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Research Article

Options forms and Types of the Bone Pelvis Female Students Who are Engaged in Physical Culture of Medical Universitet Female Students

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Abstract

Annotation: The article presents the results of a study devoted to the study of individual sizes and parameters of the bone pelvis and associated morphological index values and anthropometric indices in female students engaged in physical education at the university.

Keywords: female students; physical culture; bone pelvis; size; morphological index values; anthropometric indices

Introduction

The study of changes occurring in the human body under the influence of exogenous and endogenous factors, especially among female students of adolescence engaged in physical education at a university, is in demand and relevant [1-4]. Quite intense physical and psychological stress among modern students, dietary habits and regional ecology, bad habits and early onset of sexual activity, physical inactivity and reluctance to engage in physical education and sports among many of them, unfavorable premorbid background - this is not a complete list of problems that are reflected on the formation of the body of many young students, during the transition period from puberty to the first reproductive period [1-5]. In particular, this concerns issues of the formation of sexual somatotypes, the skeleton, incl. and bone pelvis of teenage female students.

This article is devoted to the study of this problem and the anatomical and morphological features of the bony pelvis and a number of anthropometric indicators in the sexual somatotypes of female students of medical universitet.

Material and methods

When writing this article, its author actively used such research methods as: pelvimetry, the index method, with the determination of a number of selected morphofunctional index values, the method of literary critical analysis of available sources of information on the issue under study, the method of mathematical statistics. The study was conducted in 2021-2022, with the participation of I-III year students of Zaporizhzhya State Medical University. A total of 48 teenage girls took part in the study during their physical education classes. The average age of female students was 19.29±0.23 years. All of them are classified as adolescents.

When conducting the study, we used such methods as determining anthropometric indicators (length and body weight), linear, latitudinal and girth dimensions (shoulder width, pelvic width), measuring the external dimensions of the pelvis (pelviometry), pelvic index (PI), a number of morphofunctional index values, such as the determination of the morphia index, with the determination of two values that are compared and interrelated in somatotypes - the relative shoulder width index (RSWI) and the relative pelvic width index (RPWI), or the morph-funccional index for women [6]. We also determined indicators of such morphological index values as the pelvic-brachial index (PBrI), Solovyov index (SI), Rohrer index (RI), body-mass index (BMI). In addition, regarding the indicators associated with the individual sizes of the bony pelvis of female students, we determined 3 latitudinal (distantia spinarum, d. ristarum et d. trochanterica), 1 longitudinal size (c. externa), or the so-called external conjugate [1, 6-9]. When determining the severity of pelvic contractions, we used individual values of the true conjugate (c. vera), obtained by mathematical calculations made depending on those obtained using the classical formula used in obstetrics and anthropology [1, 6-9].

Depending on the obtained values of the true conjugate (c. vera), the degrees of narrowing of the bony pelvis present in female students and its types were determined, according to modern classifications. We used the classification of A.Ya. Krassovsky – three degrees of narrowing (I – from

11 cm to 9 cm, II – less than 9 to 7.5 cm, III – less than 7.5 cm) [7; 8]. By "anatomically narrow pelvis we understood" this definition, accepted in modern obstetrics, is as follows: "Anatomically narrow is considered to be a pelvis, one or more sizes of which are reduced by 1.5–2 cm or more" [7; 8]. We determined the degree of formation of the pelvic bones and their "bone maturity" using the method proposed by N.I. Kovtyuk (2004) [1, 10].

Results and discussion

In the studied group of female students (n=48), we obtained the following anthropological indicators: body length in the entire group corresponded to average height and amounted to 165.56±0.30 cm. The average body weight in the group was 57.45±1. 18 kg. The average BMI value was 20.94±0.42 kg/cm², which corresponds to the normal values of this index indicator [5, 6, 9]. Individual indicators of BMI values in the group were as follows: normal BMI values (from 18.5 to 24.99 kg/cm² were determined in the vast majority - 40 (83.33%) female students. In 2 (4.17%) female students, excess BMI was determined body weight (BMI from 25.0 to 29.99 kg/cm²), which we regarded as pre-obesity, in 1 (2.08%) student the BMI exceeded the value of 30.0 kg/cm² obesity of the 1st degree [5,6, 9].

