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## CHARACTERISTICS OF THE DISTRIBUTION OF SOMATOTYPES AND ASSESSMENT OF PHYSICAL DEVELOPMENT IN GIRLS LIVING IN THE REPUBLIC OF KARAKALPAKSTAN

**Abstract:** Data on the peculiarities of the physical development of girls living in ecologically unfavorable conditions of the Aral Sea region are presented. Some features of deviations in the physical development of girls, including weight deficit (19,69%), dolichomorphy of the chest (58,27%) and asthenization of the somatotype (37%), were revealed.

**Key words:** environmental crisis, physical development, somatotype, body weight, chest, asthenization, pesticides, endocrine destructors.

**Language:** English

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### Introduction

In the territory of the Aral Sea region, which is subject to an environmental crisis, soil degradation, large-scale migration of toxic dusts and (nano) dust caused by the drying of water bodies, the residual content of pesticides in soil, water and products, salts, spores of various microorganisms and the microorganisms themselves also cause pathological

conditions in the human and animal bodies [1]. Changes in environmental conditions indicate the initial deviations of the morphological parameters of the body.

According to many modern researchers, physical development is an integral indicator of the health and flexibility of the child's body. Physical development is subject to general biological laws and depends

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mainly on socio-economic, biomedical and environmental factors. The results of the study of the level of physical development of children and adolescents living in unfavorable environmental zones indicate cases of delayed physical development (retardation), low growth and body weight, violations of the process of osteogenesis, a decrease in the adaptive abilities of the body or, conversely, excess body weight due to fat metabolism of muscle tissue [2, 6, 11].

It is known that representatives of different constitutional and anatomical groups are characterized by different anatomical and physiological features of the body and its components, different features of the reactivity of the body. Growth and differentiation of the somatotype affect the rate of growth processes and the rate of biological maturation. High growth rate and early morphofunctional development form mainly hypersthenic (picnic) somatotype. Low growth rates and a period of morphofunctional differentiation create conditions for the formation of an asthenic somatotype. Representatives of the athletic and sub-athletic (normosthenic) somatotypes occupy an intermediate position in terms of growth activity [10].

The constitutional approach allows us to more accurately determine the typological specifics of an individual's reactions to environmental problems and reasonably identify risk groups in relation to damaging factors in order to timely implement preventive measures even before the onset of symptoms of the disease. With this in mind, the determination of the physique and assessment of the physical development of young people living in the Southern Aral Sea region are relevant in connection with the unfavorable environmental situation in the region.

The aim of this work is to assess the physical development and determine the physique of young girls of ontogeny due to the unfavorable environmental situation living in the Southern Aral Sea region.

### Materials and methods

In 2020-2021, an anthropometric survey was conducted of 127 female volunteers aged 20-22 years who were born and live in the Southern Aral Sea region (Nukus, Khodjaili, Chimbai and Ellikkala districts of the Republic of Karakalpakstan).

The following parameters of the body structure were determined by the generally accepted method [9]:

1. Body weight was measured on a VEM-150-Massa-K electronic medical scales (ZAO Massa-K, Russia) with a measurement accuracy from 50 to 150 g, depending on the load.
2. Body length was measured using a medical height meter (SECA 217 (Germany)) with a measurement accuracy of up to 5

mm. 3. The chest circumference was measured using an electronic tape measure («Measure King», VAHIGCY, China) with a metric tape made of non-stretchable material with a measurement accuracy of 0.01 cm.

On the basis of measurements was calculated:

The body mass index (BMI) according to the type of deviation of body mass according to the standard technique: with an indicator of 15.99 or less - pronounced body weight deficit; 16-18,49 - body weight deficit; from 18.5 to 24.99 - norm; 25-29,99 - overweight; more than 30 - obesity [9].

The body type was determined (with the classification of M.V. Chernorutsky (1925)) according to the Pinier index, which was calculated using the formula:  $IP = L - (M + T)$ , where L is body length (cm), M is body weight (kg), and T is chest circumference (cm). At values of the Pinier index of more than 30, the asthenic type (hyposthenics) is noted, from 10 to 30 - the athletic type (normosthenics), less than 10 - the picnic type (hypersthenics) [14].

