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NUTRIENT STATUS OF PRE-SCHOOL CHILDREN UNDER CONDI-TIONS OF RADIOECOLOGICAL MONITORING AND A MEGACITY

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ABSTRACT

Modern preventive medicine focuses on the development and implementation of effec-tive large-scale measures to optimize the qualitative and quantitative composition of dietary in-take. Given contemporary environmental conditions, such as soil contamination by pesticides, heavy metals, and radionuclides, continuous monitoring and correction of food components are essential. The aim of this study was to investigate the prevalence of polyhypovitaminosis and mineral deficiencies in pre-school children living in areas with varying degrees of radioac-tive contamination and iodine deficiency (using Ivankiv District and the city of Kyiv as exam-ples).

In the examination of the children, the spectral-dynamic method ("KSK-BARS") was utilized to assess vitamin and mineral status, the biochemical method (iodometric urine analy-sis) was used to determine iodine excretion levels, and statistical analysis methods (t-test) were applied. As a result, new data were obtained regarding the combined deficiency of fat-soluble vitamins and essential trace elements in children living under conditions of chronic low-dose radiation exposure and endemic iodine deficiency. A high prevalence of polyhypovitaminosis was established in both groups, specifically deficiencies in vitamins A (77.0%), E (73.0%), and D (46.2%) among children in the Ivankiv District. A critical level of iodine deficiency was identified: in 80% of children in the Ivankiv District and 44.5% of children in Kyiv, iodine excretion rates were below the physiological norm. The presence of complex poly-deficient states (A–B1–B2–B6–B9–D–E) was confirmed.

Keywords

Pre-school children; polyhypovitaminosis; trace elements; mineral deficiency; radioactive con-tamination; iodine deficiency.

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INTRODUCTION

Rational nutrition is one of the key factors in ensuring health and preventing diseases across all age groups. This is particularly relevant for young children, who are characterized by intensive growth and development processes, as well as reduced resistance to the influence of adverse environmental factors, specifically radioactive contamination (Serdyuk, 2018).

A deficiency or imbalance of essential substances in the diet leads to the development of nutrition-related diseases. Deficiencies in vital food ingredients such as iodine, vitamin A, and iron constitute a global public health problem due to their significance and prevalence (Matasar et al., 2020). The Ukrainian Polissya, specifically the Ivankiv District, is characterized not only by radionuclide contamination resulting from the Chornobyl disaster but also by insufficient iodine content in the environment (Matasar et al., 2020; Matasar, Petryshchenko, & Chernyshov, 2020).

LITERATURE REVIEW

The problem of micronutrient deficiency remains one of the most pressing issues in modern medicine. According to WHO data, deficiencies in iodine, vitamin A, and iron are recognized as global threats, which are particularly critical during childhood (Matasar et al., 2020). Current research in Ukraine indicates that children's health status is formed under the combined influence of adverse factors: environmental pollution and unbalanced nutrition (Serdyuk, 2018).

Chronic exposure to low doses of radiation places increased demands on the body's antioxidant system, the key elements of which are vitamins A, E, C, and trace elements Se, Zn, and Cu (Matasar, Petryshchenko, & Lutsenko, 2019; Petryshchenko et al., 2021). Fat-soluble vitamins play a crucial role in maintaining homeostasis under conditions of environmental distress. Specifically, vitamin D deficiency in Ukraine has reached pandemic proportions (Matasar, Petryshchenko, & Lutsenko, 2019). The lack of B-group vitamins also significantly reduces the adaptive potential of residents in affected regions (Matasar, Petryshchenko, & Chernyshov, 2020).

Modern data suggest that classic iodine deficiency is often complicated by a lack of selenium- and iron-dependent enzymes (Matasar, Petryshchenko, & Matasar, 2021). Despite a significant number of works, comparative studies of the nutrient status of children in rural radioactive-contaminated areas versus megacities remain fragmentary (Petryshchenko et al., 2021).

MATERIALS AND METHODS

A total of 83 preschool children were examined: 26 from the Ivankiv district and 57 from the city of Kyiv. The "KSK-BARS" complex was utilized to assess vitamin and mineral status. Iodine status was evaluated based on urinary iodine excretion levels in 40 children (20 subjects from each group). Statistical analysis was performed using Student's t-test in Microsoft Excel.

