

Research Article

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Study of Pelvic Bone Characteristics in Young Female Wrestling Athletes

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ABSTRACT

The article presents research data on characteristics of the formation and structure of the pelvic bone from a group of young women athletes engaged in wrestling. Also shows several features associated anatomical and morphological parameters, and a number of index values and their pathological changes. According to the results of the study highlighted the existing violations of the structure and functionality. The above analysis of the survey data, presented the conclusions.

Aim of the Article: The aim of the work is to study changes in the formation and structure of the bony pelvis and the anatomical values and morphological indicators associated with it in young female athletes engaged in freestyle wrestling.

Research Hypothesis: During the preparation for this study, its author put forward a working hypothesis that young female athletes who have been intensively and long-term involved in martial arts may have a number of anthropometric, pelvimetric, and morpho-functional changes, such as, in particular, an anatomically narrow pelvis, the first and possibly second degree of narrowing of the bony pelvis, and even other disorders such as maturation of the pelvic bones and, possibly, even pathological forms of the pelvis.

Method and Materials of the Study: The following methods were used in this study: anthropometry, pelvimetry, index method, interview method, and mathematical statistics method. For statistical processing of the obtained data, the applied software package "Statistika 7.0" was used, using Student's t-test. Data corresponding to the accuracy level of $p < 0.05$ were considered reliable. The study was conducted at the training and sports complex "Gart" in Novaya Kakhovka, Kherson region, Ukraine. The study involved 16 female athletes of puberty and adolescence. Age categories: schoolchildren - 1 (6.25%), cadets - 8 (50.0%), juniors - 10 (62.5%). The average age of the athletes ($n=16$) was 16.74 ± 0.31 years. 12 (75.0%) have been practicing freestyle wrestling for 6-8 years, the remaining 4 have been practicing it for 3-5 years. The number of training sessions is up to 5-6 per week, their duration is from 2 to 4 hours. The girls have the following sports qualifications: MS - 1 (champion of Ukraine among juniors in the weight category up to 48 kg), CMS - 1 (champion of Ukraine among juniors in the weight category up to 53 kg), 1st category - for 14 young female athletes.

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Abbreviation

CMS: Candidate for Master of Sports

BMI: Body Mass Index

Q I-I: Quetelel- I index

IR: Index Rorhera

SH: Shoulder Width

PW: Pelvis Width

RPWI: Relative Pelvic Width Index

RSWI: Relative Shoulder Width Index

PBI: Pelvic Bone Index () proposed by Kovtyuk N.I

PI: Pelvis Index

SDI: Sexual Dimorphism Index according to j. Tanner

SFP: Simple Flat Pelvis

ANP: Anatomically Narrow Pelvis

TNP: Transversely Narrowed Pelvis

Introduction

Questions concerning women's sports and its impact on the female body are always relevant and in demand. Women's freestyle wrestling as a sport began to develop in the USSR and, accordingly, in Ukraine, as a result of the decision of the USSR Freestyle Wrestling Federation of February 22, 1990 [1]. Since 2004, when women's freestyle wrestling became an Olympic sport, this type of martial art has become even more actively promoted and attracted thousands of fans. Today, many girls and young women of prepubertal, pubertal, adolescent and first mature ages attend freestyle wrestling classes, train and participate in competitions in this type of martial art. There are currently many recommendations, training programs, and research results on the methodological features of the training process (Ryzhenko O.V., 2000; Yushkov O.P. et al., 2004; Ugolnikova O.A., 2005; Karkavtseva I.A., 2007; Rudnitsky V.I., 2009). However, there are clearly not enough studies on the medical and biological features occurring in the bodies of female athletes. Only a few serious studies, both in our country (Piskov S.N., 2008, 2009;

Dyusenova A.A., Oleynik E.A., 2013) and abroad (Yagello V., Tkachuk V., Krushevsky A., 2004) highlight the existing and identified destructive pathological processes in many organs and tissues of female athletes, including young athletes engaged in freestyle wrestling (Stelmakh Yu.Yu., 2013; Usmanhodzhaeva A.A., Kasimova D.A., Vysogortseva O.N., 2015). Unfortunately, studies devoted to changes in the bone pelvis were practically not found in the domestic and foreign sources of information available to us. The available data are scattered, contradictory and not generalized. Therefore, our attempt to study the existing changes in the formation of the pelvic bone in a group of young athletes engaged in freestyle wrestling seemed to us to be very relevant and promising, which served as the basis for conducting the study and writing this article.

Results of the Study and Discussion

The conducted study established that the average body length in the study group was 163.63 ± 1.89 cm and average body weight was 58.41 ± 2.51 kg. Weight-to-height ratios were determined using the Rohrer, Quetelet I and Quetelet II indices (BMI). The body mass index (BMI) in the group was 21.62 ± 0.85 kg/cm², Quetelet I – 356.54 ± 14.18 g/cm, IR – 13.31 ± 0.58 kg/cm³. We additionally conducted studies that included determination of shoulder width (SH) and pelvis (PW), relative pelvic width index (RPWI) and relative shoulder width index (RSWI), sexual dimorphism index (SDI) according to J. Tanner, and pelvimetry. After completion of the study, the necessary calculations were made, statistical processing was carried out and the results obtained were analyzed.