Chest index (IGC, chest circumference\*100/body length) brachymorphic (short, wide >56), mesomorphic (moderate - 51-56) and dolichomorphic (narrow <51) of the chest.

Based on the results of measuring these characteristics, it is possible to track the physical development of a person and determine the anthropometric model of the body structure. All the results were performed using the functions of the Excel program installed in the Microsoft Office 2010 application package; using the MicroCAL Origin v. 6.10 statistical data processing program. From the results obtained, the arithmetic mean values (M), the smallest and largest values (min-max), and the errors of the arithmetic mean (m) anthropometric indicators were calculated.

### Results and Discussion

To characterize physical development, three main anthropometric indicators are usually used, namely body weight, body length, and chest circumference. Body length is the most stable indicator that characterizes the state of plastic processes in the body. A person's body weight primarily depends on genetic factors, age, and gender, and serves as a relative indicator of their physical development and health. The third important somatometric indicator is the circumference of the chest.

It was found that the height of the studied girls is  $162.13 \pm 0.43368$  (min-max values, respectively 149-174.6) cm, body weight  $54.61 \pm 0.61412$  (min-max values, respectively 42.4-77) kg, and chest circumference  $82.33 \pm 0.39985$  (min-max values, respectively 73.4-95) cm.

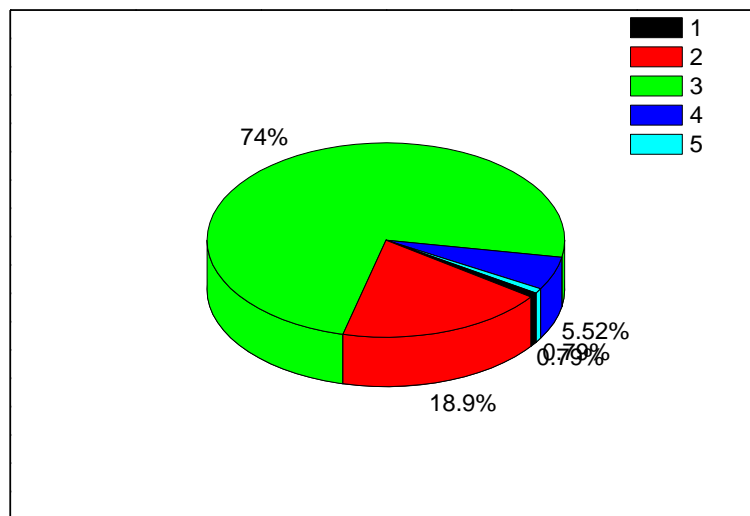
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**Table 1. Main anthropometric indicators for girls living in the Republic of Karakalpakstan (Uzbekistan)**

Indicators	M	m	Min-Max
Body length, cm	162,13	0,43368	149-174,6
Body weight, kg	54,61	0,61412	42,4-77
Chest circumference, cm	82,33	0,39985	73,4-95

In recent years, studies have been widely conducted in most countries to identify various deviations in body weight (body mass deficit and overweight) using the body mass index in adolescents and young adults [19]. The results on the body mass

index of the studied girls were as follows: 0.79% had a pronounced body weight deficit, 18.9% had a body weight deficit, 74% had a normal body weight, 5.52% were overweight and 0.79% had the category of obesity.



**Fig. 1. Distribution of body mass index in girls**

*Note: 1 - pronounced body weight deficit, 2 - body weight deficit, 3 – normal, 4 – overweight, 5 – obesity*

In recent years, cases of weight loss among young people and children have become more frequent and, accordingly, there is a slowdown in growth and development (retardation) [7, 17]. This condition can cause menstrual disorders and delayed sexual development, especially in girls during puberty. According to the literature, a study of the level of development of secondary sexual characteristics in girls aged 10 to 17 years living in Nukus revealed a general delay in sexual development associated with a violation of their growth and development [7]. Women with a body weight deficit are usually characterized by a delay in menarche, a slowdown in the introduction of puberty, while women who have reached the optimal reproductive age have an irregular and prolonged menstrual frequency [12].

