in development of the controlled patients.

Following the changes, that will occur in the body composition of the members of the group in coming years, they will allow to observe the progress in development of participants in typical, specific human environment.

The decrease in fat mass and increase in muscular compartment occurs in athletes (professionals) and in persons who start with sport activity. The disturbances in the balance between the fat mass and muscles occur in persons under great pressure in school or work. It is worth to mention that there is coincidence between sport activity and body composition – constant exercises lead to changes in human body composition. Fat mass in such a person is lower 5 % than the rest of the population, parallel occurs the increase in lean body mass [7, 10, 12, 16, 17, 20].

The aim of this paper is to establish the initial human body composition of the members of the group. The analysis of the body composition of the members of the group will allow to find the persons with the extreme parameters of specific weight (density) and following the further development of this persons (pediatric examination will be conducted, if necessary, in extreme condition of the examined child).

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MATERIAL AND METHODS

The examined group is composed of 31 persons (children) living in children's house close to Wrocław, region Lower Silesia. There are 16 boys and 15 girls aged from 8 to 20 years (mean calendar age of the members of the group is 13,61 years). The youngest boy and girl are 8 years old. The oldest boy is 20, the oldest girl is 19 years old. Mean calendar age of male is 13,75 years, of females the mean calendar is 13,46 years.

The weight of boys – the highest score is 176,3 cm, the lower 123,8 cm; of girls respectively 168,3 cm and 114,1 cm. The measured circumferences of the thoracic cage are: in boys – from 53,1 cm to 102,1 cm, in girls from 58,1 cm to 102,2 cm.

The children and young members of the examined group stay in this dormitory from 3 months to 15 years.

Measurements and analysis were conducted by team of doctors, anthropologists and stomatologists in the place of living of the children. The children were with their professional protectors. The members of the group were asked to answers on the questions concerning the habits and knowledge about feeding. Sexual development was established and the status of the dentition was collected. The analysis and measurements were conducted in one day. (Tab. I)

Tab. I The parameters obtained in measurements of the children:

Number of the patients	Initials of the children	Sex of the examined child	Weight of the body [cm]	Circumferences of the thoracic cage [cm]	Age [years]
1	D.S.	M	153,0	68,1	12
2	W.K.	K	134,4	58,1	10
3	S.K.	K	114,1		9
4	A.P.	K	139,6	71,5	10
5	W.P	K	153,2	79,1	13
6	K.Ś.	K	155,1	74,1	14
7	E.S.	K	164,1	82,5	14
8	M.B.	K	154,9	102,2	19
9	A.S.	K	160,4	74,1	18
10	M.A.	K	166,0	91,2	16
11	P.K.	M	153,5	77,3	14
12	K.M.	M	141,5	62,3	12
13	D.Sz.	M	135,3	60,5	10
14	N.Sz.	K	127,7	61,5	8
15	S.Sz.	M	126,1	53,1	8
16	M.B.	M	156,9	97,1	12
17	P.Sz.	M	172,2	83,2	16
18	B.L.	K	161,9	82,1	14
19	N.S.	K	168,3	86,2	16
20	M.K.	M	166,4	81,2	17

Number of the patients	Initials of the children	Sex of the examined child	Weight of the body [cm]	Circumferences of the thoracic cage [cm]	Age [years]
21	A.Ch.	K	163,7	88,1	15
22	P.T.	K	145,8	69,1	11
23	K.K.	K	159,0	83,0	15
24	J.P.	M	146,3	77,1	10
25	M.K.	M	123,8	56,5	9
26	K.M.	M	162,9	79,6	15
27	P.B.	M	169,5	86,3	19
28	A.M.	M	170,5	81,1	14
29	D.B.	M	166,6	102,1	20
30	M.B.	M	169,6	99,1	17
31	K.S.	M	176,3	81,1	15

The weight parameters of the body and circumferences of thoracic cage were used to count specific weight (density) of the members of the examined group. The formula according Łutowina, Utkina and Cztięcowa to estimate the specific weight (specific density) was used:

$$CW = 1,085591 - 0,000003 \times (B-v) - 0,000221 \times (o. kl. p.)$$

Description of the formula:

CW – specific weight of the human body (density of the body)

B-v – height of the human body (cm)

o. kl. p. – circumference of the thoracic cage of the children (cm)

RESULTS

The obtained parameters of the specific weight of examined children were used to estimate proportions among fat-free dry mass, total body water and fat mass taken from the charts according K. P. Chanina (Tab. II)

