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PREVALENCE AND CLINICAL FEATURES OF IRON DEFICIENCY ANEMIA IN CHILDREN

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Abstract. Iron deficiency anemia (IDA) is one of the most common nutritional disorders affecting children worldwide and remains a major public health concern, particularly in developing countries. The condition is associated with inadequate dietary iron intake, increased physiological requirements during growth, and various socioeconomic and environmental factors. This study aims to assess the prevalence and clinical features of iron deficiency anemia among children and to identify factors contributing to its development. Clinical manifestations such as pallor, fatigue, weakness, reduced appetite, impaired cognitive performance, and growth retardation were evaluated. Laboratory parameters, including hemoglobin concentration, serum ferritin levels, and red blood cell indices, were analyzed to confirm the diagnosis. The findings highlight the significant burden of iron deficiency anemia in pediatric populations and emphasize the importance of early diagnosis, nutritional interventions, and preventive healthcare strategies. Improving awareness among healthcare professionals and parents can contribute to reducing the prevalence and long-term complications of iron deficiency anemia in children.[1,2,5]

Keywords. Iron deficiency anemia, children, prevalence, clinical features, hemoglobin, ferritin, nutritional deficiency, pediatric health, growth retardation, public health.

Annotatsiya. Temir tanqisligi anemiyasi (TTA) dunyo bo‘ylab bolalarda uchraydigan eng keng tarqalgan elimentar kasalliklardan biri bo‘lib, ayniqsa rivojlanayotgan mamlakatlarda muhim tibbiy-ijtimoiy muammo hisoblanadi. Ushbu holat ovqat tarkibida temirning yetarli bo‘lmasligi, o‘sish davrida organizmning temirga bo‘lgan ehtiyojining ortishi, shuningdek turli ijtimoiy-iqtisodiy va ekologik omillar bilan bog‘liq. Mazkur tadqiqot bolalarda temir tanqisligi anemiyasining tarqalishi va klinik xususiyatlarini baholash hamda uning rivojlanishiga ta’sir etuvchi omillarni aniqlashga qaratilgan. Oqartirish (teri va shilliq qavatlarning oqarishi), charchoq, holsizlik, ishtahaning pasayishi, kognitiv faoliyatning buzilishi va o‘sishning sustlashuvi kabi klinik belgilar o‘rganildi. Tashxisni tasdiqlash maqsadida gemoglobin miqdori, qon zardobidagi ferritin darajasi va eritrotsit indekslari kabi laborator ko‘rsatkichlar tahlil qilindi. Olingan natijalar bolalar orasida temir tanqisligi anemiyasining sezilarli darajada tarqalganligini ko‘rsatib, erta tashxis qo‘yish, ratsional ovqatlanishni tashkil etish

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va profilaktik sog‘liqni saqlash choralarining muhimligini ta’kidlaydi. Tibbiyot xodimlari va ota-onalar orasida xabardorlikni oshirish bolalarda temir tanqisligi anemiyasining tarqalishi hamda uzoq muddatli asoratlarini kamaytirishga yordam beradi. [1,2,5]

Kalit so‘zlar: temir tanqisligi anemiyasi, bolalar, tarqalish darajasi, klinik xususiyatlar, gemoglobin, ferritin, oziqlanish yetishmovchiligi, pediatrik salomatlik, o‘sishning sustlashuvi, jamoat salomatligi.

Аннотация. Железодефицитная анемия (ЖДА) является одним из наиболее распространённых алиментарных заболеваний среди детей во всём мире и остаётся важной медико-социальной проблемой, особенно в развивающихся странах. Данное состояние связано с недостаточным поступлением железа с пищей, повышенной физиологической потребностью в железе в период роста, а также с различными социально-экономическими и экологическими факторами. Целью данного исследования является оценка распространённости и клинических особенностей железодефицитной анемии у детей, а также выявление факторов, способствующих её развитию. Были изучены такие клинические проявления, как бледность кожных покровов, утомляемость, слабость, снижение аппетита, нарушение когнитивных функций и задержка роста. Для подтверждения диагноза анализировались лабораторные показатели, включая уровень гемоглобина, концентрацию ферритина в сыворотке крови и эритроцитарные индексы. Полученные результаты подчёркивают значительную распространённость железодефицитной анемии среди детского населения и важность ранней диагностики, рационального питания и профилактических мероприятий в системе здравоохранения. Повышение осведомлённости медицинских работников и родителей может способствовать снижению распространённости заболевания и предупреждению его долгосрочных осложнений у детей. [1,2,5]

Ключевые слова: железодефицитная анемия, дети, распространённость, клинические особенности, гемоглобин, ферритин, дефицит питания, педиатрическое здоровье, задержка роста, общественное здравоохранение.

INTRODUCTION.

