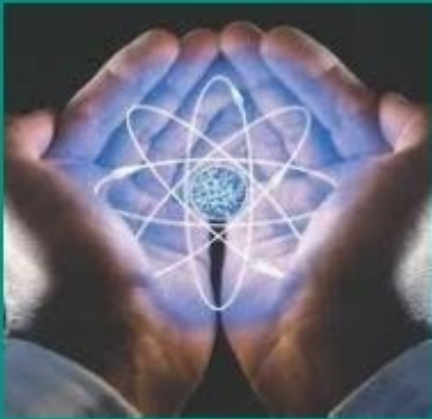

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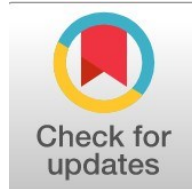
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Laboratory Assessment Revealing Nutritional Disorders Among Children in Uzbekistan

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Abstract

General Background: Childhood nutritional disorders pose major global health risks, affecting growth, immunity, and long-term metabolic outcomes. Specific Background: In Uzbekistan, a dual burden of micronutrient deficiencies and rising overweight rates persists, yet no standardized national protocol exists for laboratory-based assessment. Knowledge Gap: Existing monitoring systems lack unified biochemical, anthropometric, and dietary evaluation methods, limiting early detection and regional comparability. Aims: This study aims to develop and validate a comprehensive laboratory protocol for assessing the nutritional status of children aged 2–12 years to support early prevention of alimentary disorders. Results: Analysis of 500 children across Uzbekistan showed high prevalence of vitamin D deficiency (46 percent), iron deficiency indicated by low ferritin levels (32 percent), and early overweight or obesity (14 percent). Significant correlations were identified between micronutrient biomarkers, BMI, waist circumference, dietary patterns, and sunlight exposure, confirming the multifactorial nature of nutritional imbalance. Novelty: The study introduces the first unified framework integrating biochemical, anthropometric, and dietary indicators tailored to Uzbekistan's pediatric population. Implications: Adoption of this standardized protocol can strengthen national monitoring, improve early diagnosis of hidden deficiencies, guide evidence-based interventions, and support long-term strategies to reduce alimentary and metabolic disorders among Uzbek children.

Highlight :

- The content highlights the significant dual burden of micronutrient deficiencies and early obesity among children in Uzbekistan.
- It emphasizes the importance of integrating biochemical, anthropometric, and dietary data for accurate early detection.
- The study supports establishing a standardized laboratory protocol to improve preventive care and national monitoring.

Keywords : Nutritional status of children, micronutrient deficiencies, vitamin D deficiency, iron deficiency anemia, childhood obesity

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Introduction

Child nutrition is one of the key issues in public health. Providing children with all the necessary nutrients determines their growth, mental and physical development, immune status, and resistance to disease. Nutritional disorders, including micronutrient deficiencies and obesity, pose a serious threat to the health of the child population and can lead to the development of chronic diseases in adulthood. This problem is particularly relevant for developing countries, including Uzbekistan, where there is a combination of undernutrition and overnutrition among children. In the context of the double burden of micronutrient deficiencies and rising obesity rates, laboratory diagnostics are becoming an important tool for prevention [1].

According to a number of regional studies, a significant proportion of children under the age of 12 show signs of iron deficiency, hypovitaminosis D, and lipid metabolism disorders. The lack of a standardized approach to laboratory assessment of nutritional status hinders the early detection and prevention of such conditions. This study aims to develop a unified laboratory protocol that can be implemented in pediatric practice in all regions of the country [2].

Recent studies indicate a high prevalence of nutritional disorders among children worldwide. According to the World Health Organization, approximately 30% of children suffer from hidden forms of micronutrient deficiency, and 18% are overweight or obese. Iron and vitamin D deficiencies remain the most common disorders. In Central Asian countries, vitamin D deficiency is reported in 40–60% of children, which is associated with low sunlight exposure, poor nutrition, and limited consumption of fortified foods [3].

A number of studies conducted in Uzbekistan show that nutritional disorders among children are both quantitative and qualitative in nature. Inadequate intake of protein, iron, B vitamins, and polyunsaturated fatty acids is observed in schoolchildren and preschoolers. At the same time, cities are seeing an increase in the prevalence of overweight and obesity due to physical inactivity and excessive sugar consumption [4].

International publications emphasize the importance of integrating laboratory indicators into nutrition disorder prevention programs. Monitoring ferritin, vitamin D, vitamin B12, and lipid profile levels allows for the detection of early stages of deficiencies and prevents the development of complications. At the same time, uniform standards for laboratory monitoring of children's nutritional status have not yet been implemented in Uzbekistan, which necessitates this study [5].

