



Anatomical and Morphological Features of the Pelvic Bones in Female Athletes Engaged in Weightlifting and Strength Sports

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Abstract

Based on the analysis and generalization of literary sources, as well as the results of the pedagogical experiment, this research article presents the data obtained as a result of the author's study on the anatomical and morphofunctional features of the bony pelvises of adolescent female athletes who are involved in athletic, strength sports and weightlifting. The author of this study reliably noted the presence of an anatomically narrow pelvis, with I-II degrees of its narrowing, in a significant group of female athletes who took part in the study, as well as various variants of anatomical and morphofunctional changes in the structure of the bony pelvis, in the studied group of young athletes, often combined.

Keywords: Female Athletes; Adolescence; Athletic Sports; Weightlifting; Bony Pelvis; Narrow Pelvis; Pelvimetry; Morphofunctional Changes; Sexual Somatotypes; Adaptive Changes

Abbreviation

SDI: Sexual Dimorphism Index; SW: Shoulder Width; PW: Pelvic Width; SFP: Simple Flat Pelvis; GUNP: Generally Uniformly Narrowed Pelvis; NP: Narrow Pelvis; MSP: Mixed Pelvic Shape (The Unisex Pelvis); CMS: Candidate for Master of Sports; MS: Master of Sports.

Introduction

Any research work concerning the medical and biological characteristics of women's sports in ontogenesis, and especially in the traditionally male athletic and strength sports, is always relevant and in demand [1-5].

In the last decade, modern women's sports have been characterized by a pronounced emancipation. Most men's sports have moved to women's sports: football, most types of wrestling and martial arts, boxing, water polo, weightlifting. However, most new women's sports still do not have training methods that are based on the characteristics of the female body, taking into account the cyclical nature of its functions, and, most importantly, the prospect of childbearing. The health of female athletes has always been a priority for women's sports [1-3]. In connection with the rapid development of women's sports, from the point of view of sports anatomy and morphology, adaptive processes occurring in the

body of female athletes of different age groups do not go unnoticed. In women's sports, today, a special place is occupied by such sports as athletics, originally male sports. including regular lifting of significant weights [1,3]. In these specializations, female athletes are required to make significant physical and psycho-emotional efforts to perform all the elements and techniques of the performed action. Significant physical and psychological stress in these sports determine the features of the construction of the training and competitive process of female athletes [1-11].

Aim of study

The aim of our study is to determine the existing anatomical and morphofunctional indicators in female athletes of different sexual somatotypes involved in such athletic sports as kettlebell lifting, weightlifting and powerlifting.

Hypothesis of the study

In the course of preparing this study, its author put forward a working hypothesis that in a group of young female athletes regularly engaged in strength athletics and weightlifting, adaptive changes in sexual somatotypes occur towards their shift to an intermediate, mesomorphic and pathological for women, andromorphic sexual somatotype, as well as changes in their physique, shifts in psychological self-assessment towards a masculine type. This

indicates that as a result of adaptive hormonal restructuring, masculinization phenomena occur in their bodies.

Methods and means of research

To achieve the goal of the study, we used a set of scientific methods, including the analysis of available scientific and scientific-methodical sources of information, determination of anatomical-anthropometric and morphofunctional indicators in female athletes, interviewing. The experimental base of the study were sports sections in which female athletes of adolescent age trained, engaged in weightlifting, kettlebell lifting, powerlifting. Activities were carried out aimed at determining the values of the sexual dimorphism index (SDI) in the studied groups of female athletes, with the determination of anthropometric indicators of shoulder width (SW) and pelvic width (PW), with the subsequent distribution of athletes into sexual somatotypes according to the classification of J. Tanner. All young female athletes who took part in the study conducted by the author gave their voluntary, oral and written consent to participate in it.

We also conducted pelvimetry using the classical method, with the determination of 3 transverse and 1 longitudinal dimensions of the bony pelvis [1-3,5,11]. After receiving the pelvimetry data, the athletes were determined to have changes in the sizes of the bony pelvis, its anatomical and morphological changes and the degree of pelvic narrowing, in accordance with the classification of narrow pelvises according to Litzman, mathematical recalculations of the pelvimetry data necessary to determine 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]. The experiment involved adolescent athletes involved in weightlifting (n = 18), kettlebell lifting (n = 13), powerlifting (n = 17), a total of 48 athletes. The average age of the sportswomen was 19.43 ± 0.46 years, which corresponds to adolescence [5,11]. The length of experience in these sports ranged from 3 to 9.5 years. The level of sports qualification of the sportswomen ranged from 1st rank to candidate master of sports (CMS) and master of sports (MS). The intensity and frequency of training was 4-6 times a week, from 1.5 to 2.5 hours per training session.

