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## FEATURES OF MORPHOFUNCTIONAL INDICATORS OF ADOLESCENTS IN THE ENVIRONMENTAL CONDITIONS OF KARAKALPAKSTAN

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### ABSTRACT

This article evaluates somatometric indicators and the functional state of the cardiovascular system in adolescents living in the Republic of Karakalpakstan. The study involved 61 adolescents from the Muynak district, an area that is considered environmentally critical, near the dried-up coast of the Aral Sea, and 68 adolescents from the Ellikkala district, an area that is considered relatively safe from an ecological point of view. Statistically significant differences in the values of body length and body weight of adolescents were revealed ( $p < 0.05$ ). It was found that systolic blood pressure and heart rate values in adolescents in Muynak are higher than in their peers living in Ellikkala ( $p < 0.05$ ). There were no statistically significant differences in the values of chest circumference and diastolic blood pressure in adolescents ( $p > 0.05$ ). In the course of the study, initial data on the morphofunctional status of adolescents living in the Republic of Karakalpakstan were obtained.

### KEYWORDS

Karakalpakstan, environment, physical development, cardiovascular system, blood pressure, adolescents.

## INTRODUCTION

The morphofunctional status of a person is one of the main criteria determining the state of health of the body, and is manifested in the effects of endogenous and exogenous factors in different age ranges [1]. Unfavorable environmental conditions primarily pose a danger to the child's body [9, 14]. Because their physical development and the state of hemodynamics are sensitive to changes in environmental factors [1]. Therefore, we can call their body one of the markers of the state of the environment. In the case of adaptation of the child's body to any environmental factors, the work of the cardiovascular system is added. It plays a key role in maintaining a state of homeostasis. For this reason, cardiovascular diseases occupy a leading place among the population living in regions with unfavorable environmental conditions [5]. One of the regions with such unfavorable environmental conditions is undoubtedly the Aral Sea region. A number of negative environmental factors (dust and salt storms, pesticides, heavy metals, salinity, poor quality of drinking water) caused by the drying of the Aral Sea also had a negative impact on the health of the population living in this region [7, 16, 22, 26, 28]. In particular, this has led to the morphofunctional development of children [19, 23], adolescents [20], young men [26, 28], girls [24, 26, 28], athletes [13, 27], an increase in the incidence among the population of diseases related to the respiratory system [7, 16], digestive system [7], endocrine system [7], cardiovascular system [7, 8, 21, 22, 23], oncology [7, 18], reproductive system [7, 25].

The purpose of this work is to compare somatometric indicators and the functional state of the cardiovascular system in adolescents living in Muynak

and Ellikkalinsky districts of the Republic of Karakalpakstan.

## MATERIALS AND METHODS

Somatometric examination was carried out in 129 boys aged 14, born and now living in Muynak and Ellikka districts of the Republic of Karakalpakstan (61 of them - from Muynak and 68-from Ellikka districts). The following parameters of the body structure are determined: 1. Body weight was measured on electronic medical scales with a measurement accuracy of up to 100 g, depending on body weight. 2. The height was estimated using a height meter «MM 045» with a measurement accuracy of up to 5 mm. 3. The circumference of the chest was measured using an anthropometric tape.

In addition, we measured blood pressure (systolic blood pressure, diastolic blood pressure) and heart rate in the shoulder using an electronic tonometer. All calculations are built-in Excel functions from the Microsoft Office 2010 application; MicroCAL Origin V.6.10 is implemented using statistical data processing programs. According to the results of the study, the arithmetic mean (M), standard deviation (SD), minimum (min) and maximum (max) values were calculated.

## RESULTS AND ITS DISCUSSION

According to the results obtained, statistically significant differences in the values of body length and body weight indicators of adolescents living in areas with varying degrees of anthropogenic pollution were revealed (Fig.1).