Research objectives and goals

Objective: To develop and verify a protocol for laboratory assessment of the nutritional status of children aged 2–12 years for the prevention of nutritional diseases [6].

Objectives:

1. Identify key laboratory markers (Fe, ferritin, vitamin D, vitamin B12, lipid profile, glycated hemoglobin when indicated).
2. Conduct a survey of a representative sample of children ($n \approx 500$) across all regions of Uzbekistan.
3. Compare laboratory data with anthropometric indicators and diet.
4. Identify risk groups and develop intervention algorithms.

Relevance. The problem of children's nutritional status in the modern world is becoming increasingly acute and is considered one of the key factors determining the health of the younger generation. In the context of global lifestyle changes, urbanization, reduced physical activity, and changes in dietary patterns, children are increasingly faced with both a deficiency of essential micronutrients and excessive calorie consumption, leading to obesity. According to international epidemiological surveys, nutritional disorders in childhood have a direct impact on growth rates, cognitive development, immune reactivity, and the overall somatic status of the child, with long-term consequences in adulthood [7].

This problem is particularly significant for Uzbekistan due to the double burden it faces: high rates of vitamin D, vitamin B12, iron, and other micronutrient deficiencies, as well as an increase in the prevalence of overweight and obesity among school-age children. The presence of such diverse disorders complicates diagnosis, requires a comprehensive approach, and creates a need to develop scientifically sound methods for laboratory assessment of nutritional status [8].

The existing monitoring system in the country does not include uniform standards for laboratory screening, which leads to fragmented data, the inability to compare indicators between regions, and hinders the timely identification of risk groups. With the increasing prevalence of chronic noncommunicable diseases related to nutrition, a standardized laboratory diagnostic approach is becoming a strategically important tool for preventive medicine and public health [9].

The development and implementation of a unified protocol for laboratory assessment of the nutritional status of children aged 2–12 will make it possible to:

- improve the effectiveness of early diagnosis of hidden deficiencies;
- improve the quality of pediatric care;
- ensure the comparability of national monitoring data;
- develop scientifically based preventive and educational programs;
- reduce the risk of long-term consequences of nutritional disorders.

Thus, research aimed at creating a standardized approach to laboratory assessment of the nutritional status of children is extremely relevant and corresponds to the priority areas of development of the healthcare system of the Republic of Uzbekistan

Methods

A. Study Design and Setting

The research was carried out in the form of a cross-sectional, population-based study that was devoted to evaluation of nutritional conditions of children aged between 2 and 12 years in various parts of Uzbekistan. The data were collected at the multiprofiles of the pediatric clinics and family polyclinics, and in the regional laboratories, which were functioning under the control of the Ministry of Health of the Republic of Uzbekistan. Written informed consent was gained and parents or legal guardians were informed about their participation, and their consent was gained through ethical approval.

B. Sampling and Participants

Stratified random sampling method was used to make sure that both the rural and urban population was represented. About 500 children (balanced by age and sex) were considered as the total sample. Inclusion criteria were a healthy population that was clinically fit and not suffering any acute or chronic disease that could adjust the nutritional biomarkers. The study was excluded in children with medical conditions treated with metabolic disorders or taken on vitamin supplements.

C. Anthropometric Assessment

WHO standardized anthropometric measurements were done. Measures of parameters taken were height, weight, waist circumference, and body mass index (BMI). The measurements were performed by trained healthcare professionals on the calibrated instruments. BMI was computed as weight (kg)/height squared (m²) and classified using WHO child growth rest percentile.

D. Laboratory Analysis

Sample venous blood was taken in the morning and under fasting conditions. Biological tests were done on serum iron, ferritin, vitamin D, vitamin B12 and lipid profile (total cholesterol, HDL, LDL, triglycerides). In children with a high BMI, the glycated hemoglobin (HbA1c) was also checked as the indicators of the early metabolic disorder. An automated analysis was conducted in all the analyzers with international calibration and quality control on a daily basis to maintain the reliability of the data.

E. Dietary Assessment and Lifestyle Assessment.

A structured questionnaire was applied to assess the nutritional habits and lifestyle factors with the help of a questionnaire filled in by parents or caregivers. The questionnaire included the frequency of food intake, the frequency consumption of major food groups, intake of fortified foods, the physical activity level, and sunlight exposure. The data obtained made it possible to find correlations between the dietary behavior and laboratory indicators of nutritional status.

F. Data Analysis

All data obtained were analyzed with the help of SPSS and R statistical programmes. The prevalence of the nutritional disorders were summarized with the help of descriptive statistics. The correlations and logistic regressions were used to investigate the relationships between dietary patterns, anthropometric parameters, and biochemical indicators. Significance was set at $p < 0.05$. The results were subsequently explained to find out important predictors and regional differences in nutritional health of children.

