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# **Impact of HIV infection on the school children physical growth and development**

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**ABSTRACT:** Anatomical and physiological features of children is peculiar, usually changes are observed in childhood based on living conditions [2,6]. Due to the imperfect body structure in the children growth and development pathological conditions matter, namely infectious diseases. When studying physiological and morphological features in normally growing children differ in some childhood periods [2,6,7]. Children physical development considered a major sign of health. Depending on indicators of age, gender and according to living conditions develops various physical development degrees. [3,6,8,]. According to the authors, in states where there is a war, it leads to a sharp deterioration in physical growth, children and adolescents development. It also needs to take into account when assessing physical development and genetic factors. [4,6,9]. For health assessment in every age period of children the main role is played the degree and a physical development combination. Frequent illness with chronic and infectious diseases also leads to stunted growth [2,6,8]. To assess the physical development of HIV-infected children the mass state and growth dynamics is considered the main factor in the HIV infection course. Physical developmental delays in HIV-infected children is an opportunity for the first development signs of HIV infection [1,5,10,11,12].

Lots of problems have been observed during the clinical development period together with physical and mental development compared with healthy peers there is a lag in anthropometric indicators in HIV-infected children. [6,11,13]

**KEYWORDS:** HIV infection, physical, children, immunity, growth.

## **I.INTRODUCTION**

**RESEARCH PURPOSE:** study of changes in physical growth and development indicators in dynamics in HIV-infected schoolchildren.

**RESEARCH MATERIALS AND METHODS:** A control group of 475 HIV-infected children was selected for the scientific study. The children growth according to anthropometric research methods was carried out using a vertical height meter. In the course of studying the childhood growth dynamics in relation to the healthy children indicators compared by the World Health Organization were compared annually (WHO 2007) according to the normative growth and development indicators. Also it was studied in the clinical course of the chronic malnutrition state in HIV-infected children.

Real/ average height for each year of the child in (cm) x100%.

The obtained indicators are evaluated according to the following criteria:

- norm>95%;
- persistent malnutrition 1-degree: 90-95%
- severe malnutrition 2-degree: 85-89%
- severe malnutrition 3-degree: <85%

The scientific research was carried out on the basis of anthropometric data. The research materials were processed statistically.

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## RESEARCH RESULTS AND CONCLUSIONS:

According to the author N.P. Gundobin's modified classification of the mankind ontogenetic development, external and internal factors are important for the children growth and development [6]. During childhood, the following differences in anthropometric parameters were noted among healthy and HIV-infected children. The control group included preschool age children for the first 3 years in the amount of 8 (1.6%) HIV infected children and 20 (3.4%) healthy children of preschool age for the first 3 years, in which the anthropometric growth indicators dynamics was studied. In HIV infected boys, the average height is 92.1 cm ( $p > 0.01$ ), which, according to the WHO, the normal standard indicators growth and development was low compared to the average. When comparing these indicators with healthy children, the average growth was equal to 96.2 cm, it was distinguished by a high growth of 4.2 cm. HIV-infected girls at this age have an average height of 91.3 cm ( $p > 0.05$ ), which, according to WHO, growth and normal standard indicators development was the lowest compared with the average, the healthy girls growth was 95.1 cm, that is, there was a 3.8 cm lag in growth. We know that in this period of childhood all systems and organs are already developed and, in contrast to infancy, there is a slowdown in growth [3,6]. In the growth dynamics, out of 9 (1.9%) HIV-infected boys and girls and 20 (3.4%) healthy children, 5 (1.1%) HIV-infected children had 99.1 cm increase ( $p > 0.05$ ), according to WHO, the average normative standard indicators were characterized by a low growth of 0.4% compared to healthy children. In 4 (0.8%) HIV-infected girls at this age, the average growth was 98.6 cm ( $p > 0.05$ ) and did not differ in comparison with healthy girls, which, according to WHO standards, was equal to the average indicators. When checking the growth dynamics of 10-year-old 2.2% HIV-infected boys of preschool 5 years age, the average growth was 103.6 cm ( $p > 0.10$ ), which scores were lower than the WHO average, the average height of healthy children of the same age was 105.7 cm. 2.1 cm was higher than the HIV infected boys growth. And the growth in HIV-infected girls of the same age was determined by 102.4 cm ( $p > 0.10$ ). When healthy girls were 104.7 cm tall, 2.3 cm higher. Low growth was determined by the normative indicators. When comparing these indicators of the same age in healthy girls, the average growth of indicators according to regulatory standards was determined. Unlike other children of preschool age, there was a slow growth development [3,6,8]. In a follow-up study, the HIV infected children growth was different from that healthy children. Growth development in accordance with the standard WHO indicators was low and the healthy children growth of the same age corresponded to medium and high indicators. Together with the study of the growth development dynamics in HIV-infected preschool children, the chronic malnutrition degree was also studied. These 5 year olds had a 93% performance criterion, there was a 1-degree chronic malnutrition. At other ages, no changes were observed. In the studying process it is necessary to pay attention to the genetic factors influence and congenital causes negatively affecting the growth development.