To determine the body type of girls, a somatotype diagnostic scheme was used, which is based on the definition of the J.M. Tanner index (1979), or the sexual dimorphism index (SDI), which allows you to determine the correspondence between the proportions of the human body and its gender [1]. The principle of determining the somatic type of sex of a person is embedded in the somatotyping of women according to J.M. Tanner. This index, using the values of the width of the pelvis and shoulders, allows you to classify women as gynecomorpha, mesomorpha and andromorpha, and also allows you to identify gender features of the metabolic and hormonal status and establish the correspondence of the development of the skeletal system to the sex of a person [1,2].

Based on the results of the anthropometry, somatotyping was performed in the study group using the values of sex somatotypes according to the classification proposed by J. Tanner. To determine a number of additional morphological index indicators, we determine such anthropometric values as shoulder width (SW) and pelvic width (PW) (d. cristarum). We obtained the following indicators: in the group, the PW value corresponded to 26.41 ± 0.65 cm ($p < 0.05$), which is less than the permissible anatomical norm of 28-29 cm [3]. As for the sizes of the shoulder width (SW), the following indicators were obtained: in the group ($n = 16$), the SW value was 31.53 ± 1.38 cm ($p < 0.05$). The results of the study reliably determined ($p < 0.05$) that in the studied group the SH in relation to the SH corresponds to the male body structure, the girls have an android body type - with broad shoulders and a narrow pelvis [4]. The value of the sex somatotype indicator in the entire ($n=16$) studied group is 68.19 ± 3.89 , which corresponds to the gynecomorphic type. At the same time, it was determined that there are 9 (56.25%) gynecomorph female athletes in the studied group, 5 (31.25%) mesomorpha, and 2 (12.5%) andromorpha.

The Relative Shoulder Width Index (RSWI) in the entire group was 19.22 ± 0.71 cm, which corresponds to the mesomorphic type.

At the same time, 9 (56.25%) athletes had a dolichomorphic type, 4 (25.00%) had a mesomorphic type, and 3 (18.75%) had a brachymorphic body type [5]. The Relative Pelvic Width Index (RPWI) indicates the existing changes in the type of the bony pelvis [6]. In our study, we obtained the following results: the average RPWI is 16.15 ± 0.38 cm, which is metriopyelia (average pelvic dimensions) [4]. In 9 athletes (56.25%), the RPWI corresponded to the values of stenopyelia (narrow pelvis), in 5 (18.75%) it corresponded to the values of metriopyelia (medium pelvis) and in 2 (12.50%) a wide pelvis was determined [5]. In the entire group, the following pelvimetry data were obtained: d. spinarum - 23.19 ± 0.58 cm, d. cristarum - 26.41 ± 0.65 cm, d. trochanterica - 31.16 ± 0.66 cm, c. externa - 19.00 ± 0.58 cm, c. vera - 10.41 ± 0.42 cm ($p < 0.05$).

The analysis of the pelvimetry results, with the determination of two transverse (d. spinarum, d. cristarum) and 1 direct size (c. externa) reliably ($p < 0.05$) indicates that the indicators we obtained are less than the anatomical norms of the external dimensions of the pelvis: d. spinarum - 25-26 cm; d. cristarum - 28-29 cm; c. externa - 20-21 cm [3]. The only exception is the indicators of d. trochanterica, corresponding to normal values (30-32 cm) [3]. To analyze the assessment of the development and determination of the degree of formation of the pelvic bones, as well as to determine the relationship with the indicators of sexual maturity of female athletes, the pelvic bone index (PBI) proposed by Kovtyuk N.I. was used [7]. Among all female athletes, the PBI was 42.63 ± 1.81 cm, which corresponds to the average value for this age group [7].

We also used such an informative morphological indicator as the pelvic index (PI) in our study [6]. In the entire group, its value was 99.69 ± 2.07 ($p < 0.05$), corresponding to the presence of a narrow pelvis [3]. At the same time, in 9 (56.25%) the indicator indicates a narrow pelvis, in 3 (18.75%) it is close to the norm, and in 4 (25.00%) young female athletes, it is below the norm with a tendency to form a narrow pelvis. The revealed anatomical and functional changes in the bone pelvis in young female athletes. It was reliably established that: anatomically narrow pelvis was determined in 13 (81.35%) young female athletes; wide pelvis – in 2 (12.50%); normal pelvis – in 1 (6.25%) young female athletes; I degree of pelvic narrowing – in 5 (21.35%) young female athletes; II degree of pelvic narrowing – in 3 (18.75%) female athletes; “erased” pelvic shape (unisex pelvis) – in 13 (81.25%) young female athletes. Simple flat pelvis (SFP) was recorded in 1 (6.25%), transversely narrowed pelvis (TNP) was recorded in 7 (43.75%) athletes [8].

Conclusion

In 9 (56.25%) prepubertal and pubertal female athletes, the gynecomorphic type of sexual constitution is still preserved; in older groups of female athletes, taking into account their many years of sports experience, the number of mesomorphic athletes is growing - 5 (31.25%) and andromorphic - 2 (12.5%), which is an unfavorable sign of disorders of the endocrine and reproductive systems.

The formation of a narrow anatomically narrow pelvis in the overwhelming majority of 13 (81.25%) young female athletes in the form of its so-called “erased” forms, in combination in 8 (50.00%) girls with pelvic stenosis of the I-II degree of stenosis, in the presence of reliably confirmed bone maturity in all age groups, is an unfavorable risk factor in the field of obstetric pathology and may be a problem in childbirth in the future.

The results obtained from the conducted study, and their subsequent analysis, fully confirmed the hypothesis of this study put forward by the author.

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