Results of the Study and Discussion

As a result of anthropometric measurements of the shoulder width (SW) and pelvis width, we obtained the following values: in female kettlebell lifters (n = 13), the shoulder width was 36.64 ± 0.77 cm, and the pelvis width was 27.67 ± 0.34 cm. In female weightlifters, the shoulder width was 36.47 ± 0.44 cm, SB – 27.14 ± 0.77 cm. In the group of female powerlifters, the shoulder width was 35.78 ± 0.63 , and the pelvis width was 26.85 ± 0.82 cm. Based on the obtained shoulder width and pelvis width data, the SDI val-

ues were calculated according to J. Tanner's classification, with the determination of sex somatotypes [4,6-10,14,15] in female athletes of the 3 study groups. As can be seen from the obtained values of the conducted anthropometry, the average values of the shoulder width indicators in all three study groups ($p \leq 0.05$) significantly exceed the obtained values of the pelvis width, with values in all groups less than the anatomically acceptable value of 28-29 cm [1-3,5,11].

This type of ratio of the SW/PW indicates a masculine body type in female athletes of all three groups [4,6-10, 14,15]. The distribution of female athletes by sexual somatotypes is as follows: in female kettlebell lifters (n = 13), the gynecomorphic sexual somatotype was not determined, the mesomorphic somatotype was determined in 9 (69.23%) athletes, and the andromorphic somatotype in 4 (30.77%) athletes. In young female weightlifters (n = 18), girls with a gynecomorphic sexual somatotype were also not determined. The number of female athletes with a mesomorphic sexual somatotype in this group is 12 (66.67%), with an andromorphic somatotype - 6 (33.33%) athletes. In powerlifting, the gynecomorphic sexual somatotype was determined in 1 (5.88%) athlete, the mesomorphic sexual somatotype in 13 (76.47%) athletes, and the andromorphic sexual somatotype in 3 (17.65%) athletes. In all three groups, the athletes classified as belonging to the mesomorphic sexual somatotype predominate - 34 (70.83%) and the andromorphic sexual somatotype - 13 (27.08%) young female athletes involved in athletic sports.

According to pelvimetry data, the following values of the bone pelvises and their changes were obtained: normal pelvic dimensions were determined only in one (2.08%) athlete out of 48 subjects, anatomically narrow pelvis, with a decrease of 1 or more dimensions [1-3,5,11] – in 47 (97.92%) of all studied young female athletes from three groups. Simple flat pelvis (SFP) was determined in 2 (15.39%) athletes from the group of girls involved in kettlebell lifting, in 3 (16.67%) female weightlifters and in 2 (11.77%) female powerlifters. Generally uniformly narrowed pelvis (GUNP) [1-3,5,11] was determined in 1 (7.69%) kettlebell lifting female athlete, in 2 (11.11%) weightlifting female athletes, and in 3 (17.65%) powerlifting female athletes. The data on the identified degrees of narrowing of the bony pelvis are as follows: in the group of kettlebell lifting young female athletes (n = 13), the 1st degree of pelvic narrowing was determined in 4 (30.77%) young female athletes, the 2nd degree of narrowing – in 2 (15.39%) girls. In the group of weightlifters, the 1st degree of pelvic narrowing was determined in 3 (16.67%) athletes, the 2nd degree of narrowing – in 1 (5.56%) athletes. In the powerlifting group, the first degree of pelvic narrowing was determined in 4 (25.53%) young female athletes, the second degree of pelvic narrowing – in 2 (11.77%) young female

athletes. In addition, the unisex pelvis, or mixed pelvic shape – MSP [1-3,5,11], was determined in 7 (53.85%) athletes in kettlebell lifting, in 11 (61.11%) young female athletes-weightlifters, and in 10 (58.82%) athletes involved in powerlifting.

The greatest number of anatomical and morphological changes in the structure of the pelvis and I-II degrees of its narrowing was determined in athletes of all three groups, with a mesomorphic sexual somatotype, and, to a lesser extent, in athletes from the group with an andromorphic sexual somatotype. In the groups of athletes involved in kettlebell sport and powerlifting, the same number was determined - 6 athletes with I-II degrees of pelvic narrowing, but at the same time, their number dominates in athletes in kettlebell sport - 46.15% and 35.19% in powerlifting.

Conclusions

- In both studied groups of young female athletes, the phenomena of intensive adaptive changes in inverted sexual somatotypes were revealed, as a consequence of inadequate physical and psycho-emotional loads in female athletes.
- The indicators of anatomical and morphofunctional changes in the bony pelvises and the degrees of their narrowing that we have identified, against the background of adaptive inversions of the values of sexual dimorphism in all three groups, towards mesomorphic and andromorphic sexual somatotypes in young female athletes involved in athletic sports, give reason to think about significant adaptive changes in the bodies of young female athletes, caused by intense physical activity for them.
- The author of this article managed to fully achieve the goal of his research and confirm the research hypothesis he put forward.

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