Improper nutrition and a sedentary lifestyle lead to the fact that the body accumulates fat under the skin, and this is excess body weight. The problem of excess body weight is of a social nature all over the world, and in recent years it has been considered as a

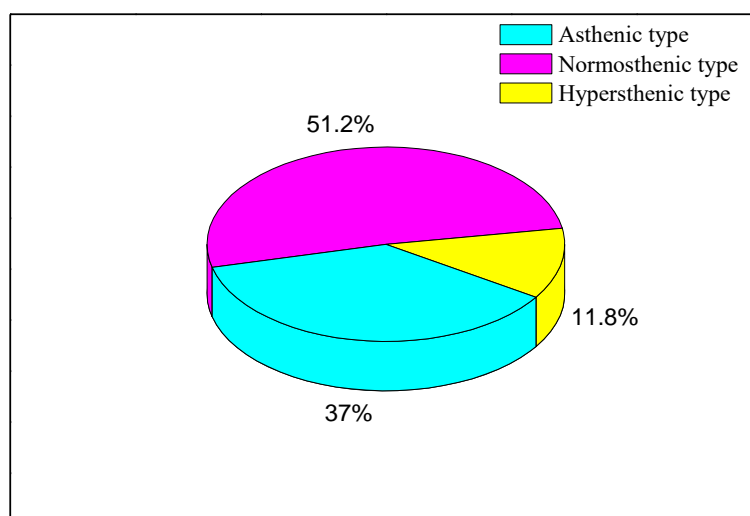
threat to public health [4]. Overweight people eventually have problems with hypertension, the functioning of the cardiovascular system, atherosclerosis, and the development of diabetes.

According to the chest index, 5.51% were brachymorphic, 36.22% were mesamorphic, and 58.27% of the girls had chest dolichomorphy. In girls with dolichomorphy of the thorax, the thorax is narrow, such girls have a deficit of body weight compared to height.

The study of the body allows us to determine the features of the morphofunctional development of a person. 37% of the girls tested on the Pinier index had asthenic, 51.2% normosthenic and 11.8% hypersthenic somatotype. In recent years, under the influence of adverse environmental factors, a wide range of changes in the body has been observed, including asthenization, gracilization, body proportionality, andromorphy in women, gynecomorphy in men, and a number of functional disorders [13, 16, 17].

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**Fig. 2. Body composition distribution in girls**

In previous years, several studies have been conducted on the typological features of students' physical development. According to the authors [8, 20], asthenization of the body structure is observed in girls and boys studying in higher education. This is due to the fact that in a young body there is an insufficient body weight, and with age there is a transformation of the body structure into a normosthenic and hypersthenic type. The unstable socio-economic situation in the country, the inability to meet material needs, an unbalanced diet or lack of food, high morbidity, weak immunity also increase asthenization in adolescents [3].

Another author [13, 21] says that this variability in the body of girls is due to the fact that harmful endocrine disruptors of the environment bind to sex hormones in the body, disrupting the harmony in the formation of the body.

The endocrine disruptors known to us and recognized by most scientists include pesticides, flame retardants, polychlorinated biphenyl (PCBs), phthalates, bisphenols, dioxins, and hexachlorobenzene [15, 18]. These substances enter the body directly through the skin, respiratory tract, or oral route through food, textiles, furniture, and

children's toys [18]. In the literature, there is information about the negative impact of endocrine disruptors on human growth and development. These pollutants restrict growth in the prenatal period, easily penetrate the placenta and accumulate in the fetal tissues. A large concentration of them is found in breast milk. This creates conditions for the impact of endocrine destructors on the body not only in the perinatal period, but also in infancy, during postnatal ontogenesis: in the pre-puberty, adrenarcho and puberty period. During this period, there is a decrease in the concentration of growth hormone and insulin-resistant growth factor-1 (IGF-1) under the influence of endocrine destructors [5]. This, in turn, leads to a violation of harmony in physical and sexual development.

Thus, the anthropometric and anatomical features revealed in the work in girls who permanently live in the Aral Sea region – in the territory with a high level of aerotechnogenic impact, can be the result of a long-term action of pollutants that have an endocrine-destroying effect and pollute the environment of the region. The approach used in this work can be used to monitor the health status of residents of the Aral Sea region.

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