

Bone Pelvis and its Anatomical and Morphofunctional Features in Sexual Somatotypes in a Number of Female Athletic Sports

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Abstract

On the basis of the analysis and generalization of the literature sources, as well as the results of the pedagogical experiment the data about the morphofunctional features of the bone pelvis in female athletes of adolescent age who are engaged in athletic sports are presented in the article. The presence of anatomically narrow pelvis, with I-II degrees of narrowing, as well as various variants of morphofunctional changes in the structure of the female athletes' bone pelvis, often combined, in a significant group of female athletes who took part in the study is noted.

Keywords: Female Athletes; Adolescence; Athletic Sports; Bone Pelvis; Narrow Pelvis; Pelvimetry; Morphofunctional Changes; Sexual Somatotypes

Introduction

Any research works concerning medico-biological features of female sports in ontogenesis, and especially in native male athletic-force sports, are always topical and in demand [1-16].

In this regard, the purpose of our study is to determine the available anatomical and morphofunctional indicators in female athletes of different gender somatotypes engaged in such athletic sports as weightlifting, weightlifting and powerlifting. A large number of researchers, both native and foreign, are studying the morphofunctional and anatomical-anthropological changes in female athletes, including those of adolescent age. Particularly relevant, in my opinion, is the study of adaptive mechanisms in female athletes engaged in primarily male sports, such as weightlifting, weightlifting, powerlifting. Among the research works concerning the changes in the bone and reproductive systems in female athletes, physical changes in sexual somatotypes and manifestations of adaptive mechanisms, we would like to mention a number of authors. These are the works of C. Fort ,

E. Dore, N. Defransa, Van E. Praagh, 2000; J. Keogh, 2008; E.A. Demarchuk, 2008; O. V. Syrova, T. M. Zagorovskaya, A. V. Andreeva, 2008; T. P. Zamchyi, M. H. Spataeva, Y. V. Koryagina, S. V. Matuk, 2010, 2011, 2013, 2016; T. N. Strelkovich, N. I. Medvedeva, E. A. Khapilina, 2012; V. A. Yashvorskaya, M.I. Levitsky, 2012; V.B. Mandrikov, R.P. Samusev, E.V. Zubareva, E.S. Rudaskova, G.A. Adeshina, 2015; E. A. Oleinik, 2010-2018; K. A. Bugajewski, 2014-2018.

During the analysis of available information sources on the studied problem, we found that there are practically no works concerning the study of pelvic bone formation and adaptive changes in female athletes in athletic sports. In this regard, our study is an attempt to fill this information gap.

Aim of the work

The aim of the study is to determine the available anatomical and morphofunctional indicators in female athletes of different gender somatotypes engaged in athletic sports such as weightlifting (kettlebell lifting), weightlifting (barbell lifting) and powerlifting.

Material and Methods

In carrying out this research work, we used the method of in-depth literary-critical analysis of available scientific sources of information on the issue under study, using reference books, specialized periodicals, and Internet resources.

Result and Discussion

The experimental base of the study conducted in 2022 was the sports sections where female athletes of young age ($n = 48$) engaged in weightlifting, kettlebell lifting, powerlifting were trained. All female athletes who took part in the study gave their voluntary consent. To achieve the goal of the study we used a complex of scientific methods, including the analysis of available scientific and scientific-methodological sources of information, determination of anatomico-anthropometric and morphofunctional values in female athletes, interviewing. We carried out activities aimed at determining the values of the gender dimorphism index in the studied groups of female athletes, with the definition of anthropometric indicators of shoulder width and pelvic width, with subsequent allocation of female athletes to the gender somatotypes according to J. Tanner classification.

We also performed pelvimetry according to the classic method, determining 3 transverse and 1 longitudinal dimension of the bone pelvis [1,3,5-7,11,14]. After obtaining the pelvimetry data, the existing changes in the size of the bony pelvis, its anatomico-morphological changes and degrees of pelvic narrowing were determined in female athletes according to the Litzman classification of narrow pelvis, mathematical recalculations of pelvimetry data necessary for determining the true conjugate (*c. vera*), the values of which were used to determine the degree of pelvic narrowing or its normal values [1-3,5,11,14].

In our experiment was attended by female athletes of young age, engaged in weightlifting ($n = 18$), kettlebell lifting ($n = 13$), powerlifting ($n = 17$), total - 48 female athletes. The average age of the female athletes was $19,43 \pm 0.46$ years, which corresponds to adolescent age [5,11]. The training experience in these kinds of sports was from 3 to 9,5 years. The level of sports qualification of sports-women - from the I class to the candidate for the master of sports and the master of sports. The intensity and frequency of training is 4-6 times a week, from 1.5 to 2.5 hours per training session.

According to the anthropometric measurements of the width of the shoulders and the width of the pelvis, we got the following values: the width of the shoulders was $36,64 \pm 0,77$ cm and the width of the pelvis was $27,67 \pm 0,34$ cm at the female weightlifters ($n = 13$). The weightlifters had a shoulder width of $36,47 \pm 0,44$ cm and a pelvic width of $27,14 \pm 0,77$ cm. In the group of powerlifting female athletes, the values of shoulder width were $35,78 \pm 0,63$ cm, and pelvic width - $26,85 \pm 0,82$ cm. Based on the obtained data for shoulder and pelvic width, we calculated the values of the sexual dimorphism index by J. Tanner classification, with the definition of sexual somatotypes [4,6-10,13-16] at female athletes of 3 studied groups.