In the study course, growth dynamics was studied in 225 (47.3%) HIV-infected children of primary school age and in 227 (38.0%) healthy children. Age analyzes were performed. We know that 7 year olds and primary school children grow faster than mass. There was a big difference in average height in 43 (9.0%) HIV-infected boys and girls of the same age. If boys had an average height of 122.9 cm ( $p < 0.10$ ), then the girls' height was 115.5 cm ( $p < 0.01$ ), differed in growth retardation by 7.4 cm. When studying the healthy boys growth of the same age was 126.2 cm with comparison of HIV-infected boys had 3.3 cm difference, and the average height of healthy girls was 122.2 cm ( $p < 0.10$ ), compared to HIV infected girls differed by 6.7 cm in height. Although there are minor differences between the HIV-infected and healthy boys growth, then the differences in indicators between girls were large. Compared to WHO growth standards boys showed average growth rates, when the girls have low growth rates.

When studying the growth of 8 year olds, 19 (4.0%) HIV infected boys and 20 (4.2%) HIV-infected girls by age differences in growth dynamics can be observed. The average height of HIV infected boys was 125.3 cm ( $p < 0.02$ ), in healthy children of the same age, the growth was 131.4 cm. It was distinguished by a high growth of 6.1 cm. And HIV-infected girls observed 124.7 cm height ( $p < 0.10$ ), differed from healthy girls by 3.5 cm in short stature. When compared with HIV infected boys of the same age there was a lag in 0.6 cm growth. It is in these analyzes, when comparing healthy boys with HIV-infected girls the healthy boys growth was observed to be 3.2 cm higher. The 8 year old boys and girls growth according to the WHO growth standards was average. And healthy boys and girls showed high growth from the average. At this point, it should be borne in mind that the immunodeficiency state in the HIV-infected children body can negatively affect growth. We have verified this condition when studying the same age growth. Differences were observed in the average height of 9-year-old HIV-infected boys and primary school age girls. Boys' height length was 123.9cm ( $p < 0.01$ ), relatively healthy