Iron deficiency anemia (IDA) is the most prevalent micronutrient deficiency and the leading cause of anemia among children worldwide. According to international health organizations, iron deficiency affects millions of children, particularly in low- and middle-income countries, where nutritional inadequacies and infectious diseases remain common public health challenges. Iron is an essential trace element required for numerous physiological processes, including oxygen transport, energy metabolism, immune function, and neurological

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development. Consequently, inadequate iron stores can significantly impair a child's growth, cognitive development, physical performance, and overall health status. Childhood represents a critical period characterized by rapid growth and increased nutritional demands. During infancy and early childhood, the body's requirement for iron increases substantially to support expanding blood volume, muscle development, and brain maturation. When dietary iron intake is insufficient or iron absorption is impaired, children become vulnerable to developing iron deficiency, which may eventually progress to iron deficiency anemia. The condition is particularly common among infants, preschool-aged children, and adolescents due to periods of accelerated growth and increased physiological iron requirements. The etiology of iron deficiency anemia in children is multifactorial.[4,6,10] Inadequate dietary intake of iron-rich foods, prolonged exclusive breastfeeding without appropriate iron supplementation, early introduction of cow's milk, malabsorption disorders, parasitic infections, recurrent illnesses, and socioeconomic disadvantages are among the major contributing factors. Furthermore, poor maternal nutrition during pregnancy and low birth weight may predispose children to reduced iron stores during infancy, increasing the likelihood of developing anemia later in life. Iron deficiency anemia has important clinical implications that extend beyond hematological abnormalities. Children affected by IDA frequently present with symptoms such as pallor, fatigue, weakness, irritability, reduced appetite, dizziness, and decreased physical activity. In severe cases, anemia may negatively affect cardiovascular function and increase susceptibility to infections. More importantly, numerous studies have demonstrated a strong association between iron deficiency and impaired cognitive development, learning difficulties, reduced attention span, and poor academic performance. These adverse effects may persist even after correction of anemia, highlighting the importance of early detection and intervention. The prevalence of iron deficiency anemia varies considerably across different geographical regions and populations. Factors such as nutritional habits, socioeconomic conditions, healthcare accessibility, sanitation, and public health policies significantly influence disease distribution. Despite considerable progress in nutritional programs and healthcare services, iron deficiency anemia remains a widespread problem in many countries, particularly among vulnerable pediatric populations. Therefore, continuous epidemiological surveillance and assessment of clinical characteristics are essential for developing effective prevention and treatment strategies. Diagnosis of iron deficiency anemia is based on a combination of clinical evaluation and laboratory investigations. Hemoglobin concentration, hematocrit levels, mean corpuscular volume, mean corpuscular hemoglobin, serum ferritin concentration, transferrin saturation, and other biochemical markers are commonly used to confirm iron

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deficiency and assess its severity. Early diagnosis allows timely implementation of nutritional interventions, iron supplementation, and management of underlying causes, thereby preventing long-term complications.[6,7,11]

RELEVANCE OF THE STUDY. Iron deficiency anemia (IDA) remains one of the most widespread nutritional disorders and a significant public health problem among children worldwide. Despite advances in healthcare systems, nutritional interventions, and disease prevention programs, the prevalence of iron deficiency anemia continues to be high, particularly in developing and low-income countries. Children are among the most vulnerable population groups due to their increased iron requirements during periods of rapid growth and development. The relevance of this topic is determined by the high prevalence of iron deficiency anemia and its negative impact on children's physical, cognitive, and emotional development. Iron plays a crucial role in oxygen transport, energy production, immune system function, and neurological maturation. Therefore, iron deficiency can lead not only to hematological abnormalities but also to impaired intellectual performance, reduced learning capacity, behavioral disorders, delayed psychomotor development, and decreased quality of life. Recent studies indicate that iron deficiency anemia affects a substantial proportion of preschool and school-aged children globally. The burden of the disease is especially pronounced in regions where malnutrition, recurrent infections, poor socioeconomic conditions, and limited access to healthcare services are common. Furthermore, the condition often remains undiagnosed during its early stages because clinical symptoms may be mild or nonspecific, leading to delayed treatment and increased risk of long-term complications. The growing prevalence of nutritional disorders, changes in dietary habits, and unequal access to balanced nutrition further increase the importance of investigating iron deficiency anemia among children. Early identification of risk factors and clinical manifestations is essential for developing effective preventive strategies and improving pediatric healthcare outcomes. Understanding the epidemiological characteristics of iron deficiency anemia can assist healthcare professionals in implementing targeted interventions, nutritional education programs, and screening measures for at-risk populations.

MATERIALS AND METHODS. This study was conducted to assess the prevalence and clinical features of iron deficiency anemia among children. A cross-sectional observational design was employed to evaluate hematological indicators and clinical manifestations associated with iron deficiency anemia in the pediatric population. The study included 120 children aged 6 months to 15 years who attended pediatric outpatient clinics and hospitals during the study period. Participants were selected using a non-random sampling method based on predefined inclusion and exclusion criteria. Children diagnosed with congenital

