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# Early Childhood Nutritional Imbalance: Interrelation Of Anemia And Overweight And Evidence-Based Preventive Approaches

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**Abstract**
Anemia and overweight represent a growing double burden of malnutrition among preschool children worldwide. Iron-deficiency anemia remains highly prevalent due to insufficient intake of micronutrients, while overweight is increasing as a result of high-calorie, nutrient-poor diets and reduced physical activity. Despite appearing metabolically opposite, both conditions frequently coexist, leading to impaired growth, reduced cognitive performance, and long-term metabolic complications.
**Objective.** To analyze the nutritional, metabolic, and behavioral determinants of anemia and overweight in preschool children and to identify effective evidence-based preventive strategies with emphasis on the role of nursing professionals.
**Methods.** A systematic literature review was conducted using PubMed, Scopus, Web of Science, ScienceDirect, WHO Library, and national Uzbek medical databases, covering studies published between 2015 and 2024. A total of 87 publications were screened, and 42 met inclusion criteria. Evidence was synthesized according to PRISMA guidelines.
**Results.** The review revealed that iron deficiency, low dietary diversity, and inadequate micronutrient intake are the leading contributors to anemia, while overweight is mainly associated with excessive consumption of calorie-dense foods, increased screen time, and insufficient physical activity. Multiple studies confirmed the coexistence of both conditions in the same child, driven by poor-quality diets and inflammation-mediated impairment of iron absorption. Nurse-led educational and screening programs demonstrated high effectiveness in reducing both anemia and overweight rates.
**Conclusion.** Anemia and overweight in preschool children are interconnected conditions arising from shared modifiable risk factors. Early screening, nutritional education, balanced diets, increased physical activity, and active involvement of nursing professionals are essential for effective prevention. Comprehensive, community-based strategies can significantly improve childhood health outcomes and ensure long-term well-being.

**Keywords.** preschool children; anemia; overweight; micronutrient deficiency; early nutrition; prevention; nursing interventions; child health.

**Introduction.** Early childhood (ages 1–5 years) represents a biologically sensitive period during which rapid physical growth, neurocognitive maturation, and immunological development occur. Any disturbances in nutrition during this stage may have long-term consequences for metabolic health, learning abilities, and overall well-being. In recent years, both globally and in Uzbekistan, the simultaneous growth of anemia and overweight among preschool children has become an urgent public health issue.
According to WHO and UNICEF data (2016–2024), iron-deficiency anemia remains the most prevalent micronutrient deficiency worldwide, affecting approximately 42% of children under five. Meanwhile, early childhood overweight has increased by nearly 30% over the last decade, driven by urbanization, increased access to ultra-processed foods, and reduced outdoor activities. Despite representing opposite nutritional spectrums, anemia and overweight frequently coexist, creating a double burden of malnutrition, especially in developing countries [12].
In the context of Uzbekistan, national pediatric surveys conducted between 2018 and 2024 reveal similar trends. Although the country has made progress in maternal-child health indicators, preschool children continue to face dietary imbalances characterized by insufficient intake of iron-rich foods and excessive

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consumption of high-calorie, nutrient-poor products. This combination not only leads to iron-deficiency anemia but also contributes to early adiposity and metabolic dysregulation.

The coexistence of these two conditions enhances the risk of impaired cognitive development, recurrent infections, decreased physical performance, hormonal dysregulation, and later childhood noncommunicable diseases such as insulin resistance and obesity. Therefore, understanding the interrelation between anemia and overweight, along with identifying modifiable risk factors, is essential for developing comprehensive preventive strategies.

This article presents an evidence-based analysis of the etiological mechanisms, dietary patterns, and behavioral determinants of anemia and overweight in preschool children and highlights effective preventive approaches with a special emphasis on the role of nursing professionals.

**Purpose of the Study.** The purpose of this study is to analyze the key nutritional, metabolic, and behavioral factors contributing to anemia and overweight in preschool children and to identify effective evidence-based preventive strategies. The research focuses on evaluating dietary patterns, micronutrient deficiencies, lifestyle habits, and early screening practices, while emphasizing the important role of nursing professionals in prevention, parental education, and health promotion during early childhood.

**Materials and Methods.** This study was conducted in the form of a systematic literature review aimed at identifying the nutritional, metabolic, and behavioral determinants of anemia and overweight among preschool children. The search strategy covered publications released between 2015 and 2024, utilizing major international scientific databases including PubMed, Scopus, Web of Science, ScienceDirect, and the WHO Global Health Library, as well as authoritative national medical journals and academic repositories within Uzbekistan. Studies were included if they focused on children aged 1–5 years and provided relevant data on iron-deficiency anemia, overweight, dietary patterns, micronutrient status, lifestyle behaviors, or preventive interventions. A total of 87 articles were initially identified; after screening titles, abstracts, and full texts based on relevance and methodological credibility, 42 publications meeting the inclusion criteria were selected for detailed analysis.

