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M.S. Savvina, T.E. Burtseva, V.G. Chasnyk, V.B. Egorova, A.A. Munkhalov

## EVALUATION OF PHYSICAL DEVELOPMENT OF CHILDREN AND ADOLESCENTS OF DIFFERENT ETHICAL GROUPS, LIVING IN THE REPUBLIC OF SAKHA (YAKUTIA)

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To justify the use of regional standards for the physical development of children living in the Republic of Sakha (Yakutia) on the basis of their ethnic predisposition the data were analysed obtained during preventive examinations in 2019-2020 in the territory of the republic. The evaluation of the physical development of children aged 3 months up to 17 years was conducted as well as the comparative analysis of the compliance of centile tables CDC, WHO and regional normative scales of physical development. It was found that the regional compliance standards most adequately reflect indicators of the physical development of children in the studied populations.

**Keywords:** physical development, centile corridor, anthropometry, Sakha, indigenous peoples of the north (ipoten), Russians.

**SAVVINA Maya Semyonovna** - Candidate of Medical Sciences, senior researcher in children's health monitoring laboratory of Yakutsk Scientific Center for Complex Medical Problems; e-mail: [maya\\_savvina@mail.ru](mailto:maya_savvina@mail.ru); **BURTSEVA Tatyana Egorovna** - Doctor of Medical Sciences, professor of the department of pediatrics and pediatric surgery, Medical Institute, North-Eastern Federal University, head of Children's Health Monitoring Laboratory of Yakutsk Scientific Center for Complex Medical Problems; e-mail [bourtsevat@yandex.ru](mailto:bourtsevat@yandex.ru); **CHASNYK Vyacheslav Grigoryevich** - Doctor of Medical Sciences, professor, Head of the Department of Hospital Pediatrics, Federal State-Financed Educational Institution of Higher Professional Education "St. Petersburg State Pediatric Medical University" of the Ministry of Health of the Russian Federation; e-mail: [chasnyk@list.ru](mailto:chasnyk@list.ru); **EGOROVA Vera Borisovna** - Candidate of Medical Sciences, assistant professor of the department of pediatrics and pediatric surgery, Medical Institute, North-Eastern Federal University; **MUNKHALOV Aleksei Andreevich** - student of ETE-19-261, department of English philology, Institute of Modern Languages, North-Eastern Federal University.

**Introduction.** As it is known, the physical development of a child is understood as the dynamic process of growth (increase in body length and weight, development of organs and body systems) and biological maturation of the child as he grows up. The physical development of children is tightly connected with cognitive and social development, and is one of the indications of social wellness of the population [1,5,6].

Negative factors that affect the prenatal period and early childhood can disrupt the sequence of growth and development of the body, in some cases causing irreversible changes [4].

External factors, such as nutritional conditions, upbringing, the presence of diseases, social and other factors during the period of intensive growth and development of a child, can have a great influence on the characteristics of physical development [5,7]. The share of physi-

cal development, inherited and acquired in programming, has been the subject of discussion over the past several decades. [8,9,10,11,12]. The variability of the share of inherited factors in the determinants of the final growth of an individual is 45 - 85%, and this share is largely determined by the assessment method and is associated, in particular, with race and ethnicity [11].

In recent years, a tendency towards disharmonious development of children has been observed everywhere, mainly due to the widespread prevalence of both overweight and underweight [3,5].

The known polygenicity of the peoples inhabiting the Republic of Sakha (Yakutia), and the lifestyle of the indigenous population formed in the course of biocultural adaptation to harsh climatic conditions, suggest the presence of a peculiarity of the anthropometric characteristics of the population, which are

the result of adaptive processes [2].

The purpose of this work is to study the features of the physical development of children and adolescents in the Republic of Sakha (Yakutia).

