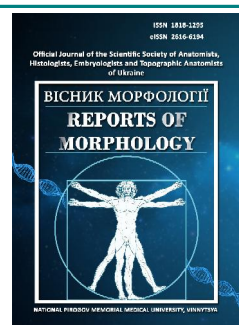# REPORTS OF MORPHOLOGY

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Dynamics of anthropometric indicators in girls within the pubertal period of ontogenesis

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The harmony of the organism development in different periods of ontogenesis, and especially puberty, determines the future fate of women in both medical and social aspects. The aim of the research was to study the total and partial body sizes in girls of pubertal period of ontogenesis. We surveyed 128 schoolgirls of 5-8 grades. We evaluated the stages of development of secondary sexual characteristics by hair growth in the axilla and pubis, the development of the mammary glands and age of onset of the first menstruation. According to G.G. Avtandilov's classification, all girls were divided into three groups - prepubertal (preceding the appearance of pubic hair), pubertal (puberty before menarche) and postpubertal period (fixed and completed pubertal maturation). The group of pubertal girls consisted of 106 schoolgirls, who were divided into groups according to calendar age: 13-year-old (n=29), 12-year-old (n=30), 11-year-old (n=24) and 10-year-old (n=23). Anthropometric survey was conducted according to the scheme of V.V. Bunak and contained the definition of total (length and body weight) and partial (longitudinal, transverse and anterior-posterior) dimensions. The analysis of the obtained results was performed in the license package Statistica 5.5 using non-parametric methods of evaluation of indicators. In our study, it was found that anthropometric indicators characterize the physical development, the level of its harmony and morphofunctional maturity of girls within the pubertal period of ontogenesis. We found a progressive age dynamics of total and partial body size in girls of this age period. The periods of the most intensive growth within the pubertal period of ontogenesis of total and partial sizes of a body are established. At the end of puberty there is the most intense age increase in body length: a rapid increase in body weight begins at the age of 12, the most intense processes of longitudinal growth of the torso and lower extremities in girls are observed from 11 years. Most of the transverse dimensions within the pubertal period of ontogenesis have a pronounced progressive age dynamic. Lower thoracic size, interspinous distance, and external conjugate did not differ statistically significantly between girls of different ages during puberty.
Keywords: girls, biological age, puberty, physical development, anthropometric dimensions.

Introduction

Health care for girls - as expectant mothers - is one of the primary tasks of integrative anthropology, given the deteriorating demographics against the background of declining birth rates and socio-economic level of the population, and, moreover, against the background of increasing overall morbidity [9, 13, 21]. The state of health characterizes the gene pool of the nation, especially when it comes to maintaining the reproductive health of the younger generation [7, 11]. Statistics in recent years remain disappointing and show a negative natural increase and decrease in the share of children, which leads to the so-called "aging of the nation". Today, Ukraine ranks 186th out of 226 countries in terms of birth rate and 4th in the world (3rd in Europe) in terms of infant mortality. This raises the issue of early diagnosis and timely treatment of girls with puberty and menstrual disorders to one of the highest priorities, because their health is crucial for the formation of the next generation [12]. It is noted that on average 19% of adolescent girls in Ukraine have menstrual disorders [26].

Morphofunctional reorganization of a woman's body determines many life processes [18, 19]. Indicators of biological age - a reliable criterion by which you can "catch" the inadequacy of the restructuring of certain parts of the human body. The harmony of the development of the organism in different periods of ontogenesis largely determines the further life and destiny of a woman in both medical and social aspects [15, 17]. From this point of view, it is especially important to study these processes during puberty, because it is accompanied by physical and psycho-emotional changes, which are aimed at maintaining and developing one of the main physiological functions of the female body - fertility [19]. The age at which girls reach puberty is of considerable interest in various fields of medicine and science in general, affects the problems of prevention and early diagnosis in medical practice and is the subject of many scientific studies on the preservation and development of reproductive potential [11]. Puberty should be considered as a complex sequence of anatomical and physiological changes, and anthropometric parameters of physical development, along with secondary sexual characteristics, are the basis for assessing the child's development, which helps the doctor during the examination of the child to identify atypical signs of puberty [10, 14, 20].

The aim of the research was to study the total and partial body sizes in girls of pubertal period of ontogenesis.