Body mass deficiency, with BMI values below 18.5 to 16.0 kg/cm², was found in 4 (8.33%), and below 16.0 kg/cm² (chronic energy deficiency) was determined in 1 (2.08 %) female students from the study group. When determining weight-height relationships, we determined the Rohrer index (RI) for girls, which characterizes the harmony of the physique as the correspondence of an individual's height to his weight and body density indicators [5, 6, 9]. The average RI value in the group was 12.67±0.25 kg/cm³, which corresponds to the average harmonious development of the individual and, accordingly, to normal body weight and density [5, 6, 9]. The distribution of the obtained IR values in the group is as follows: harmonious development was determined in 35 (72.92%) girls, body weight deficiency and a decrease in the level of development were determined in 4 (8.33%), and an increased level of development, with an increase in body weight values - in 9 (18.75%) female students. To carry out somatotyping according to J. Tanner's classification and determine morphological and anthropological changes in the formation of the bony pelvis in girls of the study group, we determined 2 latitudinal body sizes: shoulder width and pelvic width [1, 6, 9]. The average value of shoulder width (ShW) - biacromial size among female students was 31.48 ± 0.62 cm, pelvic width (PW) - intercrestal size (distancia cristarum) - 26.67 ± 0.30 cm. Noteworthy is the fact that in the group the average sizes of the ShW significantly exceed the values of the ShW. The girls of the group have broad shoulders and a narrow pelvis - a body type characteristic of a male body type [1, 6, 9, 11, 12].

The number of students whose shoulder width exceeded the width of the pelvis in the entire study group was 42 (87.5%), and only 6 (12.5%) students with a pelvic width greater than the width of the shoulders. The index of relative shoulder width RSWI (morphia index) was determined by us as the ratio of shoulder width to body length, multiplied by 100 [1, 6, 9]. Its average value in the group was 20.27±1.00 cm, which corresponds to the values. Obtained values of RSWI in the group: dolichomorphic physique body type - 32 (66,67%) – 32 female students; mesomorphic body type -12 (25,00%) female students; brachymorphic body type – 4 (8,33%) female students.

RPWI (morphia index for women) was determined by us as the ratio of the width of the pelvis (intercrestal size) to body length, multiplied by 100 [1, 6, 9, 11, 12]. Its average value in the group was 16.11±0.19 cm, which corresponds to the values of metriopyelia (middle pelvis) [1, 9, 11, 12]. The values of IOSHT we obtained in the group: stenopyelia (narrow pelvis) – 33 (68.77%) female students; metripyelia is a transitional form, similar to the meaning of a narrow pelvis; eurypyelia \ values close to normal, physiological dimensions of the bone pelvis and even slightly larger - 3 (6.25%) of the studied female students.

Noteworthy is the fact that there were only 3 (6.25%) students with metriopyelia (normal pelvis) in the entire study group (n=48), with the overwhelming number of girls with stenopyelia (narrow pelvis). An interesting fact is that the average value of the intercrestal size of the bony pelvis of female students (d. cristarum) was 26.67±0.30 cm, with its physiological norm being 28-29 cm [1, 4, 7, 8, 13]. The number of girls with distancia cristarum sizes smaller than the physiological (anatomical and obstetric) norm was 34 (70.84%), which indirectly indicates the presence of an anatomically narrow pelvis (ANP) in these girls. Number of female students with sizes d. cristarum, corresponding to the norm of 28-29 cm [1, p. 17-23; 4, p. 56-59; 7; 8; 13, p. 132-133] was 10 (20.83%) and in 4 (8.33%) this size was 1-2 cm larger than the specified norm.

