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THE FEATURES OF REAL NUTRITION OF PRESCHOOL CHILDREN IN CONDITIONS OF INDUSTRIALLY POLLUTED TERRITORIES

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Abstract

An integral part of industrialized areas is the constant increase of technogenic influence on the human body. This contributes to the deterioration of health of the population and, above all, of children as the most sensitive contingent. The industrial district of the Dnipro city, which is characterized by intense pollution of the environment, is selected for research. It should be emphasized that the residential area is located near the territory of the sanitary-protected zone of manufacturing enterprises. The particular attention was paid to selection of the control area. Since it is practically impossible to find an area that is homogeneous by parameters, but not technogenically polluted in an industrial city - the

conventionally "pure" rural area, located in the recreation area, has been chosen as a control one.

The purpose of the work was to give a hygienic assessment of the actual nutrition of children living in an industrially contaminated area, compared with the actual nutrition of kids in areas where there are no powerful industrial enterprises, in order to determine the compliance of food with current norms of physical needs of this contingent. Assessment of nutrition of children of preschool age was carried out in kindergartens using 10-day menu-schedules, the analysis of which indicates their non-compliance with hygiene requirements.

The received data testifies that the actual daily nutrition in kindergartens is scarce primarily with the number of biologically important products for the growing organism of the child: of animal origin - meat, fish up to 50%, dairy products from 25-26% to 85%, as well depleted amount of fruits and vegetables as sources of vitamins, trace elements and food fibers up to 71% with excessive consumption of cereals, pasta, sugar and sweets.

It should be added that the actual nutrition of children in the industrial region is imperfect and unbalanced by all major macro- and micro-nutrients with the insufficiency of the proteins, which in turn enhances the toxic effects of anthropogenic pollutants, reduces the organism's response to adverse environmental factors, potentiates the risk of health problems and causes the need to adjust their nutrition.

Thus, the obtained results show the necessity of continuing the comprehensive hygienic researches in this direction and are the scientific basis for studying the food supplement of the population, including children, as the most vulnerable part of the population to environmental factors, of other industrialized regions of the Dnipro and other powerful industrial regions as well as are the scientific basis for the search and implementation of effective remedies for its correction.

Key words: environmental pollution, actual nutrition of children.

Introduction. One of the critical periods of child's development is a preschool age from 4 to 6 years old. Currently due to the decrease of the standard of living of people, there is an increase in the number of physically impaired children, who have violations of growth and development, as well as the weakened immunity. Therefore, the attention to such an important factor as nutrition, which greatly affects the health of the younger generation, is very appropriate [1, 2, 3].

The purpose of the work. To provide the comprehensive hygienic assessment of the actual nutrition of children of industrial (ecologically unfavorable) and control areas.

Research methods: An assessment of the actual nutrition of children was carried out in preschool children's institutions (PCI) in the 10-day menu layout. The hygienic estimation of the actual daily consumption of certain foods, the content of the basic nutrients, vitamins, minerals and dietary value of energy is calculated and given. The obtained results were compared with the recommended daily food package and "Norms of physiological needs of the population of Ukraine in the main nutrients and energy (2017)" [4].

Results and discussion: The comparative characteristic of the average daily food range of the industrial area, recommended for children of preschool age is presented in the Table. 1.

Table 1

The average daily grocery set of children of the industrial region

Groups of food products	Actual use			The recommended need, g
	g	% of the need	± from the need, g	
Bread	323,9	190,5	+153,9	170
Wheat flour	34,8	124,3	+6,8	28
Cereals, legumes pasta	171,5	381,1	+126,5	45
Potato	108,5	49,3	-111,5	220
Vegetables	308,4	123,4	+58,4	250
Fruit	fresh	0,0	0,0	150
	dry	25,7	171,3	15
Sweets	0,0	0,0	-10,0	10
Sugar	76,7	139,5	+21,7	55
Butter	34,9	139,6	+9,9	25
Oil	13,3	147,8	+4,3	9
Egg (a piece)	0,04	8,0	-0,46	0,5
Milk	124,7	24,9	-375,3	500
Cottage cheese	25,9	51,8	-24,1	50
Meat	63,7	63,7	-36,3	100
Fish	0,0	0,0	-50,0	50
Sour cream	3,9	26,0	-11,1	15
Cheese	0,0	0,0	-5,0	5