Materials and methods

The study was conducted in September - November 2019 on the basis of Chernivtsi Secondary School I-III degrees №1. We surveyed 128 schoolgirls of 5-8 grades: 32 girls of 5th grade, 33 girls of 6th grade, 31 girls of 7th grade, 32 girls of 8th grade.

We evaluated the stages of development of secondary sexual characteristics according to the scheme of V.B. Schwartz and S.V. Khrushchev [25], determined the hair in the axilla (Ax) and pubis (P), the development of the mammary glands (Ma) and the age of start of period (Me).

According to the classification of G.G. Avtandilov [6], all girls were divided into three groups - prepubertal (preceding the appearance of pubic hair), pubertal (puberty before menarche) and postpubertal period (fixed and completed puberty).

Thus, the group of adolescent girls consisted of 106 schoolgirls, including 23 girls of 5th grade, 33 girls of 6th grade, 32 girls of 7th grade, 15 girls of 8th grade. All schoolgirls of pubertal ontogenesis were divided into groups according to calendar age (full years): 13-year-old - 29 people, 12-year-old - 30 people, 11-year-old - 24 people, 10-year-old - 23 people.

In addition, it was found that the average age of onset of menarche in girls of Chernivtsi Secondary School I-III grades №1 was 13 years 2 months.

The anthropometric survey was performed according to the scheme of V.V. Bunak [8] and included the determination of total (length and body weight) and partial (longitudinal, transverse and anterior-posterior) dimensions.

The analysis of the obtained results was performed in the license package Statistica 5.5 using non-parametric methods of evaluation of indicators.

Results

As a result of our study, we established the average parameters of weight, length, longitudinal, transverse, anterior-posterior body size in girls of different calendar ages, but which according to the development of secondary sexual characteristics belonged to the pubertal period of ontogenesis. The data obtained by us show a general tendency to increase with age all the average anthropometric indicators of physical development of girls. We compared the corresponding indicators in girls in pairs between comparison groups. The calendar age of the subjects differed by 1 year.

Thus, body length in girls of different ages is statistically significantly different. Significant differences were observed between girls aged 10 and 11 years (p<0.01) and 12 and 13 years (p<0.001) (Table 1).

Significant differences in body weight were found between 11 and 12 and 12 and 13-year-old girls, in all cases p<0.01 (see Table 1).

The height of the thoracic point differs statistically significantly between girls aged 11 and 12 years (p<0.05) and 12 and 13 years (p<0.001), the height of the shoulder - between 11 and 12-year-old girls (p<0, 01) and 12- and 13-year-olds (p<0.001) (see Table 1).

We found that the height of the pubic point is significantly higher in 11-year-old girls compared to 10-year-olds and in 13-year-old girls compared to 12-year-olds (in both cases p<0.05). This indicator has a pronounced age dynamics of increase, but between the groups of 12 and 13 years the difference in the value of this indicator is not significant. A similar pattern can be traced for the height of the trochanteric point: a statistically significant difference in the value of this indicator of physical development when comparing groups 10 and 11 years (p<0.05) and 12 and 13 years (p<0.01) (see Table. 1). The height of these anthropometric points reflects the processes of longitudinal growth of the lower extremities.

Analyzing the height of the finger point in girls of all ages, we found a significant difference in the value of this indicator between all groups of comparisons, but the most intense processes of longitudinal growth in girls are observed in the period from 12 to 13 years (p<0,001) (see Table 1).

In the study of transverse and anterior-posterior body size in girls of pubertal period of ontogenesis, we found certain features.

Let's focus on the transverse dimensions of the chest (Table 2). Thus, the middle thoracic diameter in 11-year-old girls was significantly larger (p<0.01) compared to 10-

Table 1. Changes in total and longitudinal body size in girls of pubertal ontogenesis, (M±m).