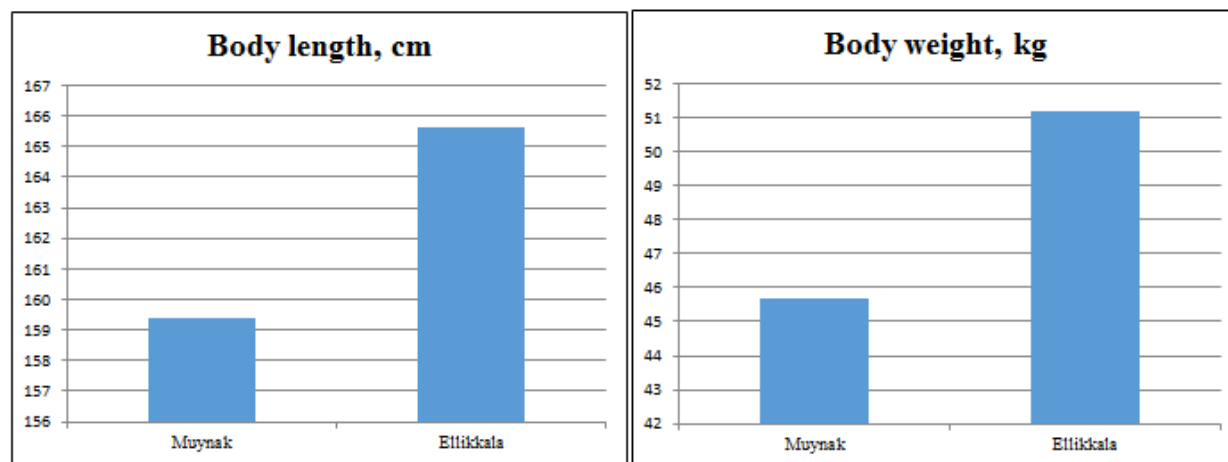


Figure 1. Comparison of the values of body length and body weight in adolescents living in ecologically different areas

Thus, in adolescents of the Muynak district, close to the epicenter of the ecological crisis in the Aral Sea and considered environmentally unfavorable, the body length was  $159.39 \pm 1.56$  cm, and in adolescents of the Ellikka district, considered environmentally relatively safe, it was  $165.62 \pm 1.44$  cm ( $p < 0.05$ ). The body weight of adolescents in Muynak district was  $45.68 \pm 0.99$  kg, and in adolescents in Ellikka district  $51.2 \pm 0.91$  kg, and these results are reliable ( $p < 0.05$ ). However, there

were no statistically significant differences in the values of the chest circumference ( $75.14 \pm 1.05$  cm in Muynak and  $77.38 \pm 1.10$  cm in Ellikka) ( $p > 0.05$ ).

There were also some differences in hemodynamic parameters. In particular, systolic blood pressure in adolescents in Muynak is  $114.34 \pm 1.34$  mmHg, and in adolescents in Ellikkala  $109.29 \pm 1.12$  mmHg is statistically significant ( $p < 0.05$ ) (Fig. 2).

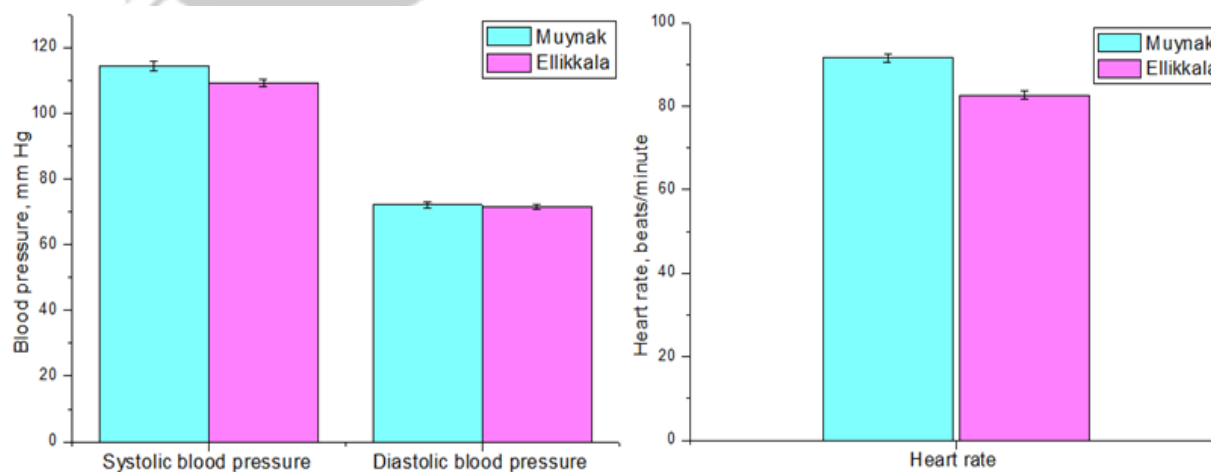


Figure 2. Comparison of blood pressure and heart rate in adolescents living in Muynak and Ellikka districts

