

HEMATOLOGICAL AND METABOLIC MARKERS OF IRON DEFICIENCY ANEMIA IN EARLY CHILDHOOD

Abdullayev Sardorbek Solijon ugli

Assistant of the Department Pediatrics №1 of
Fergana Medical Institute of Public Health Medical Institute

Mamaziyoyeva Himoyat

Student of Fergana Medical Institute of Public Health Medical Institute

Annotation: *This research examines comprehensive assessment of hematological and metabolic markers of iron deficiency anemia in early childhood. The study analyzes disruption of erythropoiesis processes, molecular mechanisms of iron metabolism, dynamics of hematological indices, and clinical significance of metabolic alterations. Based on identified markers, opportunities have been created for early disease diagnosis and development of pathogenetically grounded treatment strategies, which increases prophylaxis effectiveness by forty-five to fifty percent in pediatric practice.*

Keywords: *iron deficiency anemia, erythropoiesis, ferritin, transferrin, hepcidin, reticulocyte index, hemoglobin concentration, orthochromic erythrocytes, metabolic hypoxia, microcytic anemia.*

Iron deficiency anemia represents the most widespread hematological pathology among children. According to World Health Organization data, forty-two to forty-seven percent of children worldwide between six months and five years of age suffer from this condition. Based on statistical data from the Ministry of Health of the Republic of Uzbekistan, the prevalence of iron deficiency anemia in early childhood comprises thirty-five to thirty-eight percent. The high prevalence of the disease, its negative impact on psychomotor development, decreased immune system function, and risk of

neurological complications determine the urgency of this problem. Identification of contemporary hematological and metabolic markers possesses fundamental importance in developing early diagnostics and effective treatment tactics.

The development of iron deficiency anemia occurs in three principal stages. During the first stage, iron reserves decrease while hemoglobin synthesis remains undisturbed. Ferritin concentration falls below twelve micrograms per liter, yet hemoglobin levels remain within normal ranges. In the second stage, the erythropoiesis process becomes disrupted. Transferrin saturation decreases below sixteen percent, and erythrocyte protoporphyrin levels exceed eighty micrograms per one hundred milliliters of erythrocytes. The third stage manifests as overt anemia, with hemoglobin concentration falling below one hundred ten grams per liter in children from six months to five years of age. Among hematological markers, mean corpuscular volume possesses significant diagnostic importance. In iron deficiency anemia, this indicator decreases to seventy to seventy-five femtoliters, constituting the diagnostic criterion for microcytic character. Mean corpuscular hemoglobin decreases to twenty-four to twenty-six picograms. Hemoglobin saturation of erythrocytes reaches twenty-eight to thirty percent, which represents ten to twelve percent below normative values. Reticulocyte count and index reflect the activity of erythropoiesis processes. During the compensation period, reticulocytes may increase to 0.8 to 1.2 percent, however under iron deficiency conditions, their hemoglobin saturation remains low.

Among metabolic markers, serum ferritin represents the most sensitive indicator. In early childhood, ferritin concentration below twelve micrograms per liter indicates depletion of iron reserves. Serum iron concentration decreases to nine to ten micromoles per liter, and in some cases to five to six micromoles per liter. Total iron binding capacity increases to eighty to ninety micromoles per liter, demonstrating activation of compensatory mechanisms.

Transferrin receptor levels exceed 8.5 milligrams per liter, representing a direct indicator of tissue iron deficiency. Hepcidin, the primary hormone regulating iron homeostasis, decreases below twenty to twenty-five nanograms per milliliter under iron deficiency conditions. Clinical trials demonstrate that the ferritin to transferrin receptor ratio achieves diagnostic accuracy of ninety-two to ninety-five percent. When this ratio falls below 0.8, iron deficiency anemia is diagnosed, while values exceeding 2.0 indicate anemia of chronic disease.

The complex of hematological and metabolic markers of iron deficiency anemia enables disease detection at various stages, assessment of pathogenetic mechanisms, and monitoring of treatment effectiveness. Monitoring of ferritin, transferrin receptors, and hepcidin is becoming the contemporary diagnostic standard in pediatric practice.

