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Somatotypological Features of the Skin Fat Fold Thickness in Ethnic Kyrgyz Women

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Abstract

The purpose of this study was to determine the thickness of skin and fat folds in Kyrgyz women of various ages, taking into account their somatotypological profile. Using the method of complex anthropometry, including the determination of the values of 21 anthropometric parameters, the physical status of 1028 Kyrgyz women of different age groups was studied youth (16 - 20 years old 310 girls), mature age (1st period, 21 - 35 years old 308 women; 2nd period, 36 - 55 years 410 women) living in Osh, Kyrgyzstan. For somatotyping, we used the scheme of constitutional diagnostics. Seven somatotypes distinguished within three constitutional groups. The subcutaneous fat was measured by caliperometry. Statistical processing carried out using the statistical programs Microsoft Excel and the STATISTICA package (v. 6.0). To determine the reliability of the differences between the indicators, the Student's test was used ($p < 0.05$). The results demonstrate that within each somatotype there are broad changes in the studied anthropometric indicator. Thus, the thickness of the skin and fat folds is the smallest in women of asthenic, athletic and stenoplastic ($p < 0.05$), and the largest in representatives of the euriplastic and pycnic somatotypes ($p < 0.05$). Thus, indicators of physical status in adolescence and adulthood in women have a pronounced somatotypological specificity. These materials on the physical development and constitutional and typological characteristics of the studied population of women applicable for a personalized approach in the context of a relative norm.

Keywords

Somatotypological Features, Fat Fold, Skin, Thickness, Anthropometric, Indicators

1. Introduction

An individual approach to patients is one of the main areas of modern medical science. Personalized medicine is based on taking into account the specific characteristics of the organism, and the fundamental method for assessing physical development with this approach is the method of constitutional analysis, *i.e.* somatotyping [1] [2] [3] [4] [5]. The constitutional predisposition of a person to the development of many somatic diseases, as well as the unequal effectiveness of their treatment and rehabilitation among representatives of different constitutional types, has been established [6] [7] [8]. Therefore, the method of somatotypological (constitutional anatomical) analysis deserves implementation in terms of practical applications for clinical practice. The expediency of the practical application of anthropometric techniques in the clinic is also due to the fact that the standardized anthropometric method has the right to give objective factual materials and does not require time and economic costs.

Somatotypological features of the physique have been proven earlier in the study of different populations [9] [10] [11], but have never been studied before our study and have not been statistically confirmed in women of the Kyrgyz population. Their distribution according to their belonging to different constitutional and anatomical types (somatotypes) is also not determined; there are no corresponding quantitative standards, individual variations in body parameters under normal conditions [12] [13]. Previously, the age related anthropometric parameters including absolute fat mass and body mass index (BMI) have been studied [14].

The purpose of this study was to determine the thickness of skin and fat folds in Kyrgyz women of various ages, taking into account their somatotypological profile. Skin is created through loose connective tissue regions gliding of skin over muscle contraction [15]. Body fat estimation allows measuring changes over time attributed to interventions and treatments in hospitals and clinical practice [16].

2. Materials and Methods

The method of complex anthropometry, including the determination of the values of 21 anthropometric parameters [17], studied the physical status of 1028 Kyrgyz women of different age groups youth (16 - 20 years old 310 girls), mature age (1st period, 21 - 35 years old 308 women; 2nd period, 36 - 55 years 410 women) living in Osh and its environs. When identifying age groups, the "Scheme of age periodization of human ontogenesis" used, adopted at the VII

All Union conference on the problems of age morphology, physiology, and biochemistry, held in 1965. Limitations in this work did not include women with diseases affecting the formation of physical status (osteoporosis, underweight, alimentary obesity, degenerative-dystrophic diseases, etc.).

For women somatotypes, we used the traditional scheme of constitutional diagnostics by I.B. Galant, P. Chtetsov, B.A. Nikityuk as the most adequate. Seven somatotypes distinguished within three constitutional groups. At the same time, the leptosomal constitution included asthenic and stenoplastic types; mesosomal picnic and mesoplastic; megalosomal constitution athletic, subathletic, and euriplastic somatotypes. Within the euriplastic (undersized and tall) and asthenic (thin-boned and broad-boned) somatotypes, their variants distinguished. If the surveyed according to the complex of the studied parameters did not correspond to any of the somatotypes, then the identified as indefinite. To assess the development of subcutaneous fat by caliperometry, the thickness of the skin and fat folds in different regions of the body measured. The electronic device "Caliper" KEC-100 is designed to determine the thickness of the skin and fat fold in order to assess fat deposition and its uniform distribution over the body. To avoid errors, the measurement site was carefully determined. To properly raise the skin fold, it was tightly clamped with the thumb and forefinger or three fingers so that the skin and subcutaneous fat layer would be included in the fold. The caliper had a standard contact area of 90 mm^2 and a jaw pressure of 10 g per mm^2. The thickness of the skin fat fold (SFF) of the trunk was measured in the following zones: back at the lower angle of the scapula (the fold is oriented obliquely at an angle of 450˚ horizontal), chest at the level of the lateral edge of the pectoralis major muscle, in the middle between the nipple of the mammary gland and the anterior axillary line, the anterior abdominal wall (abdomen) along a horizontal line at a distance of 5 cm to the side (to the right) of the navel.