There were no statistically significant differences in diastolic blood pressure ( $p > 0.05$ ), i.e.  $72.08 \pm 0.96$  mmHg in adolescents in Muynak and  $71.54 \pm 0.88$  mmHg in adolescents in Ellikkala. In adolescents in the Muynak district, the heart rate value is higher than  $91.58 \pm 1.02$  beats/min, and in representatives of the Ellikkala  $82.65 \pm 0.98$  beats/min ( $p < 0.05$ ).

As can be seen from the results obtained above, adolescents living in the Muynak district, close to the epicenter of the disaster in the Aral Sea, had lower somatometric indicators (except for the chest circumference) compared with the values of their peers living in Ellikkala. The results obtained are in good agreement with the data found in the literature. For example, studies were conducted to assess the physical development and functional state of the cardiovascular system of adolescents living in the industrial city of the Irkutsk region. In 30% of lyceum students, violations of physical development were revealed [4]. Adolescents living in areas of the city of Chelyabinsk, more polluted by environmental pollutants, had physical development features [12]. It was noticed that air pollution reduces the circumference of the breast in girls by 1.97 times. A decisive role in the formation of deviations in the physical development of children aged 12-17 in Chelyabinsk was played by atmospheric air pollution with ecotoxicants [12]. Epidemiological studies of recent decades show a strong link between atmospheric air pollution and cardiovascular diseases [15]. There are two types of exposure to air pollution. Firstly, acute exposure to air pollution can cause myocardial infarction, arrhythmia, heart failure. Secondly, chronic effects also cause cardiovascular diseases and lead to an increase in the mortality rate from all causes compared to acute effects [15].

According to the majority of authors [2, 6], arterial hypotension is more common in children of puberty age, in children with an average and below average level of physical development. The number of children with hypertension has increased. Arterial hypertension usually indicates higher systolic or systolic and diastolic blood pressure in children compared to normal values [2, 6].

One of the factors affecting the physical development of children and adolescents in the school environment is lack of mobility [11]. Lack of movement (lack of mobility) is one of the reasons that cause overweight in children. Overweight children and adolescents tend to have higher levels of heart rate compared to other children [17]. Overweight people abstain from eating, and the body does not receive the nutrients it needs. In this case, you need to move more, and not abstain from eating. High heart rate and respiratory rate indicate rapid fatigue when performing small physical exertion and low efficiency of the cardiorespiratory system [10]. There is evidence that blood pressure and body weight correlate with fats in food, proteins in food correlate with somatometric indicators of the body and heart rate, and caloric content of food correlates with body weight and heart rate [3].

According to recent studies [22], hypotension by systolic blood pressure categories was not detected in 17.64% of 15-year-old girls living in the city of Nukus of the Republic of Karakalpakstan, and there were no cases of hypertension among girls. However, in 15-year-old boys, hypotension was observed in 8.70% and hypertension in 4.35%. And according to the categories of diastolic blood pressure, 2.95% of cases of hypotension and 8.82% of cases of hypertension were detected in girls, 8.69% of cases of hypotension and 8.70% of cases of hypertension in boys [22]. It was found that unsportsmanlike boys aged 17-19 years

living in the Republic of Karakalpakstan have higher systolic blood pressure than girls of the same age. On the other hand, the heart rate was higher in girls compared to boys [21].

Studies on athletes aged 17-19 years have shown that athletes living in the northern regions of the Republic of Karakalpakstan have a higher level of systolic blood pressure than athletes from the southern regions [13]. Compared with athletes living in different regions of Karakalpakstan, it was found that students who do not engage in sports have a higher level of heart rate at rest [13]. N.P. Mirametova found that the cardiovascular and respiratory systems in children aged 6-10 years depend on environmental living conditions in the South Aral Sea region [8].

## CONCLUSION

Considering the above, the study of the physical development of children and adolescents and the functional state of the cardiovascular system in the conditions of the Southern Aral Sea region is one of the most pressing problems of our time. Currently, to solve this problem, it is necessary to organize preventive work on timely and continuous receipt of information about the physical development and functional state of children and adolescents.

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