It is clear from the values of anthropometry that the mean values of shoulder width indicators in all three studied groups ($p \leq 0,05$) significantly exceed the obtained values of pelvic width, with values in all groups less than anatomically acceptable value of 28-29 cm [1-3,5,11,14]. This type of ratio shoulder/hip width indicates a masculine type of figure in female athletes of all three groups [4,6,8-10,12-16].

The distribution of female athletes by gender somatotype is as follows: in female athletes in weightlifting ($n = 13$), gynecomorphic gender somatotype was not determined, mesomorphic somatotype was determined in 9 (69.23%) female athletes, and andromorphic somatotype - in 4 (30.77%) female athletes.

In weightlifters ($n = 18$) girls with gynecomorphic sexual somatotype were also not identified. The number of athletes with mesomorphic somatotype in this group is 12 (66,67%), with andromorphic somatotype - 6 (33,33%) female athletes.

In powerlifting gynecomorphic sexual somatotype was determined in 1 (5.88%) female athlete, mesomorphic sexual somatotype - in 13 (76.47%) female athletes, and andromorphic sexual somatotype - in 3 (17.65%) female athletes. In all three groups athletes classified as mesomorphic sexual somatotype prevail - 34 (70.83%) and andromorphic sexual somatotype - 13 (27.08%) female athletes engaged in athletic sports.

According to pelvimetry data, the following values of bone pelvis and their changes were obtained: normal pelvic dimensions were determined only for one (2.08%) athlete out of 48 studied, ana-

tomically narrow pelvis, with a decrease of 1 or more dimensions [1,3,5,11,14] - for 47 (97.92%) all studied female athletes from the three groups. Simple flat pelvis was determined in 2 (15.39%) female athletes from the group of girls engaged in weightlifting, in 3 (16.67%) female weightlifters and in 2 (11.77%) female athletes engaged in powerlifting. Total uniformly narrowed pelvis [1-3,5,11,14] was determined in 1 (7.69%) female weightlifter, 2 (11.11%) female weightlifters, and 3 (17.65%) female powerlifters.

The data on the identified degrees of pelvic bone narrowing are as follows: in the group of weightlifters (n = 13), degree I narrowing was identified in 4 (30.77%) female athletes, and degree II narrowing was identified in 2 (15.39%) girls. In the weightlifting group, the I degree of pelvic constriction was determined in 3 (16.67%) female athletes, the II degree of constriction - in 1 (5.56%) female athlete. In the powerlifting group, degree I narrowing of the pelvis was determined in 4 (25.53%) female athletes, and degree II narrowing of the pelvis was determined in 2 (11.77%) female athletes. Furthermore, a unisex or mixed pelvis [1-3,5,11,14] was determined in 7 (53.85%) weightlifters, 11 (61.11%) weightlifters, and 10 (58.82%) powerlifters.

The greatest number of anatomical and morphological changes of the pelvis structure and I-II degrees of its constriction was determined in female athletes of all three groups, with mesomorphic sexual somatotype determined in them, as well as to a lesser extent - in female athletes from the group with andromorphic sexual somatotype.

In the groups of kettlebell lifting and powerlifting female athletes the same number was determined - 6 female athletes each with ²⁻² degrees of pelvic constriction, but their number prevails in the female athletes in kettlebell lifting - 46,15% and 35,19% in powerlifting.

Conclusion

In view of all of the above, the following conclusions can be made

- In all three groups of athletes mesomorphic sexual somatotype prevails - in 34 (70.83%) athletes and andromorphic sexual somatotype - in 13 (27.08%) athletes.

- Simple flat pelvis was determined in 2 (15.39%) female athletes of the kettlebell lifting group, in 3 (16.67%) weightlifters and in 2 (11.77%) female powerlifters.
- A generally uniformly narrowed pelvis was determined in 1 (7.69%) female kettlebell lifting, in 2 (11.11%) female weightlifters, and in 3 (17.65%) female powerlifters.
- In female athletes of all three studied groups, I-II degrees of pelvic constriction were determined in girls with mesomorphic and andromorphic gender somatotypes.
- Six female athletes (46.15% and 35.19%) with pelvic constriction degrees I-II were identified among female youth athletes involved in kettlebell lifting and powerlifting.
- "Mixed" pelvic shape (pelvis-unisex) was determined in 7 (53.85%) female weightlifters (kettlebell lifting), 11 (61.11%) female weightlifters, and 10 (58.82%) female powerlifters.
- Indicators of anatomical and morphofunctional changes in the bone pelvis and degrees of contraction, on the background of inversion of values of sexual dimorphism in all three groups, towards mesomorphic and andromorphic sexual somatotypes in female athletes engaged in athletic sports, gives reason to think about significant adaptive changes in the bodies of young female athletes, caused by intense physical loads for them.

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