The First 5 Years Characteristics of Growth and Development of Children Residing in the Regions of Uzbekistan

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Abstract

Introduction: Nutritional issues in children are associated with a complex of factors. Early assistance to the child is feasible with the on time detection of developing deviations in the health, growth and development. The actual tasks were to determine the level of growth and development of children in the regions of the Republic of Uzbekistan, assess the effectiveness of programs implemented in the country to improve nutrition and prevent micronutrient deficiency based on the application of new standards for the growth and development of children, as well as develop relevant proposals and recommendations.

Materials and Method: 3969 children under 5 years old living in 6 regions of Uzbekistan were observed. In order to monitor the growth and development of children, anthropometric measurements were carried out in the following periods: the first measurements - at birth, the second and third - at the age of 15 days and 1 month, then monthly until the expiration of 12 months, 1 time in 3 months - between 12 and 36 months, every 6 months - between 36 and 60 months and then annually. An immunological study was conducted as well for children with malnutrition.

Results: The percentage of BF in the city of Tashkent was 78.6%, Tashkent region - 66.4%, Khorezm region - 67.3%, Fergana region - 85.7%, Bukhara region - 72.2% and the Republic of Karakalpakstan - 89.0 % Based on those results, it can be stated that in the region where the percentage of IHV was lower (Tashkent and Khorezm regions), the percentage of children with low body weight is greater. By the end of 2012 and the beginning of 2013, the percentage of children of the first 6 months of life with reduced weight decreased in all regions. The dynamics of reduced weight by the end of 2012 among children aged 6-12 months was positive

Conclusion: Anthropometric indicators in children of the first 5 years of life, regardless of gender, in almost all studied regions in terms of body weight and body length/height in most cases were same level. In children under 5 years old, low body weight relative to age prevailed among the forms of impaired physical development and nutrition in all regions.

Keywords: *Malnutrition, growth and development impairment, children, socio-economic regions, Uzbekistan.*

Introduction

Taking into account the importance of normal growth as an overall indicator of health status, the World Health Organization (WHO) has developed standards for the growth and development of children[1]. These standards allow us to show how children should grow, to monitor

their growth and development with the adoption and conduct of timely preventive measures (Bogomolova, 2015; Khodzhieva et al, 2016 and *Growth reference 5-19 years. BMI-for-age*, 2007)[17].

Children's health and development are highly dependent on nutrition and the environment. The nutritional problems of children, in turn, are determined by a complex of factors, among which the well-being of the region where the child lives and the formation of eating behavior in the family are leading ones (Gelashvili et al, 2018 and Namazova-Baranova et al, 2018)[5,8,11]. For some regions of the world, there is a problem of chronic malnutrition, which leads to the development of chronic nutrient deficiency in children and continues to be the cause of infant mortality, developmental disorders, including intellectual lagging, and increases the risk of various infectious diseases (Akhmedova et al, 2016; Izotova, 2015; Khodzhieva et al, 2016 and Lobstein et al, 2015)[1,7,12]. Rapid and excessive growth leads to a higher prevalence of cardiovascular disease and obesity. According to the WHO, in 2010, about 115 million children had experienced a reducein body weight, 55 million had low body weight in relation to growth, and 171 million children under the age of five had stunted growth (L.D. I. 2015. *Health in the European Union*, 2011)[7]. In addition, in 2010, 43 million preschool children in developing and developed countries were overweight or obese. The prevalence of childhood obesity in low- and middle-income countries has accelerated over the past 10 years; according to WHO estimates, in 2015 this coefficient should have reached 11%, which is close to prevalence in countries with incomes above the average (12%) (*WHO child growth standards*, 2016)[17].

In the world, great focus is given to the scientific and organizational-methodological studies in determining the characteristics of the physical development of children and improving rational nutrition, taking into account the regional factors in the system of medical prevention (D.T. A.Bogomolova, 2015)[2]and Tanagaet al, 2010)[9],[10]. In this regard, special attention is paid to conducting targeted research: assessment, taking into account regional characteristics of the physical development of children by introducing new standards for the growth and development of children recommended by WHO; determining the frequency of various forms of malnutrition and their relationship with major diseases and immunological reactivity of children; improving the system for assessing factors affecting the health, physical and intellectual development of children (*Health in the European Union*, 2011 and *WHO child growth standards*, 2016)[13,16].

Analysis of the literature showed that early assistance to the child is possible with the timely detection of developing deviations in the health, growth and development (Ashurova, 2015 and Namazova-Baranova et al, 2018)[8,11].