The selected studies consisted of original clinical research, cohort studies, randomized controlled trials, systematic reviews, and meta-analyses addressing early childhood nutrition. Key variables extracted from the literature included hemoglobin and ferritin levels, iron and vitamin intake, BMI-for-age percentiles, patterns of food consumption, screen time, physical activity levels, and the outcomes of nutritional or behavioral prevention programs. Special attention was given to studies evaluating the quality of preschool nutrition, parental feeding practices, and the role of healthcare providers—especially nursing professionals—in early screening and preventive education. To ensure transparency and methodological rigor, the review process followed PRISMA guidelines, allowing for structured selection, assessment of evidence, and synthesis of findings across diverse study designs.

**Results.** The analysis of the selected studies revealed that anemia and overweight remain among the most prevalent nutritional disorders affecting preschool children, representing a growing double burden of malnutrition. Iron-deficiency anemia was identified as the leading form, accounting for more than half of all cases, and was frequently associated with inadequate consumption of iron-rich foods, low dietary diversity, prolonged reliance on milk-based diets, and deficiencies in essential micronutrients such as folate and vitamin B12. Several studies demonstrated that gastrointestinal infections, parasitic diseases, and maternal anemia during pregnancy significantly contribute to reduced iron stores in young children. Concurrently, the review confirmed a steady rise in overweight and early-onset obesity, primarily driven by excessive caloric intake stemming from high consumption of sugary drinks, processed snacks, fast foods, and energy-dense yet nutrient-poor meals, alongside insufficient physical activity and increased screen time exceeding recommended limits.

Importantly, multiple investigations highlighted the coexistence of anemia and overweight within the same child, a phenomenon indicative of profound dietary imbalance. This paradoxical combination was linked to consumption patterns dominated by simple carbohydrates and low micronutrient density, which contribute simultaneously to rapid fat accumulation and impaired iron absorption. Biological mechanisms such as chronic low-grade inflammation and elevated hepcidin levels were shown to reduce iron bioavailability, while decreased outdoor activity and limited sun exposure further aggravated metabolic dysregulation. Emotional

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feeding behaviors, irregular meal patterns, and inadequate parental knowledge about healthy nutrition were also identified as significant contributors to both conditions.

The findings across the analyzed studies emphasized that early identification of at-risk children through regular screening programs, particularly in kindergartens and primary healthcare settings, substantially improves prevention outcomes. Measurements such as hemoglobin and ferritin levels, BMI-for-age percentiles, and dietary behavior assessments were shown to be effective tools for detecting nutritional disorders at an early stage. Furthermore, the literature underscored the critical role of healthcare personnel—especially pediatric nurses—in educating parents, promoting balanced dietary habits, guiding micronutrient supplementation, and implementing comprehensive preventive interventions within preschool institutions. Programs integrating parental engagement, structured nutritional guidelines, and active lifestyle promotion demonstrated the most consistent positive outcomes, reducing both anemia prevalence and childhood overweight rates.

**Discussion.** The findings of this review align with a wide body of international research demonstrating that anemia and overweight in preschool children share common nutritional, metabolic, and behavioral determinants despite representing opposite ends of the malnutrition spectrum. According to WHO (2016, 2020, 2023) and UNICEF (2019, 2022) [9] global nutritional reports, iron-deficiency anemia remains a major public health problem affecting cognitive development, immune competence, and long-term physical growth. Similar conclusions were drawn by McLean et al. (2017) [5] and Pasricha et al. (2021) [7], who emphasized that insufficient intake of iron-rich foods and low dietary diversity remain the main etiological factors for anemia in early childhood. These results correspond with the work of Lopez et al. (2019) [4], who reported that young children are particularly vulnerable to micronutrient deficiencies due to rapid growth and limited dietary variety.

At the same time, rising overweight prevalence among preschoolers has been documented by WHO European Childhood Obesity Surveillance Initiative (COSI, 2020) [11], the CDC (2018–2022), and studies by Nishtar et al. (2020), all demonstrating that energy-dense and nutrient-poor dietary patterns, combined with low physical activity and increased screen time, form the basis of early adiposity. Several researchers, including Wang & Lim (2019) and Kachur et al. (2022), highlight that early childhood overweight significantly increases the risk of future metabolic syndrome, insulin resistance, and cardiovascular abnormalities [10].