Indicators	Age (years)				p₁	p₂	p₃
	10	11	12	13			
Body length (cm)	146.1±3.2	151.3±2.4	153.1±6.5	160.5±6.4	<0.01	>0.05	<0.001
Body weight (kg)	36.12±5.14	36.55±4.66	41.25±4.08	47.51±3.07	>0.05	<0.01	<0.01
Height of the suprathoracic point (cm)	117.2±3.3	119.8±4.6	124.0±5.9	130.2±6.3	>0.05	<0.05	<0.001
Pubic point height (cm)	68.34±3.15	72.15±2.63	75.45±3.93	80.91±3.99	<0.05	>0.05	<0.05
Shoulder point height (cm)	118.5±4.2	120.7±2.9	124.5±3.8	131.3±4.7	>0.05	<0.01	<0.001
Finger point height (cm)	50.22±4.02	54.04±2.55	57.99±3.32	61.45±1.85	<0.05	<0.05	<0.001
Height of the trochanteric point (cm)	72.62±3.02	76.05±2.44	77.95±3.88	80.82±3.78	<0.05	>0.05	<0.01

Notes (here and in the future): p_1 - the reliability of the difference between 10-11-year-old girls; p_2 - the reliability of the difference between 11-12-year-old girls; p_3 - the reliability of the difference between 12-13-year-old girls.

Table 2. Changes in transverse and anterior-posterior body size in girls of pubertal ontogenesis, (M±m, cm).

Indicators	Age (years)				p₁	p₂	p₃
	10	11	12	13			
Middle thoracic size	17.83±1.07	20.01±2.12	21.83±1.67	23.95±1.99	<0.01	>0.05	<0.01
Lower thoracic size	17.34±1.83	18.50±1.05	19.80±1.23	19.42±1.69	>0.05	>0.05	>0.05
Anterior-posterior chest size	13.82±1.12	14.19±0.58	15.05±1.06	16.77±1.20	>0.05	>0.05	<0.01
Shoulder width	27.06±2.05	27.22±0.93	30.36±1.89	33.98±1.01	>0.05	<0.01	<0.01
Interspinous distance	21.11±1.56	21.34±1.59	21.48±1.32	21.65±2.10	>0.05	>0.05	>0.05
Intercristal distance	22.15±1.22	23.88±1.52	24.25±1.42	24.88±1.71	<0.05	>0.05	>0.05
Intertrochanteric distance	23.86±1.68	24.22±1.33	26.26±1.03	28.76±1.67	>0.05	<0.05	<0.01
External conjugate	15.26±1.22	15.92±1.53	16.16±1.34	16.83±1.27	>0.05	>0.05	>0.05

year-old schoolgirls, between 11 and 12-year-old girls there was no significant difference in the value of this indicator, between 12 and 13-year-old girls there was a significant difference (p<0.01). Lower thoracic size does not differ significantly between girls of different calendar ages within the pubertal period of ontogenesis.

It was found that the width of the shoulders has no significant differences when comparing groups of girls 10 and 11 years. We found a significant difference in the magnitude of this transverse torso size between girls 11 and 12 years and 12 and 13 years (in both cases p<0.05). Anterior-posterior chest size has a statistically significant difference only between girls aged 12 and 13 (p<0.01). When comparing the value of this indicator between other observation groups, no significant difference was found (see Table 2).

It was found that interspinous distance has no statistically significant differences between any comparison group, in addition, it should be noted that the absolute values of this pelvic size are in girls of different calendar ages during puberty at almost the same level. Analyzing the age-related changes in intercristal distance, we found that this figure in 11-year-old girls is significantly higher than in 10-year-old (p<0.01), and then the growth rate of this pelvic size is slowed down, differences in the comparison of groups of girls 11 and 12 years, 12 and 13 years (see Table 2).

In contrast to previous indicators, the pelvic intertrochanteric distance has a pronounced age-related dynamics of changes within the pubertal period of ontogenesis, despite the fact that we did not find a significant difference between the comparison groups at the beginning of pubertal development. It should be noted that, starting at age 11, intertrochanteric distance increases rapidly. We recorded a statistically significant difference in the size of this transverse pelvic size between groups of girls 11 and 12 years (p<0.05) and 12 and 13 years (p<0.01). We found that the anteroposterior size of the pelvis, which is indicated by the size of the external conjugate in girls of different calendar ages of puberty ontogenesis, has no significant differences (see Table 2).