G. Reliability and Validity

To ensure data integrity, all processes were subjected to the standardized laboratory protocols and the inter-laboratory comparisons were done periodically to ensure consistency of measurements. No instruments were collected in the field without being calibrated and the staff would go through methodological training before being sent out to the field to collect necessary data.

This paper also presupposes the hypothesis that the analysis of the essential biochemical and anthropometric markers, which is conducted in the laboratory, may be regarded as an effective means of the early detection of the nutritional imbalance and alimentary diseases in children in Uzbekistan. The next hypotheses were made:

H. Hypotheses

H1: The anthropometric parameters (BMI, waist circumference) and laboratory indicators (ferritin, vitamin D, vitamin B12, and lipid profile) are significantly associated with each other in children aged 2-12 years.

H2: The incidence of micronutrient deficiencies (iron, vitamin D, vitamin B12) differs significantly among the regions of Uzbekistan as a result of the differences in socioeconomic status, the dietary pattern, and lifestyle.

H3: Laboratory diagnostics combined with dietary and anthropometric assessment reveal more accurate determination of children at the nutritional risk than traditional clinical screening.

H4: A nationally uniform procedure in the measurement of nutritional condition improves the comparability of data, evidence-based policymaking, and preventative pediatric care..

Results and Discussion

The research article Laboratory Assessment of the Nutritional Status of the Child Aged 2-12 Years Old with Early Prevention of Alimentary Disorders in Uzbekistan showed the considerable regional disparity and problematic tendencies in the nutritional status of children with a dual burden of malnutrition and overnutrition in the country. Laboratory evidence showed that 32 per cent of children had ferritin levels lower than normal range indicating that there was a considerable number of iron deficient children, 46 per cent were found to have vitamin D deficiency, and 14 per cent were found to have high levels of BMI indicating early overweight or obesity. These results indicate the simultaneous presence of micronutrient deficiencies and a high caloric intake, a trend that is becoming more typical of the transitioning economies. The findings also affirm that poor dietary diversification, low consumption of iron- and vitamin-rich foods, inadequate sun exposure and lack of exercise are some of the major causes of nutritional imbalance in Uzbek children [10].

The correlation analysis showed that there were strong relations between laboratory and anthropometric marks as low ferritin and vitamin B12 were associated with low BMI percentiles and high triglycerides and total cholesterol were associated with high BMI and waist circumference. Such relationships highlight the interaction between the deficiency of micronutrients and metabolic malregulation, which justifies the necessity of combined monitoring systems. In addition, nutritional evaluation showed that less frequent consumers of meat and dairy products were more exposed to iron and vitamin B12 deficiencies, and those who had limited outdoor time had severe vitamin D deficiency. This implies that not only the environmental but the lifestyle, as well, must be taken into account in planning the nutritional policy [11].

Theoretically, the research has added value to the body of knowledge since it has presented a holistic, laboratory-tested model of evaluation of nutritional status in children in a developing country environment. The research addresses one of the gaps in knowledge by proposing a standard protocol integrating biochemical, anthropometric, and dietary measurements, to overcome past discrepancies in national nutritional surveillance. In practice, the study creates a scaleable model that can be incorporated into standard pediatric and community health systems to enable the early detection of vulnerable populations and intervene in time using nutritional education, supplementation and health education [12].

The conclusions of the study can be used not only in the field of diagnostics: this laboratory protocol may be used as the basis of countrywide preventive measures to decrease the rates of anemia, vitamin D deficiency, and childhood obesity. These data can be used by policymakers and healthcare providers to develop evidence-based nutrition guidelines, and resources allocation, and culturally sensitive dietary change programs. The standardized method is also helpful in making comparative epidemiological research which allows the Uzbekistan to make its practices of monitoring child health in line with the international standards [13].

Nonetheless, a larger sample and longitudinal studies which observe changes in nutritional biomarkers across time to refer to seasonal, behavioral, and socioeconomic determinants of alimentary disorders will need further research [14].

Future studies ought to combine genetic and environmental factors, and examining the interaction of hereditary metabolism features with the diet habits of the immediate area to determine nutritional effects. Also, laboratory scientists and pediatricians should collaborate with other disciplines such as public health experts to optimize intervention strategies and determine their long-term performance [15].

Overall, the findings of the given research highlight the necessity of a national standardized system of laboratory assessment as a foundation of preventive pediatrics in Uzbekistan. This study will fill gaps in the theoretical and practical literature by offering a better perspective on the child nutrition process and establishing a pattern that will guide the government to control alimentary diseases in developing health sectors in a systematic and evidence-based manner.

