

## MEDICO-ECOLOGICAL FACTORS INFLUENCING THE LEVEL OF PHYSICAL DEVELOPMENT IN CHILDREN AT THE PRESENT STAGE

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**Abstract.** *In this article, the authors analyze literature data regarding the impact of medico-ecological factors on the physical development of children. An analysis of the structure of medico-ecological factors influencing the physical development of the examined children is conducted, and significant factors are identified. A considerable amount of research indicates that children living in areas with a high level of environmental pollution exhibit a low level of physical development. Moreover, their development is characterized as disharmonious. This is explained by the manifestation of protective-compensatory reactions of the body aimed at its optimal adaptation to the surrounding environment.*

**Keywords:** *anthropometry, height and body weight, physical development of children, medico-ecological factors.*

**RELEVANCE:** Physical development is an integral indicator of a child's health, reflecting the processes of growth and development in changing environmental conditions. The indicators of physical development are influenced not only by age and genetic predisposition but also by national and regional characteristics, lifestyle, environmental conditions, and the presence or absence of diseases [4,9].

A comparative assessment of the physical development of children living in conditions of sanitary and hygienic adversity in the living environment and children in relatively favorable environments has revealed that children in unfavorable conditions exhibit shorter body length compared to their peers in favorable areas. Additionally, there is a higher prevalence of variations in disharmonious physical development due to excess body weight and weight deficiency. Individual anthropometric indicators are evaluated by comparing them with age norms represented in the form of percentile growth charts or curves of standard deviations [7]. Measurements taken over time allow for determining how consistently and harmoniously a child is developing. Knowledge about a child's physical development is essential not only for correctly tracking their growth and nutritional status but also for assessing the body's ability to adapt in stressful situations (intellectual, emotional, physical, psychological). Additionally, this information is crucial for predicting future health problems, morbidity, mortality, intellectual development, work capacity, reproductive function, and the risk of chronic disease [16].

The climatic and geographical conditions of residence, which exert a pronounced influence on morpho functional indicators in children, hold particular significance. Acting on the essential functions of the body, natural factors can have both positive and negative effects. Many authors consider climate to be one of the most important natural factors influencing the growth and development of the human body, the occurrence of various developmental deviations in children, diseases, as well as the course and outcome of illnesses.

The aim of this study is to analyze works dedicated to the medico-ecological factors influencing the physical development of children and adolescents residing in different regions. Scientific papers by leading specialists in child and adolescent hygiene, focusing on medico-ecological factors influencing the formation of physical development in contemporary children and adolescents, were studied and analyzed using search electronic databases (Web of Science, PubMed, eLIBRARY, and Research Gate).

In recent years, a direct correlation has been established between morphological characteristics and the concentration of trace elements in the environment, particularly in soils. Elevated concentrations of calcium, aluminum, iron, and phosphorus in soils generally contribute to growth processes, while decreased concentrations, on the contrary, suppress them [15,20]. V.M. Meshchenko suggests that the geochemical features of each region are a significant factor determining the physical development of children, necessitating the development of zonal standards for their physical development [3].

It is generally accepted to consider the following definition of physical development: it is the combination of morphological and functional characteristics, interdependently influenced by surrounding conditions, characterizing the maturation process at any given moment in time. This definition encompasses both aspects of the concept of "physical development": on one hand, it characterizes the developmental process and its correspondence to biological age, and on the other hand, the morpho functional state at each specific point in time [4].

Physical development, in relation to environmental factors, serves as an expression of adaptive processes occurring in a child's body. The consequence of biological adaptation in humans is the geographical variability of morpho functional characteristics within human populations. Individual variability is determined by both internal factors (constitutional, hereditary) and various external factors (nutrition, living conditions, and others). Therefore, individual variability should be understood not only as hereditary plasticity, the reserve of previously accumulated resources but also as an adaptation for the better functioning of the organism in specific conditions [12].

The impact of adverse factors, especially during the intrauterine period, can lead to pronounced, sometimes irreversible disruptions in physical development. The main anthropometric indicators of newborns largely depend on the burden of the somatic and obstetric-gynecological history of the mother, especially the course of pregnancy and childbirth, and the use of medications during pregnancy [18].

Nutrition is a key factor in the harmonious physical and psychoemotional development of a child. An unbalanced diet in terms of macro- and micronutrients can lead to both immediate and delayed adverse consequences regarding the physical and intellectual status of the child, as well as a decrease in the body's resistance to aggressive external environmental factors [14]. The most severe consequences of the impact of inadequate nutrition on the physical development and health of a child are observed during their active growth period in early childhood [5, 6]. The main criteria for evaluating physical development include body weight and length (height for children over 2 years old), chest circumference, head circumference (for young children), as well as the ratio of these indicators, static functions (motor skills of the child), and timely eruption of milk teeth (for children under 2 years old) [9]. Each of these criteria, while having independent significance, cannot be a marker of the overall development of a child if considered in isolation, rather than in connection with other indicators [18]. It is considered that the most stable indicators of children's

physical development are the dynamics of weight (weight component) and body dimensions (linear component) [11].

Alongside health indicators for both individuals and the community, physical development is considered, along with the health index, as its direct integral indicator reflecting the interconnection of the organism with its surrounding environment [17]. Indicators of physical development can serve as a reliable criterion for determining the readiness of the body for educational, occupational, and sports activities. Together with other health indicators, physical development acts as a reliable marker of the adverse impact of environmental factors on the child's body, mostly of anthropogenic nature.