The WHO multifocal study of growth standards (WHO, 2006) was designed to provide data on "how children should grow up," including criteria for selecting children for the study: favorable socio-economic conditions for the growth of the child, breastfeeding (in the first 6 months - BF), compliance with the recommended method of feeding infants, lack of medical or environmental problems, mothers quitting smoking, giving birth to one full-term baby. In order to obtain useful information about the physical development of the child, it is necessary to have several successive measurements of the indicators of the physical development of the child according to the recommended dates of their implementation and apply them to the physical development curves derived from the corresponding reference groups of the population (Geht, 2015 and Lobstein et al, 2015)[14,15].

The aim of the study was to determine the characteristics of the physical development of children in their first five years of life and evaluate the effectiveness of programs to improve their nutrition based on modern organizational and methodological approaches.

Materials and Method

Study Population. A survey (monitoring the growth and development of children) of 3969 children of the first 5 years of their life in 6 regions of the Republic of Uzbekistan was conducted. Representatives of 5 geo-economic regions of Uzbekistan were included in the study: the Republic of Karakalpakstan and the Khorezm region - the West (1592 children), Bukhara region - Central (442 children), Tashkent region - Central-East (707 children), Ferghana region - East region (500 children) and Tashkent city (728 children).

Data Collection: At the first stage, for monitoring and evaluation of growth and development of children in the regions using growth curves according to WHO standards, a monitoring questionnaire was developed and approved by Order of the Ministry of Health of the Republic of Uzbekistan (No.145 dated March 30,

2007). In order to monitor the growth and development of children, anthropometric measurements were carried out in the following periods: the first measurements - at birth, the second and third - at the age of 15 days and 1 month, then monthly until the expiration of 12 months, 1 time in 3 months - between 12 and 36 months, every 6 months - between 36 and 60 months and then annually. If necessary, more frequent weight measurements were carried out, especially to check the adequacy of breastfeeding in the presence of deviations in the growth and development of the child and to evaluate their correction.

An immunological study was conducted in children with malnutrition. Determination of the absolute and relative content of lymphocytes, populations and subpopulations of lymphocytes (total pool of T-lymphocytes (CD3) and B-lymphocytes (CD20), subpopulations of T-helper cells (CD4), T-suppressors (CD8) and natural killers (CD16) in the blood was carried out according to the method of Zalyalyeva (2003) using monoclonal anti-lymphocyte antibodies produced by the Research Institute of Immunology of the Russian Federation (Moscow). Concentrations of serum immunoglobulins (IgG, IgM, IgA) were determined by the standard sets "IgA total - IFA-BEST", "General IgM - IFA-BEST", "General IgG - IFA-BEST" produced by VECTOR-BEST CJSC, Novosibirsk (Russia) by enzyme-linked immunosorbent assay, phagocytic activity of neutrophils - FAN was studied using melamine formaldehyde latexes. Immunological studies were carried out jointly with the Institute of Immunology of the Academy of Sciences of the Republic of Uzbekistan.

Statistical Analysis: To carry out correlation analysis and technological processing of the obtained results, the MS Excel - XP software was used.

Results

The assessment and monitoring of the growth and development of 1,592 children living in the Western region are given: 879 children in the Republic of Karakalpakstan and 713 children in the Khorezm region. It was found that children at birth corresponded to median indicators. In the Republic of Karakalpakstan, the average birth weight for girls was 3.32 ± 0.02 g, body length 50.3 ± 0.1 cm, body mass index (BMI) 13.06 ± 0.06 kg/m^2; in boys, respectively, 3.44 ± 0.03 kg, 51.2 ± 0.1 cm and 13.1 ± 0.08 kg/m^2. These indicators indicate that at birth, indicators of weight, body length and BMI relative to age corresponded to standard indicators according to the WHO growth curves. The weight, body length and BMI of children aged 0-6 months, regardless of gender, corresponded to the level of indicators in the field of -1CO + 1CO, which indicates the harmonious development of children. At the age of 12 months, the girls' body weight corresponded to 8.98 ± 0.05 kg, body length 73.9 ± 0.2 cm, BMI 16.4 ± 0.07 kg/m^2; in boys, respectively, 9.88 ± 0.06 kg, 75.6 ± 0.2 cm and 17.3 ± 0.1 kg/m^2. In girls, all indicators of physical development were in the range of -2CO - + 2CO, which corresponds to the standard. A similar dynamics of physical development by 12 months of life was also observed in boys in this region. However, starting from 7-8 months of life, the pace and development of 87.8% of children slowed down to a greater extent as a result of late (37.0%) and irrational feeding (39.4%). In dynamics from 12 months in girls and boys, body length / height indicators on average corresponded to -1CO. BMI on average in children from 12 months to 5 years old corresponded to normative indicators in accordance with WHO standards.