The pelvic-brachial index (PBrI) was determined using the formula: pelvic width (cm) x 100/shoulder width (cm). A PBrI value of up to 69.9 characterizes a trapezoidal body, 70.0-74.9 – a medium body, 75.0 or more – a rectangular body [1, 6, 9]. The results obtained in the group are as follows: the average PBrI value was 86.15±1.74, which corresponds to the rectangular shape of the body [1, 6, 9]. When considering the individual indicators of PBrI of female students, it was found that among them girls with a rectangular body shape predominate - 40 (83.33%), followed by 5 (10.42%) students with a trapezoidal body shape and 3 (6.25%) with an average body shape. To analyze changes in the structure and types of the bone pelvis, it seemed important to us to consider the identified changes in sexual somatotypes, according to the classification of J. Tanner [1, 6, 9, 11]. Taking into account measurements of shoulder width and pelvic width, the average value of the sexual dimorphism index (SDI) in the group was 65.32±2.61 ($p<0.05$). This corresponds to the values of the gynecomorphic somatotype [1, 6, 9; 11]. Data on identified somatotypes in the group: gynecomorphic sexual somatotype – 34 (70.83%) female students; mesomorphic (transitional/inverse sexual somatotype; andromorphic, pathological, reverse physiological, female, sexual somatotype – 6 (12.50%) students who took part in the study.

We also determined such anthropometric and morphological indicators as the diameter of the wrist joint and, based on the data obtained, determined the Solovyov index (IS) - according to the method of G.A. Solovyov [1, 4, 6-9б 13]. This index is widely used both in obstetrics and anthropology [1, 4, 6-9, 13]. Normally, for women, the diameter of the circumference of the wrist joint is 14-16 cm, respectively, the IP is normally 1.4-1.6 [1, 4, 6-9, 13]. Accordingly, with a diameter of the wrist joint of less than 14 cm, we can speak of an asthenic body type, from 14 to 16 cm – of a normosthenic type, and from 16 cm and above – of a hypersthenic body type [1, 4, 6-9, 13].

In the study group, the circumference of the radiocarpal joint was 14.67±0.20 cm, which corresponds to the normative values [1, 4, 6-9, 13]. Accordingly, the SI indicators on average for the group were 1.47±0.20. Normative IP indicators were determined for the vast majority of the studied female students - 34, which amounted to 70.83%. The values of circumference of the radiocarpal joint obtained in the study group: the value of the Solovyov index, within physiological values, at 14-16 cm – 34 (70.83%); Solovyov index value less than 14 cm (small bone thickness) – 11 (22.92%) female students; Solovyov index value, more than 16 cm (thick bones) – 3 (6.25%).

To determine the degree of bone maturity and the formation of flat pelvic bones in female students of the study group, we used the pelvic bone index (PBI), which has proven itself in practice, proposed by N.I. Kovtyuk (2004) [1, 10]. According to her calculations, ICT values ranging from 30 to 40 correspond to normal values of the degree of maturity of the pelvic bones [1, 10]. The average value of ICT in the group was 40.13±0.78, which corresponds to the normal values of the degree of maturity and formation of the pelvic bones in the study group. In 47 (97.92%) female

students, the ICT values correspond to the norm, and only in 1 (2.08%) girl of 18 years old its value was 28, which can be regarded as an ongoing process of formation, growth and maturation of the pelvic bones [1, 10].

We also, when studying the individual characteristics of the pelvic bones of female students, determined the values of such an informative morphological index value as the pelvic index (PI), which is defined as the result of summing the indicators of the 4 external dimensions of the pelvis (cm), and normally ranges from 100 to 107 see [1, 4, 6-9, 13]. Indicators below 100 cm indicate the presence of a narrow pelvis in the subject, more than 107 cm indicate a wide pelvis [1, 4, 6-9, 13]. The average value for the group was 99.47±0.96 cm, which corresponds to the values of the narrow pelvis for the group as a whole [1, 4, 6-9, 13]. It was found that in 27 (56.25%) girls the IT values correspond to a narrow pelvis, in 16 (33.33%) the IT values correspond to standard indicators and in 5 (10.42%) girls the IT values exceed the norm.

When measuring the external dimensions of the pelvis (pelvimetry) in the entire study group, we obtained the following indicators: d. spinarum – 23.06±0.34 cm, which is less than the norm of 25-26 cm [1, 4, 6-9, 13]; d. cristarum – 26.67±0.30 cm, which is less than the norm of 28-29 cm [1, 4, 6-9, 13]. trochanterica – 30.99±0.26 cm, which corresponds to normal values of 30-31 cm [1, 4, 6-9, 13]; c. externa – 18.80±0.31 cm, which is less than the norm of 20-21 cm [1, 4, 6-9, 13]; c. vera – 10.11±0.24 cm, which is slightly less than the norm corresponding to 11 cm [1, 4, 6-9, 13].