Discussion

Scientists point out that the study of morphofunctional features of the organism should be based on the ontogenetic approach, because within certain annual age-sex groups individuals have different anatomical and physiological level of development [2, 4, 23]. Among the many methods of assessing biological age is particularly popular, quite reliable and affordable is to determine the stages of development of secondary sexual characteristics [1, 3, 5]. The results of our study are a confirmation of this opinion, especially clearly reflect the uneven physical development in certain groups, divided by calendar age, survey data of 10-year-old and 13-year-old schoolgirls. Thus, among 10-year-old girls, 20.69% have zero stages

of development of secondary sexual characteristics and belonged to the prepubertal period of ontogenesis, and 9.37% of 13-year-old schoolgirls belonged to the postpubertal period of ontogenesis. We found that the mean age of onset of menarche in the girls we examined was 13 years and 2 months. These results are comparable to the parameters of girls living in developed countries, where the age of onset of menarche is from 12 to 13 years [22].

The age of onset of menarche is directly proportional to height and inversely proportional to body mass index [28]. The relation between the onset of menarche and body weight was established in 1974 by American scientist Rosa Frisch, who studied the issue of infertility. Over time, the minimum body weight at which the onset of menarche is possible is called "critical body weight". Its value at a height of not less than 155 cm ranges from 44 to 47 kg [11, 22]. When conducting surveys of schoolgirls in Ukraine, the average body weight, height and body mass index at the time of the onset of menarche were: city residents body weight - 47.20±1.40 kg, height - 158.0±0.01 cm, body mass index - 18.80±0.53 kg/m2, the villagers had a body weight of 45.90±2.40 kg, height - 157.0±0.03 cm, body mass index - 18.40±0.57 kg/m2. The study for girls (regardless of their place of residence) found an inverse association between age of onset of menarche and body mass index, as well as a direct relationship between age of onset of menarche and height [11]. In our study, it was determined that at the end of the pubertal period of ontogenesis in girls living in an urban-type settlement of Vinnytsia region, body length was 160.5±6.4 cm, and body weight - 47.51±3.07 kg. It should be noted that at the end of puberty ontogenesis in girls there are the most intense age increases in body length, and between 11 and 12 years - the rate of increase of this total body size is slowed, as evidenced by the lack of significant difference between the respective age groups. It should be noted that at the beginning of puberty, a significant increase in body weight in girls is not observed, despite significant increases in body length. And starting from the age of 12, a rapid increase in this total body size begins. According to the research of some scientists, it is known that body weight in girls is undeniable for puberty [11, 28]. In our opinion, the amount of body fat is especially important for the onset of menarche, because in girls the subcutaneous fat acts as a depot for the accumulation of female sex hormones, including estrogen, which affect puberty and puberty.

Analyzing the age dynamics of longitudinal body size, it is necessary to note the non-synchronicity of the detected changes in adolescent girls. Thus, the height of the sternum and shoulder points have similar age-related changes, as evidenced by our established significant differences in the value of these two indicators. Thus, we can conclude that the most intense processes of longitudinal growth of the torso and lower extremities, as evidenced by the magnitude of these two anthropometric parameters, in girls is observed from 11 years.

Chest sizes are one of the most important anthropometric indicators of physical development. These parameters determine not only the somatotypological affiliation of the person, but also play an important role in the prognostic and ascertaining sports selection [24]. Analyzing the age dynamics within the pubertal period of ontogenesis of middle-thoracic diameter, it should be noted that this figure increases sharply in girls 11 years compared with 10 years, during the next calendar age the growth rate of this transverse size of the chest slows down, and at the end of puberty ontogenesis, the size of the middle-thoracic diameter increases sharply, as evidenced by a significant difference found between groups of girls 12 and 13 years. We found that the value of the lower thoracic size does not have a significant difference when comparing girls of different calendar ages, but it should be noted that this anthropometric indicator in girls within the pubertal period of ontogenesis has a positive age dynamic. In the analysis of shoulder width, it was found that this figure in girls 10 and 11 years is almost at the same level. And from the age of 12 it begins to increase rapidly. The anteroposterior size of the thorax (or its thickness) begins to increase significantly only after 12 years. We found a statistically significant difference only between groups of girls 12 and 13 years.

Transverse dimensions of the pelvis during puberty in girls are marked by some asynchrony of changes. Thus, interspinous distance and external conjugate in girls within the pubertal period of ontogenesis did not differ significantly between any comparison group. It was found that only in 11-year-old girls the value of intercristal distance is significantly greater than in 10-year-olds, and then the growth rate of this pelvic size slows down. Intertrochanteric distance has a pronounced age dynamics of changes within the pubertal period of ontogenesis, despite the fact that we did not find a significant difference between comparison groups at the beginning of pubertal development, but from 11 years, intertrochanteric distance increases rapidly.