Among the examined children in the Khorezm region, 51.6% were boys (368) and 48.4% were girls (345). The average birth weight for girls was 3.43 ± 0.04 kg, body length 50.3 ± 0.1 cm, BMI 13.6 ± 0.2 kg/m^2, i.e. all indicators corresponded to normative indicators - median (O) according to the WHO growth curves. The weight, body length and BMI of children aged 0-6 months also corresponded to the median level. In children 9-12 months old, body weight was in the range + 1CO + 2CO, body length in the range - 0 + 1CO, in accordance with this BMI - in the range - 0 + 1CO. These data show that in this age period, physical development corresponds to the standard, but an increase in body weight is noted. It should be noted that most children (87.9%) were exclusively breastfed and breastfed. Indicators of weight, body length / height and BMI for children under the age of 5 years inclusive by region are presented in Figs. 1, 2 and 3.

Bukhara region located in the central geo-economic region. Anthropometric measurements were carried out in this region among 442 children, of which 46.6% were girls (206 children) and 53.4% were boys (236 children). At birth, the average weight, body length, and BMI were in the -1CO and median areas. After 9 months of life, deviations from the median are observed towards a decrease in body weight.

The study of growth and physical development indicators in the Central-Eastern region of Uzbekistan was carried out among 707 children in the Tashkent region, of which 443 were boys (48.5%) and 364 girls (51.5%). In children of the Tashkent region from 12 months to 5 years, the values of body length/height and body weight relative to age were in the region of -2CO and + 1CO.