This study was approved by the decision of the local ethical committee of the Institute of Medical Problems of the Southern Branch of the National Academy of Sciences of the Kyrgyz Republic on 12.10.16, Protocol No. 4. The informational consent signed on the principle of voluntary participation.

Statistical processing of morphometric data performed on a computer using statistical programs Microsoft Excel and the STATISTICA package (v. 6.0). The results presented as arithmetic means (X), and their error (Sx), the minimum (Min) and maximum (Max) individual variants of each parameter were recorded. To determine the significance of differences between the indicators, the Student's t-test used. Differences between two comparable indicators were considered significant at $p < 0.05$.

3. Results and Discussions

Based on anthropometry, data obtained that make it possible to distribute the studied female population following the belonging of individuals to a specific

constitutional group. In particular, it is shown that among women of the leptosomal group the stenoplastic somatotype is the most typical, the least asthenic somatotype. In the group of mesosomal constitutions, the mesoplastic one dominates and the picnic somatotype is less often determined. In the group of megalosomal constitutions, the euriplastic somatotype predominates; relatively rarely, subathletic and extremely rarely athletic somatotypes are determined. Results obtained after analysis of the thickness of the SFF in girls and women of mature ages within the limits of the somatotypological affiliation presented in Table 1.

So, in girls, the thickness of the SFF in the back area is minimal in the asthenic somatotype, in comparison with which in the stenoplastic somatotype this indicator is 2.0 times higher ($p < 0.05$), in women of the mesoplastic type 2.4 times ($p < 0.05$), picnic 2.8 times ($p < 0.05$). Compared with the asthenic type, this indicator in girls of the athletic somatotype does not change, in the subathletic type, it is 1.2 times ($p < 0.05$), in the euriplastic undersized type 2.4 times ($p < 0.05$), euriplastic tall type 2.4 times ($p < 0.05$), indeterminate somatotype 1.5 times more ($p < 0.05$).

Table 1. The thickness of the skin and fat folds of the back in women of different somatotypes (X + + Sx; min-max; mm).

Somatotypes	Age		
	I	II	III
Asthenic thin bone	6.4 ± 0.4 4 - 7	6.6 ± 0.3 5 - 8	7.2 ± 0.6 6 - 19
Asthenic broad-boned	6.4 ± 0.4 4 - 7	6.8 ± 0.6 5 - 8	7.8 ± 1.9 6 - 19
Stenoplastic	13.0 ± 0.2 8 - 16	14.2 ± 0.1 10 - 16	16.5 ± 0.4 8 - 18
Mesoplasctic	15.2 ± 0.2 12 - 18	16.4 ± 0.1 12 - 18	18.0 ± 1.3 12 - 28
Picnic	18.0 ± 0.5 13 - 25	16.8 ± 0.3 13 - 26	17.8 ± 0.4 8 - 24
Athletic	7.2 ± 0.7 5 - 7	8.5 ± 0.9 6 - 7	7.0 ± 1.8 6 - 8
Sub-athletic	7.5 ± 0.3 5 - 8	8.0 ± 0.1 6 - 9	8.2 ± 0.2 6 - 10
Euriplastic undersized	15.6 ± 0.6 7 - 19	16.3 ± 0.3 7 - 19	17.0 ± 0.3 7 - 21
Euriplastic tall	15.1 ± 0.4 7 - 18	15.7 ± 0.2 7 - 19	15.8 ± 0.3 7 - 21
Indefinite	9.7 ± 0.3 6 - 13	12.7 ± 0.3 8 - 16	12.9 ± 0.7 8 - 19

Note: I: girls; II: women of the 1st period of adulthood; III: women of the 2nd period of adulthood.