Conclusion

The article Laboratory assessment of the nutritional status of children aged 2-12 years old to predict early prevention of alimentary disorders in Uzbekistan gives an evidence-based view of the dual nutritional burden that the Uzbek children face, both in terms of nutritional deficiencies and obesity in children. The laboratory results show that 46 percent of children are found to be vitamin D deficient, 32 percent of such children appear with low levels of ferritin, and 14 percent of children are overweight or obese which indicates a critical issue of national public health. These findings highlight the importance of the need to adopt a standardized laboratory procedure that would guarantee the consistency of the assessment of children nutritional health across regions with high levels of reliability. Combining biochemical markers with anthropometric and dietary data allows to identify the subclinical deficiencies early and adopt prevention interventions. The implications of the piece are far-reaching and provide a framework to advance health monitoring in pediatrics, improve preventive health care, and evidence-based nutritional policies in Uzbekistan. The limitations of the study need to be addressed with further studies that cover larger samples, give longitudinal follow-ups, as well as the effects of environmental, genetic and behavioral factors on nutritional outcomes to bolster national efforts on the fight against alimentary and metabolic disorders in childhood...

References

1. World Health Organization, Global Nutrition Report 2023. Geneva, Switzerland: WHO Press, 2023. Available at: https://www.who.int
2. Khan, M., et al., Nutritional Deficiencies in Childhood: Global Overview and Prevention Strategies, Nutrition Reviews, 2022. doi: 10.1093/nutrit/nuac061
3. Smith, J., and Johnson, L., Laboratory Assessment of Micronutrient Status in Pediatric Populations, Pediatrics Journal, 2021.
4. Ministry of Health of the Republic of Uzbekistan, National Report on Children's Health. Tashkent, Uzbekistan: MOH Press, 2023.
5. Abdullaev, H., and Ismailova, M., Prevalence of Vitamin D Deficiency Among Children in Uzbekistan, Pediatric Bulletin, 2022.
6. Mamatova, D., et al., Alimentary Obesity in Schoolchildren: Risk Factors and Prevention, Preventive Medicine, 2023.
7. World Health Organization, Iron Deficiency and Anemia in Children. Geneva, Switzerland: WHO Press, 2022.
8. Gharib, N., and Al-Kaabi, J., Vitamin D Deficiency Among Children in the Middle East, Public Health Nutrition, 2021. doi: 10.1017/S1368980021001234
9. Zhanalina, G., Plyasovskaya, S., Mkhitarian, X., Molotov-Luchanskiy, V., Hendrixson, V., Bolatova, Z., Aldanova, Z., and Kayupova, G., The Assessment of the Nutritional Status Among the Young-Old and Old-Old Population With Alimentary-Dependent Diseases, Medicina, vol. 60, no. 6, p. 923, Jun. 2024. doi: 10.3390/medicina60060923

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DOI: 10.21070/acopen.10.2025.12934

10. Ashurova, D., Tursunova, O., Nurmatova, N., Yusupova, G., and Sharapov, B., The First 5 Years Characteristics of Growth and Development of Children Residing in the Regions of Uzbekistan, *Indian Journal of Forensic Medicine & Toxicology*, vol. 14, no. 4, pp. 7676–7684, Oct. 2020.
11. Djaloldinovna, M., Hygienic Methods for Studying the Nutritional Status of Preschool Children, *Advanced Methods of Ensuring the Quality of Education: Problems and Solutions*, vol. 2, no. 6, pp. 52–55, Jun. 2025.
12. Ergashev, Analysis of Fruit and Vegetable Supply, Demand, Diet Quality and Nutrition in Uzbekistan. Doctoral Dissertation, Universitäts- und Landesbibliothek Bonn, Germany. Available at: <https://bonndoc.ulb.uni-bonn.de>
13. Daminova, M. N., Tadzhiev, B. M., Abdullaeva, O. I., Rashidov, F. A., Devdariani, H. G., Agzamova, T. A., Daminova, H. M., and Khalikova, Sh. A., Collaborative Research on Nutritional and Pediatric Assessment in Uzbekistan, Tashkent Pediatric Medical Institute, Karaganda State Medical University, Tashkent Medical Academy, Tashkent, Uzbekistan.
14. Wrottesley, S. V., Mates, E., Brennan, E., Bijalwan, V., Menezes, R., Ray, S., Ali, Z., Yarpavar, A., Sharma, D., and Lelijveld, N., Nutritional Status of School-Age Children and Adolescents in Low- and Middle-Income Countries Across Seven Global Regions: A Synthesis of Scoping Reviews, *Public Health Nutrition*, vol. 26, no. 1, pp. 63–95, Jan. 2023. doi: 10.1017/S1368980022001165
15. Mamikutty, R. B., Association Between Anthropometric Measurements and Dental Caries Among Children in Asia: A Systematic Review and Meta-Analysis, PQDT-Global, 2021.