**Materials and methods.** The physical development of 1099 children was assessed, including 611 girls and 488 boys aged from 3 months to 17 years (Slavs - mostly Russians - 241, Sakha - 498, Evens - 155, Evenks - 111, Yukaghirs - 21, Dolgans - 73) surveyed in Churapchinsky, Allaikhovsky, Anabarsky, Bulunsky and Verkhnekolymsky regions of the Republic of Sakha (Yakutia).

The procedure for assessing the dynamics of the physical development of children included:

1. Measurement of body length (height) and body weight using current recommendations.

2. Calculation of body weight by body length/height, or BMI, according to well-known formulas.

3. Assessment of each recorded value for body weight, length/height, body-weight for height, body mass index, taking into account age and sex:

- A) according to Centers for Disease Control and Prevention standards for children 2 years and older living in the United States (CDC, Centers for Disease Control and Prevention) [13];

- B) according to the standards of the World Health Organization (WHO) for children under 2 years of age [14];

- C) according to regional standards developed in 2017 to assess the age dynamics of the physical development of children aged from birth to 17 years old living in the Republic of Sakha (Yakutia) with additional consideration of ethnicity [2].

To select adequate standards for assessing the dynamics of the physical development of children, living in the Republic of Sakha (Yakutia), we formed a comparative analysis of the correspondence of the use of the CDC and WHO centile scales, as well as regional normative scales of physical development, taking into account the ethnicity of children.

Additionally, demographic indicators and peculiarities of the organization of medical care in the surveyed areas were analyzed according to the official reporting data.

Database maintenance and statistical analysis were carried out using the software packages "Excel", "Statistica for Windows".

**Results.** The results are presented in the form of tables describing the proportion of the surveyed children (% of their total number and % of the number

of children of the corresponding ethnic group) falling into the normative corridors of the standard. Full compliance with the standard implies the correspondence of the calculated numbers in the cells of the table with the values of the centile cut-off values for the corresponding age and gender.

Table 1 shows the proportion (%) of the examined children who fall into the CDC centile corridors of age body weight.

As can be seen from the data presented in Table 1, the assessment of the conformity of the bodyweight of the children examined by us with the CDC standards leads to the conclusion that there is a tendency towards bimodal distribution for some ethnic groups and that, in general, the cut-off curves are shifted to the region of small values. With the exception of the Yukaghirs, Dolgan and, to a lesser extent, Sakha, small body weights prevail in the studied subpopulations. Some correspondence can be noted for values corresponding to 75 centile and above.

Table 2 shows the proportion (%) of the surveyed children who fall into the CDC centile corridors of height/body length according to age.

Analysis of the data presented in Table 2 also leads to the conclusion that the cut-off values are shifted to the area of low values for all ethnic groups, with the exception of the Yukaghirs.

Table 3 shows the centile corridors for body weight by height / length according to the CDC standards and the proportion of children examined who fall into the corresponding centile corridors.

As can be seen from the data presented in Table 4, when assessing the dynamics of the physical development of a child under the age of 2 years using WHO standards, small values of height / body length in the studied subpopulations prevail (extreme values are 4 times more common).

A more detailed interpretation of the description of compliance with WHO standards and the possibility of their use is difficult.

Table 5 presents the data of the examined children (%) used in the corresponding centile body mass corridors in terms of regional analytical indicators of the development of the Republic of Sakha (Yakutia).