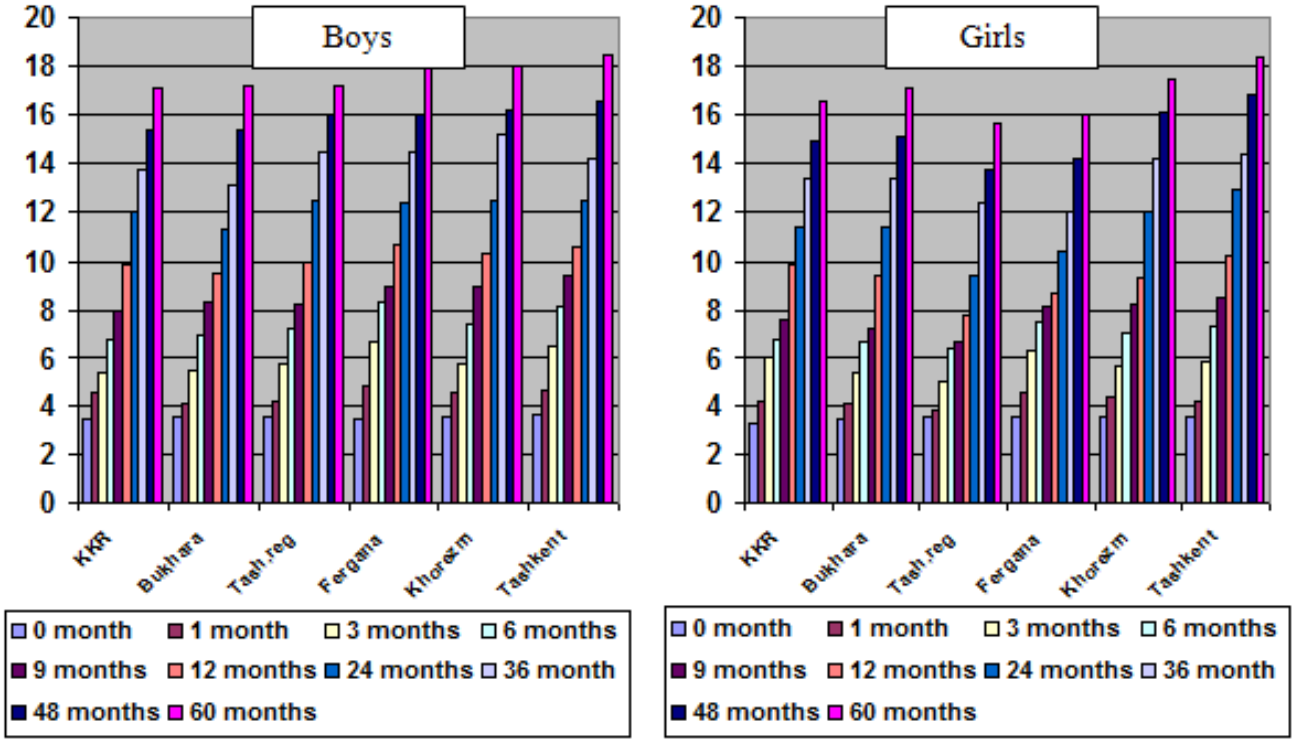

Fig. 1. Body mass index (g) of children under 5 years old inclusive

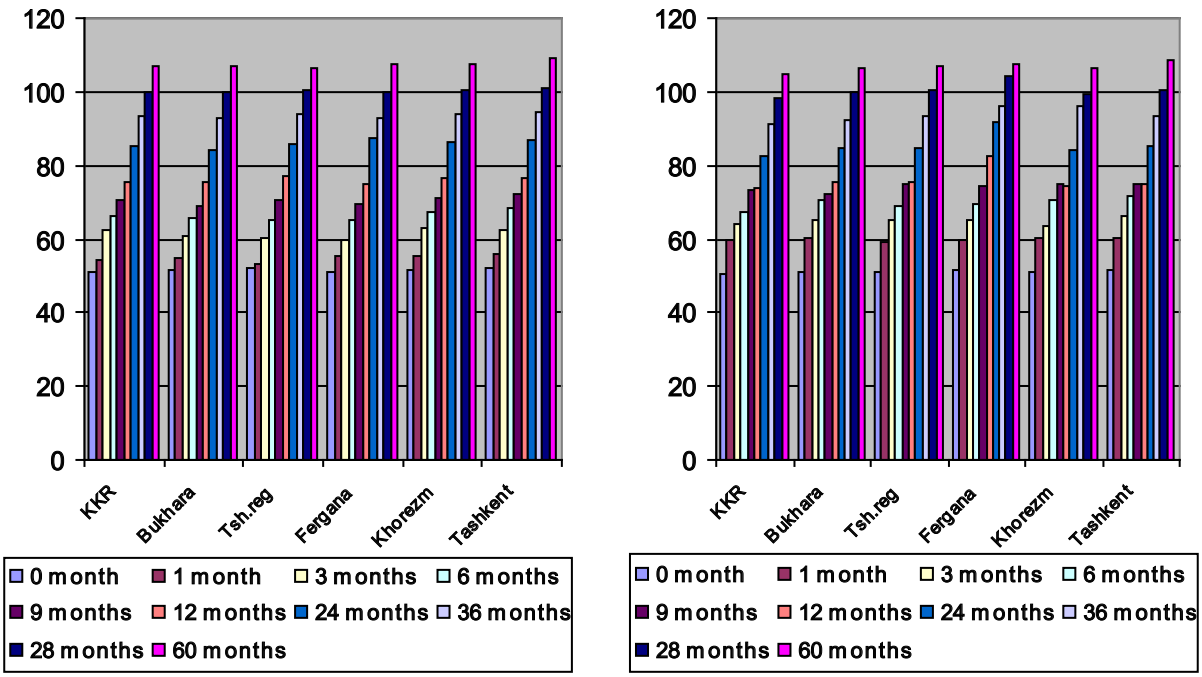

Fig. 2. Indicators of body length/height (cm) for children under 5 years old

Anthropometric measurements and monitoring of the growth and development of 500 children living in the Fergana region were carried out. Of the children examined, boys accounted for 49.2% (346 children), and girls 50.8% (354 children). An analysis of the studies showed that in children living in the Fergana region, up to 10 months of life, indicators of physical development corresponded to the range of -1CO and median (0). Subsequently, a decrease in body weight was observed in the dynamics, the indicators of which were on average in the range of -1CO. Body length/growth indicators were in the same range, BMI in the range -1CO + 2CO.