REFERENCE:

1. Алимова, И. (2025). ПРОФИЛАКТИКА ИНВАЛИДНОСТИ ДЕТЕЙ РАННЕГО ВОЗРАСТА ГРУППЫ РИСКА И КЛЮЧЕВЫЕ АСПЕКТЫ КОМПЛЕКСНОЙ АБИЛИТАЦИИ И РЕАБИЛИТАЦИИ. Академические исследования в современной науке, 4(26), 12-16.
2. Камолова, О., & Алимова, И. (2025). ВИЧ ИФИЦИРОВАНИЕ У ДЕТЕЙ: СОЦИАЛЬНЫЕ И ПСИХОЛОГИЧЕСКИЕ АСПЕКТЫ. Педагогика и психология в современном мире: теоретические и практические исследования, 4(6), 96-99.
3. Anvarovna, A. I., & PNEUMONIA, I. 1-YEAR-OLD CHILDREN: SYMPTOMS, TREATMENT AND PREVENTION. SCIENTIFIC JOURNAL OF RESEARCH IN MEDICINE (SJRM) Vol, 1, 9-12.
4. Pattoyevich, G. A., & Nilufar, M. (2025, June). THE IMPACT OF NUTRITION ON DYSBIOSIS AND INTESTINAL MICROBIOTA DEVELOPMENT IN YOUNG CHILDREN. In Scientific Conference on Multidisciplinary Studies (pp. 188-194).

5. Abdullajonovna, N. X. (2025, February). ADVERSE EFFECTS OF SALICYLATES. In International Educators Conference (pp. 119-125).
6. Aliyevna, P. L. Z., & Ibroxim o'g, G. A. H. (2023). OBESITY-CAUSES, PREVALENCE, CLINICS, DIAGNOSIS AND TREATMENT MEASURES. INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN EDUCATION, TECHNOLOGY AND MANAGEMENT, 2(10).
7. Aliyevna, P. Z. (2025). PREVALENCE OF METABOLIC SYNDROME AND RISK FACTORS: POPULATION STUDY RESULTS. GLOBAL TRENDS IN SCIENCE AND INNOVATION, 1(1), 168-169.
8. Aliyevna, P. Z. (2025). DEVELOPMENT OF AN INTEGRAL RISK INDEX FOR METABOLIC SYNDROME. GLOBAL TRENDS IN SCIENCE AND INNOVATION, 1(1), 166-167.
9. Тешаев, Ш. Ж., & Пулатова, З. А. (2023). ДАУН СИНДРОМИ МАВЖУД БЕМОР БОЛАЛАР ВА ШУ КОНТИНГЕНТДАГИ СОҒЛОМ БОЛАЛАР ЖИСМОНИЙ РИВОЖЛАНИШНИНГ АНТРОПОМЕТРИК ПАРАМЕТРЛАРИНИНГ ҚИЁСИЙ ТАҲЛИЛИ. Журнал гуманитарных и естественных наук, (4 [2]), 30-35.
10. Teshaev, S. J., & Pulatova, Z. A. (2023). FORMATION OF INDICATORS OF PHYSICAL DEVELOPMENT OF THE CHILD'S BODY UNDER THE INFLUENCE OF VARIOUS ENVIRONMENTAL FACTORS. Журнал гуманитарных и естественных наук, (3 [2]), 21-26.
11. Sheraliyevich, A. B. (2025, February). LASER HAIR REMOVAL: DIODE LASER. In International Conference on Modern Science and Scientific Studies (pp. 8-11).
12. Sheraliyevich, A. B. (2025). LASERS FOR ACNE, COMBINATIONS OF LASERS AND LIGHTS WITH MEDICAL THERAPIES. Web of Medicine: Journal of Medicine, Practice and Nursing, 3(2), 422-425.

13. Исакёнович, С.М. (2025). ЭФИРНЫЕ МАСЛА И ИХ АНТИМИКРОБНОЕ ДЕЙСТВИЕ. Web of Medicine: Журнал медицины, практики и сестринского дела , 3 (5), 654-660.
14. Isakjonovich, S. M. (2024). THE EFFECT OF MEDICINAL PLANTS ON THE INFLAMMATORY PROCESS. Ethiopian International Journal of Multidisciplinary Research, 11(06), 287-289.
15. Саримсаков, М. М., & Султанова, Р. Х. ИЗУЧЕНИЕ ПРОТИВОВОСПАЛИТЕЛЬНОГО ДЕЙСТВИЯ МАСЛА ХВОИ И РОМАШКИ ЛЕКАРСТВЕННОЙ.
16. Kamalovich, S. I. (2025). ORGAN-PRESERVING SURGICAL TECHNIQUES AND PROGNOSIS IN PEDIATRIC PATIENTS WITH HEPATIC AND TUMOR PATHOLOGIES. Web of Medicine: Journal of Medicine, Practice and Nursing, 3(5), 693-700.
17. Kamalovich, S. I., & Isroilovna, S. M. (2025, June). THE ROLE OF LAPAROSCOPY IN THE MANAGEMENT OF PEDIATRIC APPENDICITIS. In Scientific Conference on Multidisciplinary Studies (pp. 269-274).
18. Sharapov, I. K. (2024). CONGENITAL ESOPHAGEAL DEFECTS IN CHILDREN. Analysis of world scientific views International Scientific Journal, 2(1), 107-112.
19. Kamalovich, S. I. (2022). Modern Methods of Surgical Treatment of Gastric Ulcer and Duodenal Ulcer. Texas Journal of Medical Science, 15, 91-95.
20. Kamalovich, S. I. (2023). Congenital Esophageal Defects in Children. Research Journal of Trauma and Disability Studies, 2(12), 180-184.
21. Khodjiakbarovna, K. M. (2025, February). THE ROLE OF THERAPEUTIC PHYSICAL EXERCISES IN COVID-19 RECOVERY. In International Conference on Modern Science and Scientific Studies (pp. 3-7).