The thickness of the SFF of the back in women of the 1st period of mature age is minimal in representatives of the asthenic thin-boned somatotype, in comparison with which, this indicator hardly changes in women of the asthenic large-boned somatotype, in women of the 1st period of the mature age of the stenoplastic somatotype this parameter is 2.2 times more ($p < 0.05$), mesoplastic type 2.5 times more ($p < 0.05$), picnic somatotype 2.5 times more ($p < 0.05$), athletic type does not change, subathletic somatotype 1.2 times more ($p < 0.05$), euriplastic short somatotype 2.5 times more ($p < 0.05$), euriplastic tall somatotype 2.4 times more ($p < 0.05$), indeterminate somatotype 1.9 times more ($p < 0.05$). The thickness of the SFF of the back in women of the 2nd period of adulthood is minimal with asthenic thin boned somatotype, in comparison with which this indicator hardly changes in women of asthenic wide-boned somatotype, in carriers of the stenoplastic somatotype this indicator is 2.3 times higher ($p < 0.05$), mesoplastic type 2.5 times more ($p < 0.05$), picnic somatotype 2.5 times more ($p < 0.05$), athletic type does not change, subathletic somatotype 1.1 times more ($p < 0.05$), euriplastic undersized somatotype 2.4 times more ($p < 0.05$), euriplastic tall somatotype 2.2 times more ($p < 0.05$), undefined somatotype 1.8 times more ($p < 0.05$).

In girls, the thickness of the SFF in the chest area (**Table 2**) is minimal in the asthenic somatotype, compared with which in the stenoplastic somatotype this parameter is 1.7 times greater ($p < 0.05$), in women of the mesoplastic type 1.9 times ($p < 0.05$), picnic - 3.6 times ($p < 0.05$), in women of the athletic type it is 1.3 times more ($p < 0.05$), in the subathletic somatotype 1.8 times ($p < 0.05$), with euriplastic type (both variants) 3.1 times ($p < 0.05$), undefined somatotype 2.1 times more ($p < 0.05$). The thickness of the SFF of the breast in the 1st period of adulthood is minimal with asthenic broad-boned somatotype. In comparison with them, with stenoplastic somatotype it is 1.6 times more ($p < 0.05$), mesoplastic 2.2 times ($p < 0.05$), picnic 3.1 times ($p < 0.05$), athletic by 1.5 times ($p < 0.05$), subathletic by 1.7 times ($p < 0.05$), euriplastic undersized by 3.0 times ($p < 0.05$), tall somatotype by 2.9 times ($p < 0.05$), indefinite somatotype 2.4 times more ($p < 0.05$).

The thickness of the breast SFF in women of the 2nd period of adulthood is minimal in representatives of the asthenic wide-boned somatotype, in comparison with which, this indicator does not change in women of the asthenic thin-boned somatotype; in women of the stenoplastic somatotype, this indicator is 1.4 times higher ($p < 0.05$), mesoplastic type 2.0 times ($p < 0.05$), picnic somatotype 2.7 times ($p < 0.05$), athletic type 1.3 times ($p < 0.05$), subathletic somatotype 1.4 times ($p < 0.05$), euriplastic low somatotype 2.5 times ($p < 0.05$), euriplastic tall somatotype 2.7 times ($p < 0.05$), undefined somatotype 2.0 times more ($p < 0.05$).

In girls, the thickness of the FSS in the abdominal area (**Table 3**) is minimal in the case of asthenic wide-boned somatotype, compared with which in case of stenoplastic somatotype this indicator is 2.0 times higher ($p < 0.05$), in girls of

Table 2. The thickness of the skin and fat folds of the breast in women of different somatotypes (X + Sx; min-max; mm).

Somatotypes	Age		
	I	II	III
Asthenic thin bone	6.0 ± 0.3 2 - 13	6.4 ± 0.2 6 - 7	7.6 ± 0.3 6 - 9
Asthenic broad-boned	6.2 ± 0.5 3 - 10	6.2 ± 0.6 6 - 7	7.6 ± 1.1 6 - 10
Stenoplastic	10.0 ± 0.2 5 - 13	9.9 ± 0.1 8 - 14	10.3 ± 0.4 8 - 18
Mesoplasctic	11.2 ± 0.2 8 - 14	13.4 ± 0.1 8 - 18	15.3 ± 0.4 9 - 19
Picnic	21.6 ± 0.3 12 - 20	19.4 ± 0.1 10 - 22	20.5 ± 0.2 12 - 28
Athletic	7.5 ± 0.2 6 - 8	9.5 ± 0.4 8 - 11	9.5 ± 1.5 9 - 11
Sub-athletic	10.6 ± 0.5 8 - 13	10.4 ± 0.2 9 - 12	10.8 ± 1.0 9 - 16
Euriplastic undersized	18.5 ± 0.5 12 - 24	18.3 ± 0.3 13 - 25	19.0 ± 0.2 12 - 30
Euriplastic tall	18.6 ± 0.4 13 - 25	18.1 ± 0.3 13 - 26	20.7 ± 0.8 14 - 34
Indefinite	12.4 ± 0.6 11 - 16	14.9 ± 0.3 12 - 19	15.4 ± 0.6 13 - 26

Note: I: girls; II: women of the 1st period of adulthood; III: women of the 2nd period of adulthood.