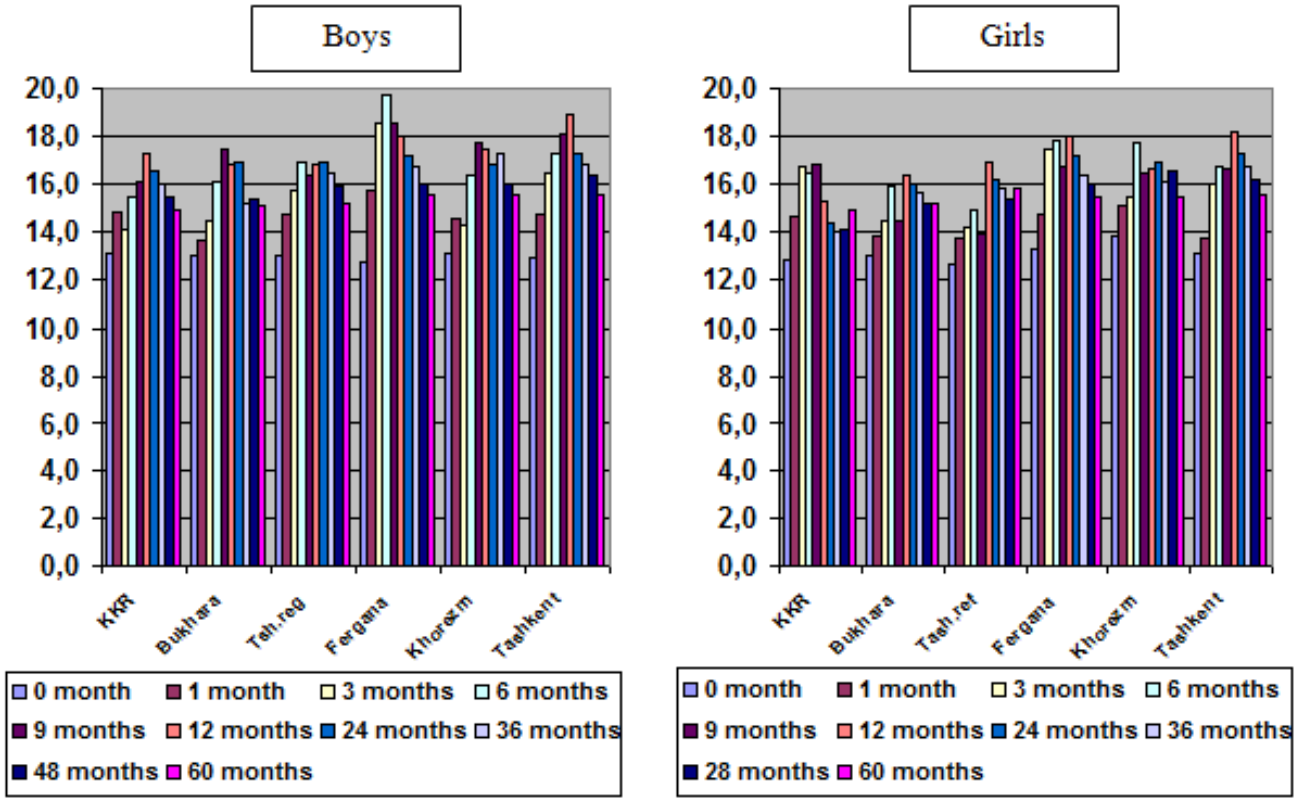

Fig. 3. BMI indexes for children (kg/m^2) up to and including 5 years old

The analysis of growth and physical development indicators was carried out among 728 children of the first 5 years living in Tashkent. The study included 364 girls and boys. Children living in Tashkent showed normative indicators, which in most cases corresponded to the range of -1 CO + median (O) according to the WHO growth curves for all age periods of life.

Anthropometric indicators of children living in the city of Tashkent correspond to the median values for all anthropometric data of the median level, the girls of the Fergana region in terms of body weight and, accordingly, BMI in the first 7-8 months of life slightly exceed their peers from other regions. From 9 months of age, there has been a decrease in the rate of increase in body weight in girls of the Fergana region, and starting from this age, the body mass index is higher for girls in Tashkent and the Khorezm region.

We examined children aged 1 to 2 years with moderate PEM living in the Khorezm region (43 children) and the Republic of Karakalpakstan (44 children), the control group consisted of 34 children in Tashkent. An analysis of the results of an immunological examination of children revealed that against the background of leukopenia relative to the control group, T-immunodeficiency was observed, expressed in a decrease in the level of CD3 + lymphocytes in 76.7% of the examined children of the Khorezm region and 84% in children of Karakalpakstan. A reduced number of immunoregulatory CD4 + subpopulations relative to the control group ($p < 0.01$) was observed in 34 of 43