The obtained data indicates that the actual use of certain products by preschoolers in the area does not correspond to the recommended one. Thus, the consumption of grain products (bread, cereals, legumes, pasta) is 2.0-3.8 times higher than recommended for this age group. At the same time, the content of milk and dairy products in the diet equals only

24.9-26.0% of the daily needs of the child's body. An insufficient egg consumption (8.0% of the recommended requirement), lack of fish, fresh fruit are also noted in the children's diet. The content of the main nutrients and energy is presented in Table. 2. According to the data, the daily diet contains the sufficient amount of proteins, however, there is a shortage of animal proteins (2.5 times). The diet of children contains fats of vegetable origin in a sufficient amount, but the amount of carbohydrates exceeds significantly (it is 61% more than recommended). The ratio of proteins, fats and carbohydrates is 1:1.1:6.2 to the actual daily diet of children at the recommended 1:1:4 for this age group, which characterizes its imbalance. The calculated energy value of the daily ration also does not correspond to the recommended dose and exceeds it by 40%.

Table 2

The content of proteins, fats, carbohydrates and energy in the diet of children of the industrial district

The content of essential nutrients and energy		In fact, on average	The physiological need, [4]
Proteins, g	in all	62,8	58,0
	including animal	16,1	41,0
Fats, g	in all	67,5	56,0
	including vegetable	28,4	16,8
Carbohydrates, g	in all	386,5	240,0
	including food fibers	7,2	-
Energy, kkal		2373,9	1700,0

The actual content of vitamins and minerals in the diet of the examined age group is shown in the Table. 3. The obtained data indicates that the diet of children is unbalanced both in vitamin and mineral resources. Yes, there is a deficiency of ascorbic acid, vitamin A (in 5 times). The content of calcium in the diet is 481.0 mg, which causes its daily deficit of 319.0 mg. At the same time, there is an increased supply of phosphorus (363.4 mg per day). This leads to a disturbance of the balance of these minerals in the diet of children. Thus, physiological norms provide the correlation of calcium and magnesium in the diet as 1: 1 and in fact it is 1: 2,4. In addition, the calculated mineral substances of the diet, presented at the expense of grain products, where they are in a bound state (except for iron), which impairs their absorption in the digestive canal. Sufficient content of the copper and zinc in the diet also does not ensure their full digestibility, because they are represented at the expense of grain products.

Table 3

**The content of vitamins and minerals in the diet of
children of the industrial district**

The content of vitamins and minerals		In fact, on average	The physiological need, [4]
Vitamins	C, mg	10,0	50,0
	A, mcg	466,7	500,0
Minerals	Ca, mg	481,0	800,0
	P, mg	1163,4	800,0
	Fe, mg	22,0	10,0
	Cu, mg	2,0	1,2
	Zn, mg	9,2	10,0

Thus, the study of the actual nutrition of children in the industrial region has shown that the average daily food intake and daily diet do not correspond the recommended. Inconsistency of nutrition with hygiene requirements leads to violations of the normal functioning of the digestive apparatus, reduces the digestibility of food and also reduces the supply and in time replenishment of children's organism with nutrients. All this, along with other factors, inhibits physical development, contributes to the occurrence of violations of the health of children and complications of diseases that are already occurred.

These data reflects to some of the trends in nutrition of the population of Ukraine: an increase in the use of grain products with the deficit of valuable proteins, which leads to disturbances in the daily dietary balance [2].

The comparative characteristic of the average daily food menu of children of the control district with the recommended for preschoolers is presented in the Table 4. The obtained data testifies that the actual usage of children of certain products in the area of observation, with the rare exception, corresponds to the recommended.

The content of the main nutrients and energy is presented in Table 5. According to calculated data, the daily ration of children in the control area contains sufficient amounts of proteins, fats and carbohydrates. The ratio of proteins, fats and carbohydrates is 1: 0.9: 3.4 to the actual daily ration, which doesn't correspond to the recommended for this age group on average. The calculated energy value corresponds to the recommended one. Actual content of vitamins and minerals in the diet of the examined age group is shown in Table. 6.