Analysis of the data presented in Table

**Table 1**

**Proportion of examined children meeting CDC weight standards**

Proportion (%) of children falling into the corridor	Ethnic group	Centiles, %						
		5	10	25	50	75	90	95
	by body weight							
	In total	9.2	15.4	33.0	58.9	78.8	91.5	95.0
	sakha	7.7	14.7	32.3	59.8	81.2	94.1	96.0
	evens	15.5	21.9	40.6	61.9	80.0	89.7	92.3
	evenki	12.6	19.8	35.1	60.4	83.8	88.3	95.5
	yukaghirs	0	4.8	33.3	42.9	66.7	81.0	95.2
	dolgans	5.5	12.7	28.2	57.5	83.6	93.2	97.3
	russians	10.1	13.0	29.2	57.9	72.2	88.9	93.5
	by height/body length							
	In total	12.0	19.4	40.1	66.2	84.4	94.0	96.4
	sakha	10.3	18.2	41.4	68.9	87.3	95.6	96.8
	evens	15.5	26.5	41.9	68.4	82.6	92.3	92.9
	evenki	20.7	30.6	51.4	77.5	89.2	99.1	100
	yukaghirs	0	5.8	23.8	47.6	66.7	90.5	95.2
	dolgans	13.7	19.2	45.2	71.2	84.9	94.5	98.6
	russians	10.2	14.4	30.6	54.6	78.7	89.4	95.0
	by body weight by height/body length							
	In total	9.5	12.6	23.8	40.0	61.1	78.7	85.2
	sakha	6.8	10.2	22.6	37.9	62.1	78.5	85.3
	indigenous peoples of the north	14.8	16.5	23.5	40.0	62.4	81.2	84.7
	russians	9.1	13.6	26.1	44.3	59.1	77.3	85.2

Table 2

Proportion of surveyed children meeting the WHO standards in terms of body weight, height/length, body weight by height/length

	Parameter	Centiles, %						
		5	10	25	50	75	90	95
Proportion (%) of children falling into the corridor	Body mass	4.3	5.8	10.1	23.2	47.8	68.1	78.3
	Length/height	20.0	22.9	35.7	44.3	67.1	81.4	87.1
	Weight by height/length	5.7	7.1	11.4	20.0	37.1	51.4	60.0

Table 3

Proportion of examined children meeting regional weight standards

	Ethnic group	Centiles, %						
		5	10	25	50	75	90	95
Proportion (%) of children falling into the corridor	по массе тела							
	In total	6.9	15.7	35.9	59.6	77.4	88.3	92.4
	sakha	6.6	16.0	38.9	61.3	80.7	90.8	94.1
	indigenous peoples of the north	6.4	16.8	30.7	55.0	72.1	84.1	88.5
	russians	8.5	13.7	37.6	63.2	78.6	89.7	94.9
	по росту/длине тела							
	In total	6.0	13.5	30.9	58.5	80.4	89.6	94.5
	sakha	5.5	12.3	30.1	59.0	83.0	91.6	95.5
	indigenous peoples of the north	5.6	13.7	29.3	55	74.3	84.9	91.6
	russians	7.7	15.8	35.0	62.4	84.1	92.7	97.0

5 indicates that regional standards better reflect the distribution of body weight values in the studied population. It should be noted that, while the proportion of children falling into a diagnostically significant corridor (5%) is quite satisfactory, there is a tendency for the curves corresponding to 10 and 25 centiles to shift to the region of small values.

Table 6 shows the centile corridors for height/body length in terms of regional standards for assessing the physical development of children in the Republic of Sakha (Yakutia) and the proportion of the examined children falling into the corresponding centile corridors.

Analysis of the data presented in Table 6 indicates that regional standards quite accurately reflect the distribution of height/body length values in the studied population, which indicates that, in general, the dynamics of the physical development of children in the studied areas is average for the corresponding ethnic group of children, living in the Republic of Sakha (Yakutia).

Thus, the use of regional standards of physical development of children that takes ethnicity into the account can evi-

dently be recommended for practical use in mathematical modelling in the course of describing the impact of industrialization on the child population of the Republic of Sakha (Yakutia).

A preliminary analysis of the age dynamics of the height and weight of children in populations of different social composition, ethnicity and occupation confirms the need to take these factors into account when modelling the effects of industrialization. It is also evident that it is necessary to compare the dynamics of anthropometric indicators with the standards developed for individual ethnic groups living in the Republic of Sakha (Yakutia) since the lifestyle and diet in the villages located in the circumpolar and polar regions are largely determined by the ethnic characteristics of the subpopulations.

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