Tab. II. Proportional composition of the body of examined group

Number of the patients	Initials of the children	Sex of the examined child	Specific density of the body	FAT-free dry mass (%)	Total body water (%)	Fat mass (%)
1.	D.S.	M	1,070	23,02	62,88	14,10
2.	W.K.	K	1,072	23,29	63,61	13,10
3.	A.P.	K	1,074	23,53	64,27	12,20
4.	W.P.	K	1,068	22,75	62,15	15,10
5.	K.Ś.	K	1,069	22,89	62,51	14,60
6.	E.S.	K	1,067	22,65	61,85	15,05
7.	M.B.	K	1,063	22,11	60,39	17,50
8.	A.S.	K	1,069	22,89	62,51	14,60
9.	M.A.	K	1,065	22,28	61,22	16,50
10.	P.K.	M	1,068	22,75	62,15	15,10

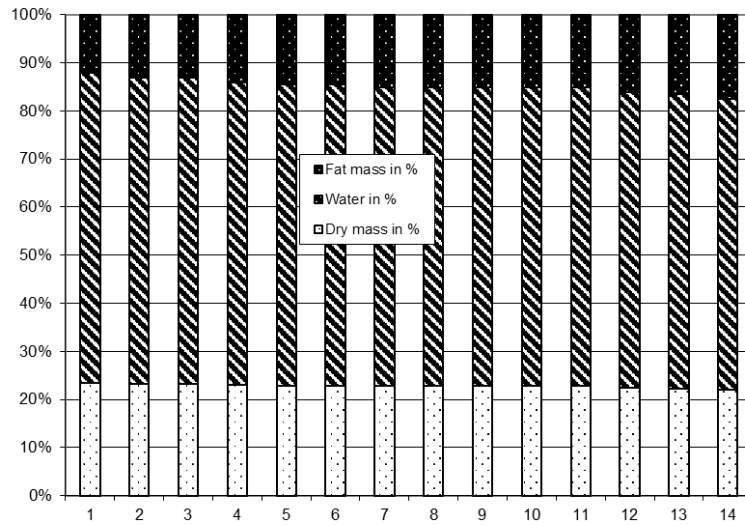
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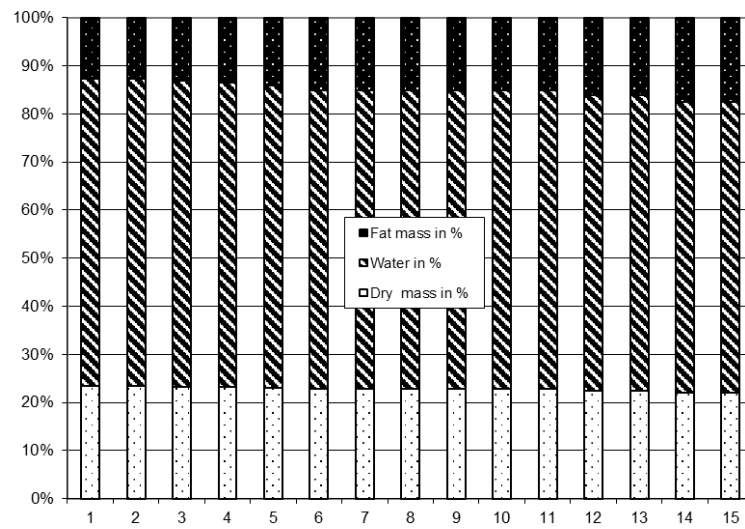
Number of the patients	Initials of the children	Sex of the examined child	Specific density of the body	FAT-free dry mass (%)	Total body water (%)	Fat mass (%)
11.	K.M.	M	1,071	23,16	63,24	13,60
12.	D.Sz.	M	1,072	23,29	63,61	13,10
13.	N.Sz.	K	1,072	23,29	63,61	13,10
14.	S.Sz.	M	1,073	23,40	63,90	12,70
15.	M.B.	M	1,064			
16.	P.Sz.	M	1,067	22,65	61,85	15,05
17.	B.L.	K	1,067	22,65	61,85	15,05
18.	N.S.	K	1,066	22,49	61,41	16,10
19.	M.K.	M	1,067	22,65	61,85	15,05
20.	A.Ch.	K	1,066	22,49	61,41	16,10
21.	P.T.	K	1,070	23,02	62,88	14,10
22.	K.K.	K	1,067	22,65	61,85	15,05
23.	J.P.	M	1,068	22,75	62,15	15,10
24.	M.K.	M	1,073	23,40	63,90	12,70
25.	K.M.	M	1,068	22,75	62,15	15,10
26.	P.B.	M	1,066	22,49	61,41	16,10
27.	A.M.	M	1,067	22,65	61,85	15,05
28.	D.B.	M	1,063	22,11	60,39	17,50
29.	M.B.	M	1,063	22,11	60,39	17,50
30.	K.S.	M	1,067	22,65	61,85	15,05

Specific weight of examined members of the group ranges from 1,063 kg/m³ in two girls and one boy to 1,074 kg/m³ in one girl. The dimorphous differences are statistically insignificant.