examined children (79.0%) living in the Khorezm region, and 36 of 44 children (81.8%) living in Karakalpakstan. The content of the relative number of CD8 + lymphocytes in children of the Khorezm region did not significantly differ from the data of the control group, however, in 8 out of 43 children (18.6%) there was a reduced level of T-suppressors / cytotoxic lymphocytes. In children with PEM, the level of CD8 + lymphocytes was reduced ($p < 0.05$). Possibly, insufficient protein content in the diet causes a decrease in the expression of CD8 + lymphocytes in these children compared with children without PEM. There was a significant increase in the relative content of natural killer cells (CD16 +) against the background of the relative and absolute deficit of the total pool of T-lymphocytes (CD3 +). The increase in the relative CD16 + content in children of Karakalpakstan was more pronounced than in children of the Khorezm region ($p < 0.01$). Note that the absolute content of CD16 + in this case did not differ from the control (Table 2). Severe functional deficiency of phagocytes was also noted (the content of active phagocytes was less than 50%).

Table 2: Nonspecific protection factors and parameters of humoral immunity in children with PEM in the Aral Sea regions (M ± m)

Immunological index	Control group (Tashkent), n=34	Regions	
		Khorezm region, n=43	Karakalpakstan Republic, n=44
CD3+	44,5±0,4	39,6±0,2	38,5±0,2
CD4+	27,8± 0,3	25,6±0,2	23,1±0,2
CD8+	19,7± 0,2	19,2± 0,2	16,1± 0,1
CD4/CD8	1,42±0,02	1,33±0,02	1,44±0,02
CD16+,%	10,8 ± 0,1	15,7 ± 0,2*	17,4 ± 0,2*
CD16, 10^9/l	0,46 ± 0,01	0,43 ± 0,01	0,41 ± 0,01
ФАН - Neutrophil phagocytic activity NPA	57,5±0,3	36,4 ± 0,4*	34,2 ± 0,3*
CD20+	20,4±0,2	29,2 ± 0,3*	27,3 ± 0,3*
CD20, 10^9/l	0,93±0,004	0,8±0,01*	0,64 ±0,02*
IgG,g/l	6,9±0,05	4,3±0,03*	3,9±0,03*
IgA,g/l	0,81±0,005	0,52±0,006*	0,65±0,005*
IgM,g/l	0,87±0,005	0,39±0,004*	0,38±0,004*

Note: * The values are significant relative to the control group ($p < 0.05$-0.001).

In general, expressed deviations by average in all regions of the examined children compared with new WHO standards are not observed. The indicators of physical development of children of the first 5 years of life who were breast-fed up to 2 years of age are practically at all age stages in all studied regions at the median level or in the range -1CO - + 2CO in terms of body weight and body length/height, from -1CO to + 1CO according to BMI.

The first stage of malnutrition is reduced weight, which can quickly occur, quickly stop and indicates the acute and/or chronic disease that caused this malnutrition (malnutrition, diarrhea, ARI, etc.). Monitoring results in 2007 showed that in Tashkent, the percentage of children with reduced weight relative to age was 2.7% in children aged 0-6 months, 4.3% in children of the first year of life; in the Tashkent region, respectively 4.5% and 8.4%; in the Fergana region - 4.1% and 6.2%; in the Republic of Karakalpakstan - 4.6% and 6.0%, in the Khorezm region - 5.9% and 7.1%; in Bukhara region - 5.7% and 6.5%.

As it is well known that the most effective intervention for this age group is exclusively breastfeeding (IHV). The percentage of BF in the city of Tashkent was 78.6%, Tashkent region - 66.4%, Khorezm region - 67.3%, Fergana region - 85.7%, Bukhara region - 72.2% and the Republic of Karakalpakstan - 89.0 % Based on those results, it can be stated that in the region

where the percentage of IHV was lower (Tashkent and Khorezm regions), the percentage of children with low body weight is greater. By the end of 2012 and the beginning of 2013, the percentage of children of the first 6 months of life with reduced weight decreased in all regions. The dynamics of reduced weight by the end of 2012 among children aged 6-12 months was positive, i.e. the percentage of children of this age with this form of malnutrition in all regions decreased. This percentage ranged from 2.2% in Tashkent to 3.9-3.5% in Tashkent and Khorezm regions.

The monitoring results showed that in 2007 in the group of children over the age of one year and under 5 years old, lower weight was more marked in Khorezm (8.4%) and Tashkent (7.0%) regions. In dynamics, by 2012 this indicator decreased in all regions and ranged from 2.0% in Tashkent to 5.3 and 5.9%, respectively, in Tashkent and Khorezm regions.