RESULTS

A significant prevalence of polyhypovitaminosis was identified in both groups (table 1). The most pronounced deficiencies involved vitamins A, E, D, and B_9.

Table 1. Prevalence of hypovitaminosis among the examined children

Source: Matasar et al., 2020.

Hypovitaminosis	Ivankiv District (n=26), n (abs.)	Ivankiv District (n=26), %	Kyiv (n=57), %
Retinol (A)	20	77.0	45.0

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Table 1 (continued)

Hypovitaminosis	Ivankiv District (n=26), n (abs.)	Ivankiv District (n=26), %	Kyiv (n=57), %
Tocopherol (E)	19	73.0	48.0
Folic acid (B_9)	15	57.7	42.0
Pyridoxine (B_6)	13	50.0	38.0
Calciferol (D)	12	46.2	52.0
Thiamine (B_1)	10	38.5	32.0
Riboflavin (B_2)	10	38.5	30.0
Cyanocobalamin (B_{12})	10	38.5	28.0
Niacin (PP)	8	30.8	25.0
Rutin (P)	8	31.0	22.0
Ascorbic acid (C)	5	19.2	15.0

Complex polyhypovitaminosis (A–B1–B2–B6–B9–D–E) was observed in 11% of children from Kyiv and 19% from the Ivankiv district. Regarding mineral status, iodine deficiency was more pronounced in rural areas (77%), while calcium deficiency was more prevalent in the metropolis (60%) (Matasar, Petryshchenko, & Chernyshov, 2020).

Table 2. Prevalence of hypomicroelementosis among the examined children

Source: Matasar et al., 2020.

Hypomicroelementosis	Ivankiv District (n=26), n (abs.)	Ivankiv District (n=26), %	Kyiv (n=57), %
Iodine (I)	20	77.0	44.5
Iron (Fe)	17	65.4	58.0
Calcium (Ca)	15	58.0	60.0
Sodium (Na)	14	54.0	48.0
Phosphorus (P)	14	54.0	50.0
Zinc (Zn)	10	38.5	35.0
Chromium (Cr)	10	38.5	32.0
Potassium (K)	9	34.6	30.0
Magnesium (Mg)	7	27.0	25.0
Selenium (Se)	5	19.2	18.0
Copper (Cu)	5	19.2	16.5

Urinary iodine excretion results (table 3) confirmed a significant deficiency (Matasar, Petryshchenko, & Matasar, 2021).

The median urinary iodine in children from the Ivankiv district was 62.01µg/L (mild de-ficiency). In 80% of children in this group, iodine supply was below the normal range. In Ky-iv, the median was 103.52 µg/L; however, 44.5% of children also exhibited insufficient iodine levels (Fig. 1).

Table 3. Urinary iodine excretion rates in preschool children (µg/L)

Source: Matasar et al., 2020.

Group	Mean (M±m)	Minimum (M min)	Maximum (M max)
Ivankiv District	62.01 ± 5.63	27.61	115.91
Kyiv City	103.52 ± 6.01	48.75	146.31