The observed 10 years old girl A. P. (specific weight 1,074) is characterized by the lowest score of fat mass (12,20 %) and the highest score of total body water in her body (64,27 %). The three children with the lowest specific weight (1,063) are characterized by the highest score of fat mass (17,50 %) and the lowest score of total body water (60,39 %). The analysis of the obtained scores is the base for starting the observation and follow up this group (4) of children.



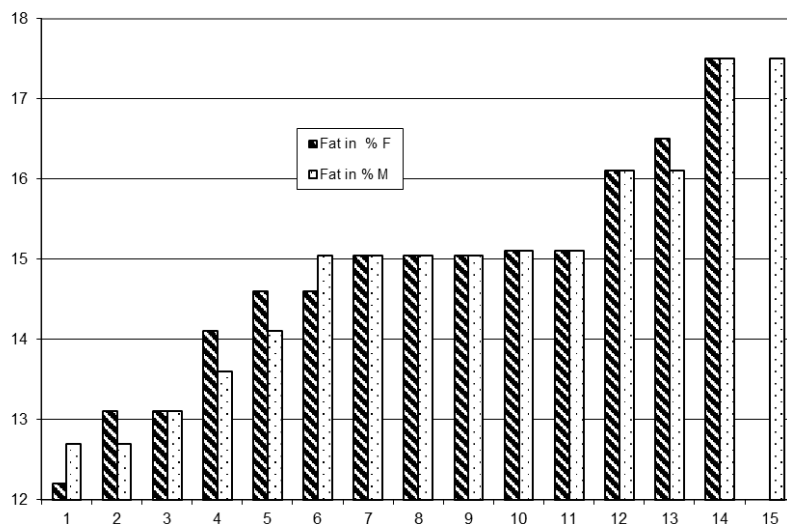
Ryc.1 Body composition of examined girls



Ryc. 2 Body composition of examined boys

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Ryc. 3 Proportional fat mass participation in body of the examined members of the group

DISCUSSION

The analyses of the human body started in XIX century, over hundred years ago. The specific weight in case of homogenous substance is measured as the weight per volume of a substance. The human body is inhomogenous, so obtained score ought to be treated as mean specific weight. In examined group the mean specific weight is equal with the specific density of the body. The density of the mass is its mass per volume, the relation between mean specific weight and mean specific density can be show as:

Mean specific weight = mean specific density x gravity (multiplied)

In examined group the gravity is constant, so the score of density can be treated as the score of the weight. In observed group the specific weight range from 1,063 kg/m³ to 1,074 kg/m³ in girls and 1,063 kg/m³ to 1,073 kg/m³ in boys.

To estimate the composition of human body were used the anthropometric methods, so in connection with the age of the group (children) the mistake, concerned with the distribution of the fat mass in elder people (centralization and internalization of the fat compartment), is avoided. The main attention was turned on the patients with the extreme parameters – suggesting on one hand obesity, on the other malnutrition. Excessive alimentation of the young people is the problem of the whole world – occurs in the majority of the developed countries – from North America, through Europe, to Asia [9, 11, 19]. The necessity of the fight with children and young people obesity is out of question. In many countries of the world the obesity

is a problem that is a danger for the health of the population, that's why we can observe growing interest in the alimentary status of young people. Each year more, and more money are spent on treatment of obesity and disorders caused by the complications and problems concerned with obesity. In connection with the observed decrease in interest in professional sport activity, as well in regular physical activity, one ought to foresee the increase in the scale of that process. Each year the doctors let the young people not attend in the sport activities at school and after the school. In addition to this complex of negative factors that influence on the health of the population, we can observe growing amount of mistakes in the alimentary habits. We prefer to eat sweets, more preserves and little fruits and vegetables.

The alimentary status, in particular proportional composition of the human body is responsible for the clinical parameters of the health: among them arterial blood pressure, stroke volume, vital capacity – maximum breathing capacity, total lung capacity, inspiratory capacity. So it is straight connection between the feeding and the physiological parameters describing the physical efficiency.

In the 50's years of the XX century the human body was divided into several compartments: total body water, protein, bones, mineral mass and fat mass [6]. In the next step, the development of the science caused the new development of the body: the body was divided into four compartments: body fat, cellular compartment, body water and solid mass [4]

The proper observation and monitor of the composition of the human body is the key to avoid the disorders caused by obesity (arthrosis – coxarthrosis and gonarthrosis, heart diseases – infarct of the heart, coronary atheromatosis, obliterative atheromatosis, arterial hypertension, diabetes-threaten), as well as cachexia (infectious diseases, osteoporosis, fatigability).