The analysis of anthropometric indicators of physical development in girls of pubertal period of ontogenesis indicates a pronounced age dynamic. The most significant changes during puberty are the longitudinal dimensions of the body, length and weight of the body, as well as the transverse dimensions of the pelvis and chest. Thus, the pubertal period of ontogenesis can be defined as a set of successive biological stages [11, 15, 16, 27], which are reflected in the features of anthropometric body size, which leads to the further formation of a woman's full reproductive function.

Conclusions

1. We found that body length in girls of different calendar ages within the pubertal period of ontogenesis is statistically significantly different, at the end of the pubertal period of ontogenesis in girls there are the most intense

age gains of this total body size, and in 11 to 12 years - slow longitudinal growth.

Significant differences (p<0.01) in body weight were found between 11 and 12, as well as between 12 and 13-year-old girls. Rapid weight gain begins at the age of 12.

2. Significant differences in the magnitude of anthropometric longitudinal body size in girls of pubertal ontogenesis were found: the height of the suprathoracic and shoulder points differed statistically significantly between groups of girls aged 11 and 12 years, as well as 12 and 13 years; pubic and acetabular points are significantly higher in 11-year-old girls compared to 10-year-old and in 13-year-old girls compared to 12-year-old. The identified patterns are evidence that the most intense processes of longitudinal growth of the torso and lower extremities in girls are observed from 11 years.

A significant difference in the height of the finger point was found between girls of all ages, but the most intense processes of longitudinal growth in girls are observed in the period from 12 to 13 years.

3. It was found that most of the transverse dimensions of the torso, with the exception of the lower thoracic size, within the pubertal period of ontogenesis has a pronounced progressive age dynamic, which is confirmed by significant differences between the comparison groups. The anteroposterior size of the chest increases significantly only after 12 years. We found a difference (p<0.01) only between groups of girls 12 and 13 years.

4. A significant increase in the individual transverse dimensions of the pelvis in girls during puberty ontogenesis was found. It was found that in the group of 11-year-old girls the value of intercristal distance was significantly higher than in the group of 10-year-olds. Intertrochanteric distance has a pronounced age dynamics of changes within the pubertal period of ontogenesis, a statistically significant difference was found between groups of girls 11 and 12 years, as well as 12 and 13 years. Interspinous distance and external pelvic conjugate have no statistically significant differences between any comparison group.

References

[1] Eyer, M., Dainat, B., Neumann, P., & Dietemann, V. (2017). Social regulation of ageing by young workers in the honey bee, Apis mellifera. *Experimental Gerontology,* 87, 84-91, doi: 10.1016/j.exger.2016.11.006

[2] Freitas, A.S., Figueiredo, A.J., deFreitas, A.L., Rodrigues, V.D., daCunha, A.A., Deusdara, F.F. … Silva, M.J. (2014). Biological Maturation, Body Morphology and Physical Performance in 8-16 year-old obese girls from Montes Claros - MG. *J. Hum. Kinet.,* 43, 169-176, doi: 10.2478/hukin-2014-0102

[3] Linpei, J., Weiguang, Z., & Xiangmei, C. (2017). Common methods of biological age estimation. *Clin. Interv. Aging,* 12, 759-772, doi: 10.2147/CIA.S134921

[4] Cairney, J., Veldhuizen, S., Kwan, M., Hay, J., & Faught, B.E. (2014). Biological age and sex-related declines in physical activity during adolescence. *Med. Sci. Sports Exerc.,* 46(4), 730-735, doi: 10.1249/MSS.0000000000000168

[5] Alaux, C., Soubeyrand, S., Prado, A., Peruzzi, M., Maisonnasse, A., Vallon, J. ... Conte, Y. (2018). Measuring biological age to assess colony demographics in honeybees. *PLoS ONE.,* 13(12): e0209192. doi: 10.1371/journal.pone.0209192

[6] Avtandilov, G.G. (1990). *Medical Morphometry*. Moscow: Medicine.