Table 4**The average daily grocery set of children of the control region**

Groups of food products		Actual use			The recommended need, g
		g	% of the need	± from the need, g	
Bread		196,0	115,0	+26,0	170
Wheat flour		52,0	186,0	+24,0	28
Cereals, legumes pasta		100,4	223,0	+55,4	45
Potato		324,0	147,0	+104,0	220
Vegetables		232,0	93,0	-18,0	250
Fruit	fresh	144,0	96,0	-6,0	150
	dry	-	-	-	15
Sweets		11,0	110,0	+1,0	10
Sugar		63,9	116,0	+8,9	55
Butter		34,0	136,0	+9,0	25
Oil		17,2	191,1	+8,2	9
Egg (a piece)		0,4	80,0	-0,1	0,5
Milk		773,0	155,0	+273,0	500
Cottage cheese		120,0	240,0	+70,0	50
Meat		146,0	146,0	+46,0	100
Fish		36,0	72,0	-14,0	50
Sour cream		20,0	133,0	+5,0	15
Cheese		10,0	200,0	+5,0	5

Table 5**The content of proteins, fats, carbohydrates and energy in the diet of children of the control region**

The content of essential nutrients and energy		In fact, on average	The physiological need, [4]
Proteins, g	in all	116,0	58,0
	including animal	69,0	41,0
Fats, g	in all	108,0	56,0
	including vegetable	34,2	16,8
Carbohydrates, g	in all	392,9	240,0
	including food fibers	0,38	-
Energy, kkal		2920,7	1700,0

Table 6

**The content of vitamins and minerals in the diet of children
of the control region**

The content of vitamins and minerals		In fact, on average	The physiological need, [4]
Vitamins	C, mg	181,1	50,0
	A, mcg	310,0	600,0
Minerals	Ca, mg	1574,8	800,0
	P, mg	2354,7	800,0
	Fe, mg	22,7	10,0
	Cu, mg	2,7	1,2
	Zn, mg	14,7	10,0

The received data testifies to the insufficient amount of vitamin A (almost 2 times less). But the amount of mineral substances, as well as the mineral balance, was in line with the recommended one in the diet of children in this area.

The assessment of actual nutrition has shown that the average daily food intake and daily diet in the majority do correspond to the recommended one, which contributes to the harmonious growth, development and strengthening of the health of children in the control district.

Thus, the study of actual nutrition of the children's population of the industrial region showed that the actual daily food set does not correspond to the recommended one. In general, the nutrition status of this category of examined reflects to the general pattern of inadequacy of the structure of consumption of food products of the children's population of Ukraine to the physiological needs [1, 3]. It should be noted that the actual nutrition of preschool children living in adverse environmental conditions is characterized by quantitative and qualitative inadequacy of the daily diet, by deficiency of dairy products, fish, vegetables and fruits, which leads to a decrease of the physiological level of content in the daily ration of animal proteins, vitamins micronutrients and food fibers that have a protective effect and reduce the removal of lead. On the contrary, the average daily food set and the daily diet of the children of the control area in the majority corresponds to the recommended one, which contributes to the harmonious growth and development of children, strengthening their health.

Conclusions. The actual nutrition of preschoolers of the industrial region is characterized by its quantitative and qualitative inferiority, namely: the lack of animal proteins - meat and fish - by 50%, dairy products - by 25-85%, vegetables and fruits - by 71%

with excessive consumption of cereals, wheat products, sugar and sweets, which leads to a decrease of the content of vitamins, trace elements and food fibers in the diet. The study of the actual nutrition of children of the control district showed that the average daily food intake and daily diet in the vast majority do correspond to the recommended, which contributes to the harmonious growth, development and strengthening of the health of children living in the control district. The malnutrition of children, living in the industrial region, can cause a violation of the processes of growth and development, a reduction of the body's resistance to adverse environmental factors, which causes the need for the correction of the nutrition.

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