Anthropogenic factors are crucial exogenous elements influencing human physical development and health [2, 19]. The impact of anthropogenic factors contributes to changes in morphometric development [5,8]. Various literature sources indicate that anthropogenic pollution of the living environment increases the likelihood of forming an asthenic body type and reduces the rate of body growth and development [4,9]. The child population is particularly sensitive to the adverse effects of anthropogenic factors, which is explained by the incomplete growth and development of the child [10,17]. A significant number of studies indicate that children living in areas with high levels of environmental pollution exhibit a low level of physical development. Moreover, their development is characterized as disharmonious [22]. This is explained by the manifestation of protective-compensatory reactions of the organism aimed at its optimal adaptation to the surrounding environment [2,20]. Among all indicators of physical development, body weight shows the greatest variability. Children exhibit both low and high gradations, corresponding to the concept of increased population polymorphism under the influence of anthropogenic stress [13,11].

In polluted areas, both low and high body weights are observed in children, indicating the variability of this characteristic. The authors found that air pollution adversely affects the growth and development processes of children. Comparative assessments of the physical development of preschoolers by Russian scientists revealed that in polluted city areas, children with above-average levels of physical development are 5.41 times more likely, and children with delayed physical development are 2.63 times more likely than in areas with a favorable environment. Russian researchers [6,8] studied the physical development of first-graders in Kirov and considered gender sensitivity to environmental pollution. The authors identified that air pollution negatively influences physical development, leading to a decrease in body weight and an increase in the rate of body length growth. However, boys showed a clear decrease in anthropometric parameters, such as body length and chest circumference, with children with pronounced deviations in physical development in industrial areas being almost four times higher than in the comparison group (29.8% and 7.7%, respectively). In industrial areas, the proportion of children with harmonious physical development is lower than in favorable areas [2,8]. A comparative analysis of the physical development of school-age rural children in the Nizhny Novgorod region, living in areas with different environmental conditions, showed that boys from areas with a tense environmental situation lagged behind their peers living in favorable areas. For girls, differences in total body parameters were less pronounced, indicating their greater adaptive capabilities and ability to withstand anthropogenic loads. However, girls showed a more pronounced variation in body weight than in body length. As a result, the authors concluded that variability in body weight is a response to the influence of environmental factors [3,21].

In the question of the interdependence of indicators of physical development and the health status of children, the opinions of the authors are extremely diverse. P.N. Bashkirov [3], V.G. Vlastovsky [5], G.L. Apanasenko [6] point out that high somatometric data may not always serve as criteria for good health. At the same time, a whole range of authors note that the higher the physical development of children, the higher their resistance. V.N. Kardashenko et al. [7] and others believe that poor physical development is the primary cause of morbidity, determining elevated levels of illness. V.N. Kardashenko and co-authors, through their numerous studies [1], demonstrate that deviations in age development and the disharmony of morphological status generally coincide with deviations in health. The more significant these deviations, the more serious developmental abnormalities are diagnosed in children.

According to L.Ya. Oberg [4,18], children with both low and high levels of physical development more often experience illnesses compared to those with average levels. V.V. Shiba [6] notes that signs of health issues in response to adverse environmental factors are more detectable and pronounced in individuals with decreased physical development.

There have also been scientific publications where a lag in morphometric characteristics of physical development in modern children compared to children of previous years was observed. This trend indicates a process opposite to acceleration - deceleration (a slowed pace of growth and development of the organism) [3,19].

As the most intensive growth and development of a child occur intrauterinely, factors relevant to this period play a crucial role.

Assessment of individual anthropometric indicators is conducted by comparing them with age norms presented in the form of percentile growth charts or curves of standard deviations [10]. Measurements taken dynamically allow determining how consistently and harmoniously the child is developing. Knowledge about a child's physical development is essential not only to understand how they are growing and how well-nourished they are but also to assess the body's ability to adapt in stressful situations (intellectual, emotional, physical, psychological). Additionally, this information is necessary for predicting future health problems, morbidity, mortality, mental development, work capacity, reproductive function, and the risk of developing chronic diseases [11].

There is an ongoing debate in the scientific literature about the preferable use of regional standards or WHO norms for assessing children's physical development. Most authors support the need for developing regional standards for physical development [21].

The establishment of standards for children's physical development and their periodic updates are part of environmental monitoring, which involves observing changes in the life processes of children in response to external factors. Numerous studies indicate that children living in areas with high levels of environmental pollution show low levels of physical development, characterized as disharmonious [7,8,21]. This is explained by the manifestation of protective-compensatory reactions of the body, aimed at its optimal adaptation to the environment.

The World Health Organization (WHO) defines physical development as one of the fundamental criteria in the comprehensive assessment of a child's health. Serving as a leading criterion for the health status of the younger generation, physical development reflects changes occurring in their social, environmental, and hygienic conditions of life [18].

In conditions of unstable environmental conditions, insufficient medical support for school-age children, and an increase in non-traditional teaching methods, monitoring physical development can be more informative, indicating the influence of the mentioned factors.

Conclusion. Physical development parameters, especially weight and height, can be considered as indicators of potential pathological processes in a child's organism. A wide range of factors influences the physical development of the child population. Each of these factors, individually and collectively, may lead to deviations from normal levels of physical development, subsequently resulting in health issues for children. The most significant medico-ecological factors impacting the deterioration of children's physical development in the region manifest during the intrauterine development period and continue to exert influence throughout their growth and development. Further research is needed to explore biological factors affecting the physical development of children after birth. The obtained results underscore the necessity of implementing a system of measures aimed at preventing deviations in physical development in areas with high levels of atmospheric chemical pollution.

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