[7] Biro, F.M., Greenspan, L.C., Galvez, M.P., Pinney, S.M., Teitelbaum, S., Windham, G.C. … Wolff, M.S. (2013). Onset of breast development in a longitudinal cohort. *Pediatrics*, 132(6), 1019-1027, doi: 10.1542/peds.2012-3773

[8] Bunak, V.V. (1941). *Anthropometry: a practical course*. M.: Uchpedgiz.

[9] Byrskog, U., Olsson, P., Essen, B., & Allvin, M. K. (2014). Violence and reproductive health preceding flight from war: accounts from Somali born womenin Sweden. *BMC Public Health,* 14, 892, doi: 10.1186/1471-2458-14-892

[10] Cairney, J., Veldhuizen, S., Kwan, M., & Hay, J. (2014). Biological Age and Sex-Related Declines in Physical Activity during Adolescence. *Med. Sci. Sports Exerc.*, 46(4), 730-735, doi: 10.1249/MSS.0000000000000168

[11] Dinnik, V.A. (2017). The current trend to the hour of the start of the state development of the girls (look around the literature and the authorities). *Journal of the National Academy of Medical Sciences of Ukraine*, 23(1-2), 122-128.

[12] Dynnik, V.A. (2015). Pathomorphosis of physical, sexual development and concomitant extragenital pathology in patients with abnormal uterine bleeding during puberty over the past 30 years. *Modern Pediatrics,* 67(3), 120-124, doi: 10.15574/SP.2015.67.120

[13] Dynnik, V.A. (2017). Problems associated with the reproductive potential of girls from the zone of military conflict. *Modern Pediatrics,* 81(1), 34-38, doi: 10.15574/SP.2017.81.34

[14] Elchuri, S.V., & Momen, J.J. (2020). Disorders of Pubertal Onset. *Prim. Care*, 47(2), 189-216, doi: 10.1016/j.pop.2020.02.001

[15] Freitas, A.S., Figueiredo, A.J., de Freitas, A.L., Rodrigues, V.D., da Cunha, A.A. … Silva, M.J. (2014). Biological Maturation, Body Morphology and Physical Performance in 8-16 year-old obese girls from Montes Claros - MG. *Journal of Human Kinetics,* 43, 169-176, doi: 10.2478/hukin-2014-0102

[16] Freitas, A.S., Silveira, M.F., Francisco de Santana, J.J., D'Ângelo, M.F., Haikal, D.S., & Monteiro-Junior, R.S. (2021). New reference parameters for body mass index in children aged six to ten years. *Rev. Paul. Pediatr.,* 39. doi: 10.1590/1984-0462/2021/39/2019129

[17] Herbison, A.E. (2016). Control of puberty onset and fertility by gonadotropin-releasing hormone neurons. *Nat. Rev. Endocrinol.,* 12(8), 452-466, doi: 10.1038/nrendo.2016.70

[18] Kaplowitz, P. (2011). Update on precocious puberty: Girls are showing signs of puberty earlier, but most do not require treatment. *Adv. Pediatrics,* 58(1), 243-58, doi: 10.1016/j.yapd.2011.03.004

[19] Kaplowitz, P., & Bloch, C. (2016). Evaluation and Referral of Children With Signs of Early Puberty. *Pediatrics,* 137(1), doi: 10.1542/peds.2015-3732

[20] Klein, D.A., Emerick, J.E., Sylvester, J.E., & Vogt, K.S. (2017). Disorders of Puberty: An Approach to Diagnosis and Management. *Am. Fam. Physician*, 96(9), 590-599.

[21] Masterson, A.R., J. Usta, J. & Gupta, A.S. (2014). Ettinger Assessment of reproductive health and violence against women among displaced Syrians in Lebanon. *BMC Womens Health*, 14(1), 25. doi: 10.1186/1472-6874-14-25

[22] Morris, D.H., Jones, M.E., Schoemaker, M.J., Ashworth, A., & Swerdlow, A.J. (2011). Secular trends in age at menarche in women in the UK born 1908-93: results from the Breakthrough Generations Study. *Pediatr. Perinat. Epidemiol., 25*(4), 394-400, doi: 10.1111/j.1365-3016.2011.01202.x