One of the main indicators of the physical development and nutritional status of young children is a growth indicator. The largest percentage of children over the age of 5 and up to 5 years old with low growth for a given age was found in Tashkent and Khorezm regions (6.7 and 7.0%), in Tashkent this figure was 3.6%, in Karakalpakstan - 6.0%, in the Ferghana region - 5.1%. In general, in all regions, there has been a positive trend in reducing this form of malnutrition by the end of 2012, and in early 2013 the indicator of low growth among children aged 5 years old in virtually all regions decreased by 1.2-1.5%.

Discussion

The nutritional status of young children is also assessed by the prevalence of low body weight for this growth, which is regarded as protein-energy malnutrition (PEM). The monitoring results showed that in 2007 the percentage of children with moderate PEM in Tashkent amounted to 2.7% in children aged 0-6 months, 2.8% in children of the first year of life, i.e. in age dynamics there is no deterioration of this indicator; in the Tashkent region, these indicators amounted to 6.2 and 3.0%, respectively. 2012 studies showed that PEM, regardless of the age and region of residence of children, decreased and ranged from 1.8% in Tashkent to 3.2% in the Tashkent region among children aged 5 years.

Today, according to WHO, obesity is an increasing problem in the growth and development of children. Monitoring showed that the percentage of overweight and obesity in Tashkent amounted to 3.9% in children of the first 6 months, 9.3% in children of the first year of life; in Bukhara region - 2.2% and 4.5%, respectively; in the Tashkent region - respectively 1.8% and 3.6%; in the Fergana region - 6.2% and 3.0%; in the Khorezm region - 2.2% and 4.2%, respectively; in the Republic of Karakalpakstan - 3.8% and 2.8% of children, respectively. As you can see, in the dynamics in the regions and the Republic of Karakalpakstan there is a decrease in the number of overweight and obese children. The opposite picture is noted in the capital - this indicator by the end of the year actually increased by 3 times.

In the Fergana region, overweight and obesity prevailed in the first 11 months of boys, on average, BMI at this age stage corresponded to the range of overweight relative to the body length of the corresponding age (+ 1CO + 2CO) with a fluctuation from median (0) and above + With. The lowest indicator of overweight and obesity in 2007 was observed among children of the first 6 months in the Tashkent and Bukhara regions, the first year - in the Republic of Karakalpakstan. In dynamics, by the end of 2012, in all age stages, the leading position in the frequency of overweight and obesity continues to be held in Tashkent (E.S B 2015)[4].

Thus, among the forms of malnutrition in all regions low body weight prevails relative to age, this form is more pronounced in regions where the rate of BF coverage is less. This fact also contributes to a more pronounced growth retardation. Malnutrition in children after 6 months is exacerbated by the untimely and inadequate introduction of complementary foods. For the capital of our republic, especially among children by the end of the first year of life, overweight and obesity are more characteristic.

In-depth analysis of the results of the survey of 356 children with malnutrition and various diseases. Among the surveyed, the most prosperous is the situation in Tashkent, where the highest percentage of children with functional impairments and transient deviations in health status is noted (2nd health group) - 88.6% of the examined. Among the children of the first 5 years of life, children with the 2nd health group made up 74.4% in the Republic of Karakalpakstan, 67.9% in the Bukhara region, 65.4% in the Tashkent region, 78% in the Fergana region, 78 1%. Among all examined children with chronic diseases and the risk of transition to chronic diseases in Tashkent city made up 11.4%. Respiratory diseases and anemia predominate in the structure of

functional disorders and transient diseases in a state of health. The leading positions in the structure of chronic pathology are occupied by diseases of the circulatory system (22.0% of children), pathology of the nervous system and behavior disorders (20.7% of children), and pathology of the digestive system (13.7% of children).