Table 3. The thickness of the skin and fat folds of the abdomen in women of different somatotypes (X + Sx; min-max; mm).

Somatotypes	Age		
	I	II	III
Asthenic thin bone	9.6 ± 0.2 7 - 11	9.6 ± 0.1 8 - 10	10.6 ± 0.5 9 - 15
Asthenic broad-boned	9.5 ± 0.5 8 - 12	9.5 ± 0.4 9 - 10	10.5 ± 2.1 9 - 15
Stenoplastic	19.3 ± 0.3 13 - 25	21.1 ± 0.2 14 - 26	21.5 ± 0.5 15 - 29
Mesoplasctic	23.1 ± 0.2 19 - 26	25.1 ± 0.1 22 - 29	27.6 ± 0.5 15 - 34
Picnic	43.2 ± 0.9 31 - 50	46.2 ± 0.6 32 - 52	47.4 ± 0.8 20 - 54
Athletic	15.6 ± 0.4 10 - 18	15.5 ± 0.9 10 - 16	16.0 ± 1.7 16 - 18
Sub-athletic	21.4 ± 0.6 13 - 24	27.6 ± 0.2 14 - 29	28.0 ± 1.4 23 - 32
Euriplastic undersized	39.7 ± 1.0 25 - 47	40.6 ± 0.3 30 - 49	41.0 ± 0.4 35 - 52
Euriplastic tall	38.8 ± 0.9 24 - 47	37.5 ± 0.4 30 - 51	37.0 ± 0.6 35 - 52
Indefinite	30.0 ± 0.5 20 - 36	33.2 ± 0.2 25 - 37	28.2 ± 1.4 26 - 50

Note: I: girls; II: women of the 1st period of adulthood; III: women of the 2nd period of adulthood.

the mesoplastic type it is 2.4 times higher times ($p < 0.05$), picnic 4.5 times ($p < 0.05$). Compared with the asthenic type, this indicator in girls of the athletic type is 1.6 times ($p < 0.05$), in the subathletic type it is 2.4 times ($p < 0.05$), in the euriplastic stunted type 4.1 times ($p < 0.05$), euriplastic tall type 4.0 times ($p < 0.05$), indeterminate somatotype 3.1 times more ($p < 0.05$).

The thickness of the FSS in the abdominal area in women of the 1st period of adulthood is minimal in representatives of the asthenic large-boned somatotype, in comparison with which, this indicator hardly changes in women of the asthenic thin-boned somatotype, in women of the stenoplastic somatotype this indicator is 2.2 times higher ($p < 0.05$), mesoplastic type 2.6 times more ($p < 0.05$), picnic somatotype 4.8 times ($p < 0.05$), athletic type 1.6 times ($p < 0.05$), subathletic somatotype 2.9 times ($p < 0.05$), euriplastic short somatotype 4.2 times ($p < 0.05$), euriplastic tall somatotype 3.9 times ($p < 0.05$), indefinite somatotype 3.5 times more ($p < 0.05$).

The individual minimum and maximum values of the FSS thickness in the trunk area (back, chest, abdomen) in women with asthenic somatotype are less than with picnic, mesoplastic, euriplastic, and indeterminate somatotypes ($p < 0.05$). These results were obtained according to the somatotypological features of the skin fat fold thickness in ethnic Kyrgyz women, based on their anatomical and genetic characteristics.

4. Conclusion

Women constitutional distribution in the Kyrgyz population explained and the data seem to be especially significant in terms of positions convergence between anthropology and practical medicine. Indicators of physical status in adolescence and adulthood in women have a pronounced somatotypological specificity. Within each somatotype, there are wide changes in the studied anthropometric indicator. The thickness of the skin and fat folds is the smallest in women of asthenic, athletic, and stenoplastic, and the greatest in representatives of the euriplastic and picnic somatotypes. Materials on the physical development and constitutional and typological characteristics of the studied population of women under conditions of a relative norm applicable for a personalized approach to the implementation of diagnostic and treatment and prophylactic measures in a practical healthcare environment.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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