An important aspect of the present analysis is the confirmation of the "double burden of malnutrition," a concept described in detail by Black et al. (2017), Prentice et al. (2021), and subsequent UNICEF–WHO joint statements (2022), which note that the coexistence of anemia and overweight within the same child is becoming increasingly common in low- and middle-income countries. This pattern emerges from a combination of dietary imbalances—namely excessive consumption of refined carbohydrates and fats, paired with insufficient intake of iron, folate, and vitamin B12. Studies by Zimmermann & Hurrell (2017), Aigner et al. (2020), and Cepeda-Lopez et al. (2019) further explain that chronic low-grade inflammation and elevated hepcidin levels in overweight children suppress iron absorption, thereby linking adiposity with anemia development [4]. Moreover, recent findings by Suchdev et al. (2022) confirm that overweight children may have functionally impaired iron utilization even when dietary intake is adequate, emphasizing the multifactorial nature of the condition.

Research from Central Asian and Eastern European pediatric populations, including studies by Ibragimova et al. (2019), Akhmedova et al. (2021), and several Uzbek national pediatric reports (2018–2024), similarly demonstrate that preschool children often consume diets high in carbohydrates but low in essential micronutrients, resulting in overlapping risks for both anemia and overweight. These regional studies emphasize the role of socio-economic factors, parental knowledge gaps, and urban lifestyle behaviors in shaping childhood nutrition outcomes.

There is consistent agreement across the reviewed literature that early preventive interventions are significantly more effective than corrective measures applied in later childhood. Randomized controlled trials by Dewey et al. (2018) and meta-analyses by Peña-Rosas et al. (2019) underscore that early iron supplementation, improved diet diversity, and structured parental education programs can reduce anemia prevalence by up to 40%. Similarly, lifestyle-modification trials summarized by ESPGHAN (2020) and WHO (2021) indicate that preschool-based physical activity programs, reduced screen time, and healthy meal planning significantly lower childhood overweight rates.

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November 2025

Throughout the literature, the critical role of healthcare providers—particularly pediatric nurses—is repeatedly highlighted. According to studies by Santos et al. (2020) and Wilson et al. (2021), nurse-led education and monitoring programs in early childhood institutions substantially improve nutritional outcomes, enhance parental compliance with dietary recommendations, and ensure timely detection of risk groups. This underscores the importance of integrating nursing professionals as central figures in community-based preventive strategies.

Collectively, the evidence supports the conclusion that anemia and overweight in preschool children are deeply interconnected conditions driven by shared modifiable factors. Addressing them requires a comprehensive, multidisciplinary approach combining family education, improved dietary quality, increased physical activity, early screening, and consistent involvement of nursing personnel. These findings reinforce the need for national and local preventive strategies tailored to the nutritional and cultural context of Uzbekistan.

**Conclusion.** The analysis of the available scientific evidence demonstrates that anemia and overweight among preschool children constitute a rapidly growing double burden of malnutrition, driven by shared nutritional, metabolic, behavioral, and socio-environmental determinants. Iron-deficiency anemia remains highly prevalent due to insufficient intake of iron-rich foods, limited dietary diversity, and micronutrient deficiencies, whereas overweight arises primarily from the widespread consumption of calorie-dense, nutrient-poor foods combined with inadequate physical activity and excessive screen exposure. Despite their contrasting metabolic manifestations, both conditions frequently coexist, reflecting profound dietary imbalance and the impact of modern lifestyle changes on early childhood health. This coexistence is further exacerbated by chronic low-grade inflammation, impaired iron absorption, and hormonal dysregulation observed in overweight children.

The findings emphasize the crucial importance of early identification, regular screening, and comprehensive preventive interventions initiated in preschool institutions and primary healthcare settings. Strategies that include improving dietary quality, enhancing parental awareness, promoting active lifestyles, and ensuring sufficient intake of essential micronutrients have been shown to significantly reduce both anemia and overweight prevalence. A consistent message across the literature is the decisive role of nursing professionals in implementing these measures, providing targeted education, monitoring at-risk children, and supporting families in adopting healthier behaviors. Strengthening nurse-led programs and integrating evidence-based nutritional guidelines into early childhood education systems represent highly effective and sustainable approaches.

Overall, addressing anemia and overweight in preschool children requires a multidisciplinary, culturally appropriate, and community-centered strategy. Targeted interventions undertaken during early childhood not only improve immediate health outcomes but also form the foundation for long-term physical, cognitive, and metabolic well-being, ultimately contributing to a healthier future generation.

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November 2025

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