The composition of the controlled group is various. This paper is the opening of follow-up study of this group of children. We want to emphasize the lack of methods and procedures to follow the development of the young persons (the changes in the composition of their bodies). The difficulties are caused by influence of the environmental factors on the human genetics. The genetic factors may be increase or decrease in response to the environment. The more accurate information can be obtained in repeating the same examination on the same group in the next years. We meet the difficulties to apply the many factors describing the status of the feeding in the controlled group. The use of BMI is not correct for this purpose [18].

We want to emphasize that the most important part of the problem is situated in the status of this person in the local society – the exclusion. That exclusion caused by the obesity or cachexia may be very severe, especially in the population of the children. The elimination of “strange” person, fat or thin member of the local society may take different manifestation:

- visual exclusion
- verbal exclusion
- physical exclusion
- exclusion in the school and in dormitory

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Visual elimination is concerned with using only “bad” eyes – the negative emotions are located in the look. The verbal exclusion is when somebody disparage or humble other person. When the fat or thin person is jostled or pushed that kind of elimination is called physical exclusion. Exclusion in the school and in the children house are, when one person avoid the excluded person in school bench or in the room.

CONCLUSIONS

From that analysis, the necessary further follow-ups are required. The children with the extreme parameters of the body composition are under observation. Both extremes are under control, the threat of the obesity, as well the cachexia. We recommend the doctors' control during the routine medical examinations to exclude the pathological base for observed extremes.

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ABSTRACT

The aim of this paper is to initial description of the body composition of the group of 16 boys and 15 girls aged from 8 to 20 years. They live in the children house close to Wrocław, region Lower Silesia. The youngest boy is 8, the oldest 20, the youngest girl is 8, the oldest 19 years old. The members of the controlled group live in the children house from three months to 15 years. The weight of the body and the circumferences of the thoracic cage were collected. The scores were counted according Lutowinowa, Utkina and Cztiecowa. The highest weight in male was 176,3 cm, the lowest 123,8 cm (mean weight 155,65 cm), in females the highest weight was 168,3 cm, the lowest 114,1 cm (mean weight 151,21). The thoracic cage circumferences were as follow: in boys from 102,1 cm to 53,1 cm (mean 77,85 cm),

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in girls from 102,2 cm to 58,1 cm (mean 78,77 cm). The body proportional composition was established according K. P. Chanina charts. The specific weight in girls range from 1,063 kg/m³ to 1,074 kg/m³, and in boys from 1,063 kg/m³ to 1,073 kg/m³. The composition of the human body was as follow: the extremes - Fat-free dry mass from 22,11 % to 23,53 %, total body water from 60,39 % to 64,27 % and fat mass 12,20 % to 17,50 %. The childrens with the extreme parameters ought to be under doctors control.

STRESZCZENIE

Celem pracy jest wstępne określenie składu ciała 16 chłopców i 15 dziewczyn w wieku od 8 do 20 lat z domu dziecka znajdującego się pod Wrocławiem, na Dolnym Śląsku. Najmłodszy chłopiec ma 8 lat, a najstarszy – 20. Najmłodsza dziewczynka ma 8, a najstarsza 19 lat. Dzieci przebywają w miejscu pobytu od 3 miesięcy do 15 lat. Mierzono wysokość oraz obwód klatki piersiowej, a uzyskane wyniki pomiarów policzono według formuły zaproponowanej przez Łutowinową, Utkinę i Cztiecowa. W zakresie badanych cech u chłopców największy wzrost wynosił 176,3 cm, a najniższy 123,8 cm (średni wzrost 155,65 cm), a u dziewczynek odpowiednio 168,3 cm oraz 114,1 cm (średni wzrost 151,21 cm). Obwody klatki piersiowej wynosiły – u chłopców od 102,1 cm do 53,1 cm (średni wymiar 77,85 cm), a u dziewczynek od 102,2 cm do 58,1 cm (średni wymiar 78,77 cm). Wartości procentowe komponentów ciała odczytano z tabel zaproponowanych przez K. P. Chaninę. Ciężar właściwy u dziewcząt wahał się w przedziale od 1,063 kg/m³ do 1,074 kg/m³ oraz 1,063 kg/m³ do 1,073 kg/m³ u chłopców. Pozwoliło to na określenie składu ciała: w przedziale od 22,11 % suchej masy, 60,39 % wody i 17,50 % tkanki tłuszczowej (dla gęstości 1,063) do 23,53 % suchej masy, 64,27 % wody i 12,20 % tłuszczu (dla gęstości 1,074). Dzieci o skrajnym ciężarze właściwym wymagają zwiększenia monitoringu oraz nadzoru lekarskiego.

Artykuł zawiera 21153 znaki ze spacjami + grafika