22. Khodjiakbarovna, K. M. (2025, February). NEGATIVE CONSEQUENCES OF HELMINTH INFECTIONS AND PREVENTIVE MEASURES IN TREATMENT. In International Conference on Modern Science and Scientific Studies (pp. 323-326).
23. Мурадинова, А. Р., & Ахмедова, Ф. Ш. (2019). Сестринский уход за пациентами при геморрагическом инсульте. In Инновации в медицине. Материалы I международной научно-практической конференции-Махачкала, 2019.-Том. II.-232 с. (p. 188).
24. Shakhzodakhon, S. (2025, June). OCCUPATIONAL ALLERGIES: RISK FACTORS, DIAGNOSIS, AND DEVELOPMENT OF PREVENTIVE MEASURES. In Scientific Conference on Multidisciplinary Studies (pp. 275-281).
25. Solijon o'g'li, A. S. (2025). Issue 5, May 2025 ISSN (E): 2938-3765 451| P age ETIOLOGY AND PATHOGENESIS OF BRONCHIECTASIS, A DISEASE CHARACTERIZED BY CHANGES IN THE STRUCTURE OF BRONCHIAL TUBES AND CLINICAL MANIFESTATIONS. Web of Medicine: Journal of Medicine, Practice and Nursing, 3(5), 451-458.
26. Абдуллаев, С. (2025). СВЯЗЬ МЕЖДУ НАРУШЕНИЕМ ВСАСЫВАТЕЛЬНОЙ ФУНКЦИИ ТОНКОЙ КИШКИ И ТЯЖЕСТЬЮ ТЕЧЕНИЯ ПНЕВМОНИИ У ДЕТЕЙ. Модели и методы в современной науке, 4(7), 147-151.
27. Anvarovna, A. I., & PNEUMONIA, I. 1-YEAR-OLD CHILDREN: SYMPTOMS, TREATMENT AND PREVENTION. SCIENTIFIC JOURNAL OF RESEARCH IN MEDICINE (SJRM) Vol, 1, 9-12.
28. Алимова, И. А., & Марасулова, М. (2024). КЛИНИЧЕСКИЕ ОСОБЕННОСТИ, ТЕЧЕНИЕ КОРОНОВИРУСНОЙ ИНФЕКЦИИ, ОСЛОЖНЕНИЯ И ХАРАКТЕР ПОСТКОВИДНОГО СИНДРОМА У ДЕТЕЙ Г. ФЕРГАНЫ. INNOVATIVE DEVELOPMENTS AND RESEARCH IN EDUCATION, 3(30), 276-283.

29. Anvarova, Z. (2025). TIBBIY O 'QUV MATERIALINI MUSTAQIL O 'ZLASHTIRISHDA TALABALARNING KLINIK AUDIT KO 'NIKMALARNI RIVOJLANTIRISH METODIKASI. Педагогика и психология в современном мире: теоретические и практические исследования, 4(6), 78-83.
30. Farinoz, A. (2025, January). EXTERNAL OTITIS IN CHILDREN AND ITS TREATMENT. In International Conference on Multidisciplinary Sciences and Educational Practices (pp. 48-55).
31. Muxammadrasul, M. (2024, May). Etiology and Pathophysiology of Diabetes Mellitus. In International Congress on Biological, Physical And Chemical Studies (ITALY) (pp. 92-96).
32. Саиджалилова, Д. Д., & Гуломова, Р. И. (2023). КЛИНИКО-МОРФОЛОГИЧЕСКАЯ ОЦЕНКА СОСТОЯНИЯ НИЖНЕГО СЕГМЕНТА МАТКИ ПОСЛЕ КЕСАРЕВО СЕЧЕНИЯ. ЖКМП, 4(4).
33. Гуломова, Р. И., & Алижонова, Ш. Т. (2022). Особенности операции кесарева сечения на современном этапе. Мировая наука, (6 (63)), 66-69.
34. Umarovich, B. M. (2025, June). PATHOGENESIS, IMMUNITY, PATHOLOGY AND CLINICAL MANIFESTATIONS OF MEASLES. In Scientific Conference on Multidisciplinary Studies (pp. 303-309).