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boys were 9.5 cm behind in height. The growth length of HIV-infected girls of the same age was 126.5 cm ( $p <0.001$ ), relatively healthy girls showed a growth gap of 2.7 cm. In the same age girls relative to boys, it was observed 2.9 cm in height. When comparing these indicators with the WHO standards, the average height of boys is below the standard and the girls growth was shown to be low from the average. The growth dynamics of 10 year old children relative to different age children who were under control showed changes. The boys' average height was 119.2 cm ( $p <0.02$ ), relatively healthy boys showed a short height of 19.3 cm. When the 10 year old HIV-infected girls height was analyzed, it was 134,8 cm ( $p<0.05$ ), relatively healthy girls were observed growth is 3.4 cm. 10-year-old HIV-infected boys showed the lowest growth rates by WHO standards, and the girls had a distinctive average score. We took into account, in the growth study course, the genetic factors peculiarities. In our research continuation, we observed the growth dynamics of 21 (4.4%) HIV-infected boys and 19 (4.0%) HIV-infected girls and revealed differences when comparing children of other ages and healthy children. The average increase in HIV-infected boys was 133,5 ( $p<0.001$ ), lower from healthy boys 9 cm. When observing the girls growth of the same age, it was 136,1cm ( $p<0.001$ ), lagged behind healthy girls by 3.2 cm. When comparing these indicators with the WHO standard indicators, low indicators from the average were determined. Based on the growth rate of HIV-infected school-age children, the HIV infection development was observed in 7, 9, 11 year old girls and 9, 11 year old boys, the assessment factors were  $>90\text{-}95\%$ , was noted 1<sup>st</sup> degree of chronic malnutrition, also in 10 year old HIV infected boys were estimated at  $> 86.0\%$ , there was 2 degree chronic malnutrition. From 12 years old to 17-18 years old age of the childhood period increased growth development was observed. Especially in 13-15 years old boys and in 11-15 years old girls before sexual development, there is a "pubertal jump". Normally, you can grow by 10-12 cm per year. This process stops at the age of 18 at the end of the school period [4,6,8]. During the growth study period, 20 (4.2%) boys and 19 (4.0%) girls in contrast to healthy children, the average height of boys was 141,3 cm ( $p<0.001$ ) there was a 10.1 cm lag behind healthy children. And the girls growth were 137,4 cm ( $p<0.001$ ), in contrast to healthy girls of the same age, there was a 15 cm lag in growth. There was a low growth rate of boys and girls from the WHO standard indicators. The healthy boys and girls growth was average. This means that there is also a lag in the HIV-infected children growth at this age. And in healthy children, the indicators remained normal. In follow-up studies, 17 (3.6%) HIV infected boys and 15 (3,2%) HIV infected girls at 13 years of age, there were differences in growth dynamics. The boys' height was 142,3 cm ( $p<0.002$ ), there was a growth retardation of 6.2 cm from healthy boys. And girls showed 145.4 cm, in contrast to healthy girls, they lagged behind in height by 16 cm. There were low indicators from the average when compared with the WHO anthropometric indicators. At this place, while observing 12 (2.5%) HIV-infected boys growth and 11(2,3%) HIV-infected girls 14 years of age determined the average growth rate. At this age, the increase in HIV-infected children was also different. According to the authors, at this age, the children growth is developing rapidly. According to the observations results, the average growth of HIV-infected boys was 147,4 cm ( $p<0.02$ ), in contrast to healthy children, it lags behind by 7 cm. And for girls of the same age, the growth was 144,1 cm, differs from healthy girls in lagging 13,2 cm. According to the WHO standard indicators, boys have low rates from the average, and girls have the lowest rates of the average. In a study of 7 (1.5%) HIV infected boys and 8 (1,7%) HIV infected girls 15 year old senior school age, the average height of boys was 155,8 cm ( $p>0.02$ ). Unlike healthy boys, there is a growth gap of 12.7 cm. When observing girls, the average height was 144,4 cm ( $p<0.005$ ), and the healthy girls growth was 161.2 cm, i.e. 16.8 cm higher. When comparing these indicators with the WHO standard indicators, the HIV-infected boys growth was defined as low from the average, and in girls the lowest from the average. The healthy boys and girls growth of the same age showed average growth rates. HIV-infected girls of the same age differed from other ages by a marked stature retention. According to the authors, the growth development stops in girls at the age of 16-17, the boys growth at 18-19 years [6,8]. And according to some authors, girls at 20-22 years old, boys at 22-25 years old [6,9]. Differences in height were also noted in 16 year old boys of senior school age, in contrast to other ages. 14 (2.9%) HIV-infected boys and 15 (3,2%) HIV-infected girls of the same age showed a growth trend. The average increase in HIV-infected boys was 155,7 cm ( $p>0.10$ ), healthy children of the same age had 166.2 cm and was noted 10.5 cm higher. When studying the HIV-infected girls growth, the growth was 155.1 cm, in contrast to healthy children, there was a growth retardation of 8.2 cm. When comparing the HIV-infected boys and girls growth showed the lowest rates from the average with the standard rates of growth by WHO. 17 years old 16 (3.4%) HIV-infected boys and 14 (2.9%) HIV-infected girls growth was studied. The average height of boys was 164.4 cm, when compared with healthy boys, there was a growth gap of 4.1 cm. The HIV-infected girls growth was 162,1 cm, there was a lag in growth from healthy girls by 1.3 cm. At this age, when compared with the current ages in the growth development, differences were not observed and, according to the WHO standard, showed the lowest indicators from the average.

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When studying the growth dynamics of 13 (2.7%) 18-year-old HIV-infected boys and girls of senior school age there was a difference from other HIV infected children ages. The boys growth of this age was 165.4 cm, there was a growth gap of 4.1 cm from healthy boys. And HIV-infected girls growth was 164.2 cm, there was a lag in 1.4 cm growth from healthy girls. According to WHO growth standards, the HIV-infected children growth of this age was the lowest from normal growth rates. Growth dynamics of HIV infected children of senior school age according to the indicators criteria it is estimated at 89.0%, 2<sup>nd</sup> chronic malnutrition degree and the rest of all ages according to the indicators criteria was estimated at 90.0-95.0%, 1<sup>st</sup> chronic malnutrition degree was observed. This indicates that the control group of senior school children also develops HIV infection.

## II. CONCLUSION

1. Especially in children of 6 years old primary preschool by 3.2%, 8 year old boys of primary school age by 6.1%, 9 year old boys by 9.5%, girls by 7.1%, 10 year old boys by 19.3% and 12 year old senior school age boys 10.1%, girls 15.0%, stunting was also noted at a high percentage of other ages.

2. Changes in health indicators, i.e. chronic eating disorders are reflected in the growth of children. According to the results, except for 5 year old preschool boys and 7 year old girls of primary school age, 9-11 year old boys and girls, 15 year old high school girls, in the rest of all ages of children, 1<sup>st</sup> degree of chronic malnutrition was observed. Also, among 10 year old boys of primary school age and 15 year old girls of senior school age, there was a pronounced chronic malnutrition of the 2nd degree. This indicates an HIV infection developing in the child's body.

3. It is necessary to constantly pay attention to the physical growth and development of HIV-infected children. In turn, this is considered the initial signs of the development of HIV infection in the body.

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