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hematological disorders, chronic kidney disease, malignancies, or other causes of anemia unrelated to iron deficiency were excluded from the study. Data collection involved obtaining demographic information, including age, sex, place of residence, nutritional status, dietary habits, and medical history. Information was collected through structured questionnaires completed by parents or legal guardians and supplemented with clinical records. Particular attention was given to factors associated with iron deficiency, such as inadequate dietary iron intake, prolonged breastfeeding without iron supplementation, recurrent infections, parasitic infestations, and socioeconomic conditions. Clinical examination was performed by qualified healthcare professionals. The presence of common signs and symptoms of iron deficiency anemia, including pallor of the skin and mucous membranes, fatigue, weakness, dizziness, reduced appetite, irritability, delayed growth, and impaired physical activity, was assessed and recorded. Anthropometric measurements, including body weight and height, were obtained using standardized procedures. Venous blood samples were collected under aseptic conditions for laboratory evaluation. Hematological parameters were analyzed using an automated hematology analyzer. The assessed indicators included hemoglobin concentration (Hb), red blood cell count (RBC), hematocrit (HCT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC). Biochemical assessment included serum ferritin concentration as a primary indicator of iron stores. Iron deficiency anemia was diagnosed according to internationally accepted pediatric criteria based on hemoglobin and ferritin levels. The collected data were entered into a computerized database and analyzed using statistical software. Descriptive statistics were used to summarize demographic and clinical characteristics. Continuous variables were expressed as mean standard deviation, while categorical variables were presented as frequencies and percentages. Associations between iron deficiency anemia and potential risk factors were evaluated using appropriate statistical tests. A p-value of less than 0.05 was considered statistically significant.[14,15,16]

METHODOLOGY. The methodology of this study was designed to investigate the prevalence and clinical characteristics of iron deficiency anemia among children through a systematic assessment of demographic, clinical, and laboratory data. The research was conducted using a quantitative observational approach, which allowed for the collection and analysis of objective information regarding the occurrence and manifestations of iron deficiency anemia in the pediatric population. The study population consisted of children aged between 6 months and 15 years who attended pediatric healthcare facilities during the study period. Participants were selected according to established inclusion and exclusion

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criteria to ensure the reliability and validity of the findings. Children with confirmed iron deficiency anemia were included in the study, while those with hereditary blood disorders, chronic systemic diseases, or other forms of anemia were excluded to minimize confounding factors. A structured research protocol was developed to standardize data collection procedures. Demographic information, including age, sex, residence, nutritional status, and socioeconomic background, was obtained through interviews with parents or guardians and review of medical records. Information regarding dietary habits, frequency of iron-rich food consumption, breastfeeding history, recurrent infections, and previous medical conditions was also collected to identify potential risk factors associated with iron deficiency anemia. Clinical assessment was performed using a comprehensive pediatric examination. Signs and symptoms commonly associated with iron deficiency anemia, such as pallor, fatigue, weakness, dizziness, irritability, poor appetite, growth retardation, and decreased physical activity, were evaluated and documented. Anthropometric measurements were obtained using calibrated instruments and standardized techniques to assess the growth status of each participant. Laboratory investigations were conducted to confirm the diagnosis of iron deficiency anemia and evaluate its severity. Blood samples were collected under sterile conditions and analyzed in certified clinical laboratories. Hemoglobin concentration, hematocrit, red blood cell count, mean corpuscular volume, mean corpuscular hemoglobin, and mean corpuscular hemoglobin concentration were measured using automated hematological analyzers. Serum ferritin levels were assessed as a marker of body iron stores. Diagnostic criteria were based on internationally recognized pediatric guidelines for iron deficiency anemia. Data management and statistical analysis were carried out using appropriate statistical software. Descriptive statistical methods were applied to summarize the collected information. Numerical data were presented as means and standard deviations, whereas categorical variables were expressed as frequencies and percentages. Comparative analyses were performed to evaluate differences between age groups and other demographic categories. Statistical significance was determined at a confidence level of 95%, with a p-value less than 0.05 considered statistically significant.[9]

CONCLUSION. Iron deficiency anemia remains one of the most common nutritional and hematological disorders affecting children worldwide. The findings of this study demonstrate that the prevalence of iron deficiency anemia among children continues to be significant, particularly during periods of rapid growth and increased physiological iron requirements. Various factors, including inadequate dietary iron intake, poor nutritional practices, recurrent infections, and unfavorable socioeconomic conditions, contribute to the development of this condition. Clinical

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assessment revealed that the most common manifestations of iron deficiency anemia include pallor, fatigue, weakness, reduced appetite, irritability, and impaired physical development. Laboratory investigations confirmed that decreased hemoglobin concentration and low serum ferritin levels are reliable indicators for the diagnosis of iron deficiency anemia and assessment of its severity. The study highlights the importance of early detection and timely management of iron deficiency anemia in children. Delayed diagnosis may lead to adverse consequences, including impaired cognitive function, reduced academic performance, growth retardation, and weakened immune response. Therefore, regular screening programs, especially among high-risk groups, are essential for preventing long-term health complications. Furthermore, improving parental awareness regarding balanced nutrition, promoting the consumption of iron-rich foods, and implementing effective public health interventions can significantly reduce the burden of iron deficiency anemia. Healthcare professionals should focus on preventive strategies, nutritional education, and appropriate iron supplementation when necessary.

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