[23] Sarafyniuk, L.A., Khapitska, O.P., Yakusheva, Yu.I., Ivanytsia, A.O., & Sarafyniuk, P.V. (2018). Somatotypological features of acrobat girl in different periods of ontogenesis. *Biomedical and Biosocial Anthropology, 32*, 43-47, doi: 10.31393/bba32-2018-06

[24] Sarafyniuk, L.A., Pivtorak, V.I., Khavtur, V.O., Fedoniuk, L.Ia., & Khapitska, O.P. (2018). Peculiarities of the chest's size in volleyball players of different constitutional types. *Biomedical and Biosocial Anthropology, 33*, 47-52, doi: 10.31393/bba33-2018-08

[25] Schwartz, V.B., & Khrushchev, S.V. (1984). *Biomedical aspects of sports orientation and selection.* Moscow: Physical education and sports.

[26] Sirotchenko, T.A., & Belykh, N.A. (2011). Adolescence in the Mirror of Medical and Social Problems. *Modern Pediatrics, 38*(4), 188-190.

[27] Weiss, K.M., Leal D.B., Assis, M.A., & Pelegrini, A. (2016). Diagnostic accuracy of anthropometric indicators to predict excess body fat in adolescents aged 11-14 years. *Rev. Bras. Cineantropom. Desempenho Hum., 18*, 548-556, doi: 10.5007/1980-0037.2016v18n5p548/

[28] Zhu, H., Sun, H. P., Pan, C. W., & Xu, Y. (2016). Secular trends of age at menarche from 1985 to 2010 among Chinese urban and rural girls. *Universal J. Publ. Health, 4*(1), 1-7, doi: 10.13189/ujph.2016.040101

ДИНАМІКА АНТРОПОМЕТРИЧНИХ ПОКАЗНИКІВ У ДІВЧАТОК В МЕЖАХ ПУБЕРТАТНОГО ПЕРІОДУ ОНТОГЕНЕЗУ
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Гармонійність розвитку організму в різні періоди онтогенезу, а особливо пубертатного, визначає подальшу долю жінки як в медичному, так і в соціальному аспектах. Метою дослідження було вивчення тотальних і парціальних розмірів тіла у дівчаток пубертатного періоду онтогенезу. Нами було обстежено 128 школярки 5-8 класів. Проводили оцінку стадій розвитку вторинних статевих ознак за обволосінням у пахвовій западині і на лобку, розвитком молочних залоз і віком настання першої менструації. Згідно класифікації Г.Г. Автандилова всі дівчатка були розділені на три групи - препубертатного (передування появі лобкового обволосіння), пубертатного (статеве дозрівання до появи менархе) і постпубертатного періоду (закріплюється і завершується пубертатне дозрівання). Групу дівчаток пубертатного віку склали 106 школярок, які були розділені на групи за календарним віком: 13-річні (n=29), 12-річні (n=30), 11-річні (n=24) і 10-річні (n=23). Антропометричне обстеження було проведено згідно схеми В.В. Бунака і містило у собі визначення тотальних (довжини і маси тіла) і парціальних (поздовжніх, поперечних і передньо-задніх) розмірів. Аналіз отриманих результатів проведений в ліцензійному пакеті Statistica 5.5 з використанням непараметричних методів оцінки показників. У нашому дослідженні встановлено, що антропометричні показники характеризують фізичний розвиток, рівень його гармонійності та морфофункціональну зрілість дівчаток у межах пубертатного періоду онтогенезу. Нами виявлена прогресивна вікова динаміка тотальних та парціальних розмірів тіла у дівчаток даного вікового періоду. Встановлені періоди найінтенсивнішого зростання в межах пубертатного періоду онтогенезу тотальних і парціальних розмірів тіла. Наприкінці пубертатного періоду відбувається найінтенсивніший віковий приріст довжин тіла: стрімке збільшення маси тіла починається з 12 років, найінтенсивніші процеси поздовжнього росту тулуба та нижніх кінцівок у дівчаток спостерігаються з 11 років. Більшість поперечних розмірів у межах пубертатного періоду онтогенезу має виражену прогресивну вікову динаміку. Нижньогрудний розмір, міжостьова відстань і зовнішня кон'югата статистично значуще не відрізняються між дівчатками різного віку пубертатного періоду.
Ключові слова: *дівчатка, біологічний вік, пубертатний період, фізичний розвиток, антропометричні розміри.*