Having analyzed the data of pelviometry performed in the study group, we obtained the following data: an anatomically narrow pelvis (ANP) was determined in the majority of female students - 39 (81.25%); transversely contracted pelvis (TCP) – in 26 (54.17%); flat-rachitic pelvis (FRP) – in 3 (6.25%); simple flat pelvis (SFP) – in 2 (4.17%); generally uniformly narrowed and wide pelvis – 1 (2.08%) student each, respectively. Normal pelvic dimensions were determined only in 3 (6.25%) female students, “mixed” or “erased” pelvic shape [1, p. 17-23; 4, p. 56-59; 6-9; 13, p. 132-133] – in 16 (33.33%) girls.

The degrees of pelvic narrowing were also determined in accordance with the classification of A.Ya. Krassovsky [14, 6-9, 13]. Pelvic contractions of the 1st degree were identified in 14 (29.17%), 2nd degree – also in 14 (29.17%) students, and 3rd degree – in 4 (8.33%) girls. The distribution of changes in the bone pelvis in sexual somatotypes is presented in **Table.**

Indicator name	Gynecomorphic sexual somatotype (n=34)	Mesomorphic sexual somatotype (n=8)	Andromorphic sexual somatotype (n=6)
Normal pelvic sizes	3	–	–
Narrow pelvis	31	6	6
Wide pelvis	–	1	–
Anatomically narrow pelvis	31	6	6
"Mixed" pelvis	11	1	3
Transversely narrowed pelvis	17	1	2
Simple flat pelvis	2	1	3
Flat-rachitic pelvis	2	–	–
Generally uniformly narrowed pelvis	1	–	–
I degree of narrowing of the pelvis	13	1	–
II degree of narrowing of the pelvis	11	1	2
III I degree of narrowing of the pelvis	2	1	1

Changes in the pelvis of female students depending on the somatotype

From the data in the above comparative table it is clear that the greatest number of changes in the sizes and types of bone pelvises is observed in the group of gynecomorphic female students, the smallest in the group of female students with an andromorphic sexual somatotype. The values of altered pelvises in the group of female students with a mesomorphic sexual somatotype are close to the values of andromorphic female students. These two groups together account for 12 (25.00%) cases of anatomically narrow pelvis (ANP), 3 (6.25%) transversely narrowed pelvises, 4 (8.33%) each of simple flat and “mixed” pelvises, 1 pelvic narrowing of the 1st degree, 3 narrowing of the 2nd degree and 2 - 3rd degree. In these two groups, there was also 1 wide pelvis and absolutely no pelvises with normal sizes.

Conclusions:

1. The number of students whose shoulder width exceeded the width of the pelvis in the entire study group was 42 (87.5%), and only 6 (12.5%) students with a pelvic width greater than the width of the shoulders.

2. It was found that in 27 (56.25%) girls the PI values correspond to a narrow pelvis, in 16 (33.33%) the PI values correspond to standard indicators, and in 5 (10.42%) girls the PI values exceed the norm.

3. Anatomically narrow pelvis (ANP) was determined in the majority of female students - 39 (81.25%); transversely contracted pelvis (TCP) – in 26 (54.17%); flat-rachitic pelvis (FRP) – in 3 (6.25%); simple flat pelvis (SFP) – in 2 (4.17%); generally uniformly narrowed and wide pelvis – 1 (2.08%) student each, respectively. Normal pelvic dimensions were determined only in 3 (6.25%) female students, “mixed” or “erased” pelvic shape.

4. The greatest number of changes in the sizes and types of bone pelvises is observed in the group of gynecomorphic students, the smallest - in the group of students with an andromorphic sexual somatotype.

5. It was established that in the study group there are numerous, often combined anatomical and morphological changes in almost all anthropometric indicators and morphological index values, in all sexual somatotypes according to J. Tanner’s classification, with a predominance in the group of female students with a gynecomorphic sexual somatotype.

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