It is known that a diet affects the functioning of the immune system. Based on the results of monitoring and evaluating growth and physical development, we selected 32 children aged 3 to 5 years with PEM. With protein-energy malnutrition, a metabolic imbalance is noted, which, of course, should affect the child's immune system. The research results showed that already in the initial period of malnutrition in the immune system of children, changes take place. In particular, a decrease in the percentage of CD3 + (42.5 ± 0.2% versus 54.7 ± 0.2% in the control, $p < 0.05$) was recorded, mainly due to a decrease in CD4 + (26.6 ± 0.1% against 34.6 ± 0.2% in the control, $p < 0.05$). However, the absolute values of the content of T- and B-lymphocytes did not differ from the indicators of the control group, possibly due to the fact that in children with PEM, relative lymphocytosis was observed (60.4 ± 2.3%). The relative number of T-suppressors / cytotoxic lymphocytes (CD8 +) among children was reduced to 18.1 ± 0.1% versus 22.0 ± 0.2% in the control. The relative content of total B-lymphocytes (CD20 +) and natural killer cells (CD16 +) was reduced compared to the control group to the level of 21.5 ± 0.1% (at 28.1 ± 0.2% in the control, $p < 0.05$) and 11.4 ± 0.2% (at 17.5 ± 0.3% in the control, $p < 0.05$), respectively. The phagocytic activity of neutrophils was significantly lower than the control values - 40.1 ± 0.1% versus 46.4 ± 0.4% in the control ($p < 0.05$). Analysis of the functional activity of B-lymphocytes showed a significantly reduced level of immunoglobulins of the main classes by 2-2.5 times compared with the control. Thus, the level of IgG in children with malnutrition decreased to 4.1 ± 0.04 g/l, IgA to 0.68 ± 0.01 g/l and IgM to 0.38 ± 0.004 g/l compared with the data in the control group, where the level of IgG, IgA, IgM was respectively 8.2 ± 0.08 g/l, 1.05 ± 0.01 g/l and 0.83 ± 0.01 g/l.

Deficiency of phagocytic protection was detected in 43.7 ± 5.3% of the examined children. In the examined children of the Khorezm region, the percentage of active phagocytes was reduced by 1.3 times, and in children of the Republic of Karakalpakstan by 1.4 times relative to the control group.

The relative number of B-lymphocytes (CD20) exceeds the control group by 1.36 times ($p < 0.05$) in children in the Khorezm region and 1.27 times ($p < 0.05$) in children in Karakalpakstan, and the absolute content total B-lymphocytes significantly reduced relative to control values in both groups ($p < 0.05$).

Immunological disorders in children with respiratory and nutritional diseases were exacerbated in the presence of malnutrition. A feature of immunological reactivity in the examined children with BENP is a deficiency of phagocytic defense ($p < 0.01$), low blood levels of immunoglobulins IgG, IgA, IgM ($p < 0.05$).

Conclusion

Anthropometric indicators in children of the first 5 years of life, regardless of gender, in almost all studied regions in terms of body weight and body length/height in most cases were at the median level (0) at birth, in the range -1CO - + 2CO - at the age 0-6 months, in the range of -2CO - + 1CO - at the age of 6 months to 5 years; according to body mass index in the range -1CO - + 1CO - in children of all ages, which corresponds to normal indicators according to the standards of growth and development recommended by WHO. Furthermore, in children of the first year of life, low body weight relative to age prevailed among the forms of impaired physical development and nutrition in all regions. This form is more pronounced in regions where the coverage rate for exclusively breastfeeding in the first 6 months and breastfeeding up to 2 years of age is less (Tashkent and Khorezm regions). The same trend was observed in subsequent age stages. Violation of the physical development and nutrition of children after 6 months was exacerbated by the untimely and irrational introduction of complementary foods. In the dynamics of the 5-year monitoring, by the end of 2012 - the beginning of 2013, a decrease in the frequency of all forms of developmental and nutritional disorders, regardless of the age and gender of children, was noted in all regions. The leading position in the frequency of overweight and obesity was held by children in Tashkent and the Fergana region. In the Fergana region, overweight and obesity prevailed in the first 12 months in boys. In dynamics, by the end of 2012, in all age stages, the leading position in the frequency of overweight and obesity continues to be held in Tashkent. Immunological abnormalities in moderate early BENP were mainly manifested in defects of the T-cell immunity, which were characterized by a low content of CD3 + and CD4 + lymphocytes, which indicates that

T-cell proliferative response to antigens weakens. A decrease in the production of immunoglobulins, due to a violation of the T-cell regulation of their synthesis, is also characteristic. These immunological disorders have important prognostic value in determining the body's resistance to diseases.

Study Limitations: We could not include the prevalence of somatic diseases among children under 5 years old. If any research included such data, it might show more clear picture of influence of malnutrition on the general health condition certain regions. Thus, further researches may be required to describe the prevalence of malnutrition and its impact of the health condition of local children.

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Ethical Approval: The ethical approval for the study was granted by the Committee of Ethical Approval for Researches under the Ministry of Health of the Republic of Uzbekistan.

Consent: Written informed consent was obtained from all participants' parents of the research for publication of this paper and any accompanying information related to this study. A copy of the written consent is available for review by the authors.

Conflict of Interest: The authors declare that they have no competing interests.

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