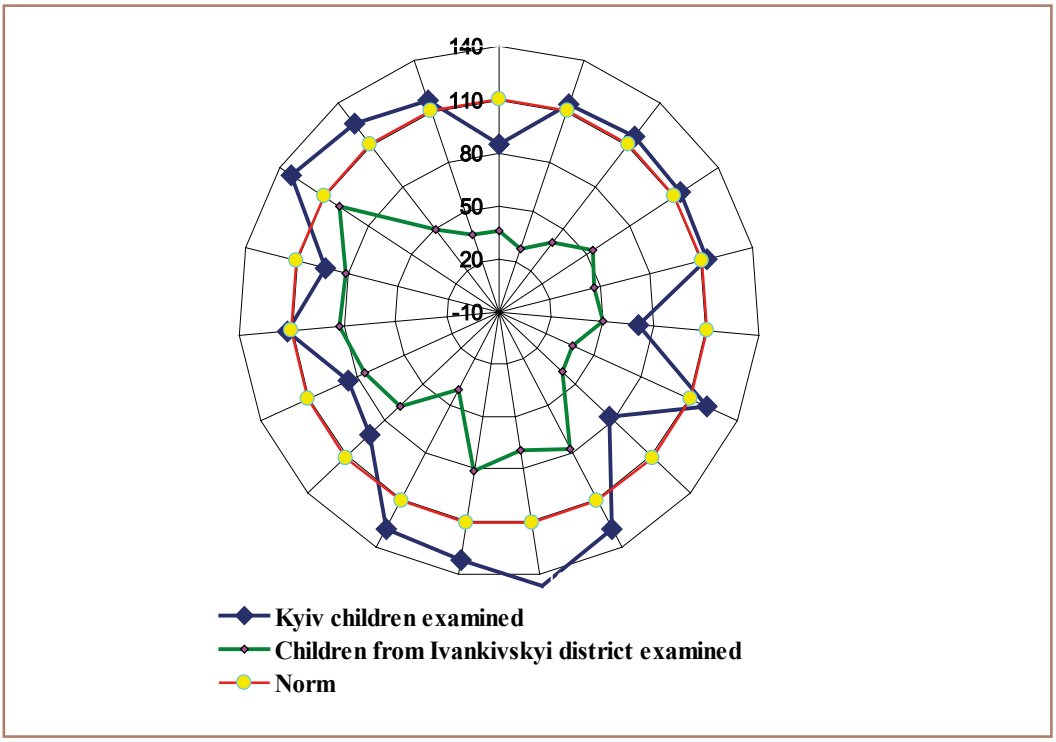

Fig. 1. Indicators of iodine excretion with urine in examined children, (µg/l)

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DISCUSSION

The results obtained indicate systemic nutritional disorders in both regions. Deficiencies in vitamins A, E, and D are critical for immune defense and the development of the nervous system (Matasar, Petryshchenko, & Lutsenko, 2019). Of particular concern is the combination of iodine deficiency with the radiation background, which increases the risk of thyroid pathologies (Matasar, Petryshchenko, & Matasar, 2021). State measures (such as salt iodization) may be insufficient without the correction of concomitant micronutrient deficiencies required for hormone metabolism.

CONCLUSIONS

1. Widespread polyhypovitaminosis, particularly regarding vitamins A, E, D, and B9, was identified in children of both groups.
2. Iodine deficiency affects 80% of children in the Ivankiv district and 44.5% of children in Kyiv, necessitating immediate correction.
3. It is necessary to implement comprehensive nutrient support programs, especially in radioecological control areas.

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BIBLIOGRAPHIC REFERENCES

1. Matasar, I. T., Petryshchenko, L. M., & Chernyshov, A. V. (2020). Water-soluble vitamins: Their physiological significance, role in life of humans and their content in the nutrition of the population suffered as a result of Chernobyl accident. One Health and Nutrition Problems of Ukraine, 53(2), 55–79. https://doi.org/10.33273/2663-9726-2020-53-2-55-79
2. Matasar, I. T., Petryshchenko, L. M., & Lutsenko, O. G. (2019). Fat-soluble vitamins: Physiological significance and role in the life of the population of ecologically hazardous regions of Ukraine. Unified Health and Nutrition Problems of Ukraine, 51(2), 60–78.
3. Matasar, I. T., Petryshchenko, L. M., & Matasar, T. V. (2021). Macroelements and their role in the human body. Unified Health and Nutrition Problems of Ukraine, 55(2), 56–82.
4. Matasar, I. T., et al. (2020). Elimination of iodine deficiency in the nutrition of the population as a social, medical and economic problem: A manual (I. T. Matasar, Ed.). Shchek.
5. Petryshchenko, L. M., et al. (2021). Substantiation of the norms of physiological needs for basic nutrients and energy taking into account the environmental conditions of the population living in the territories of radioecological control: Methodical recommendations. http://nrcrm.gov.ua/download/2021/mr2021_01.pdf
6. Serdyuk, A. M. (Ed.). (2018). Current issues of environmental protection and health of the population of Ukraine (Issue 4). TR Studio Advertising Agency.

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Volume 2 (2),
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