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HYGIENIC ASSESSMENT OF THE NUTRITIONAL STATUS AND DIET OF PRESCHOOL CHILDREN: A REGIONAL EPIDEMIOLOGICAL STUDY

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Abstract. The period of preschool childhood is characterized by intensive physical, motor, and cognitive development, demanding a highly balanced and biologically adequate nutritional intake. This research provides a comprehensive hygienic assessment of the actual nutrition of preschool children attending early educational institutions in the Andijan region. Utilizing a prospective cross-sectional methodology, the study evaluated the daily dietary intake, anthropometric indices, and micronutrient status of 450 children aged 3 to 6 years. The integrated literature review highlights the critical concept of "hidden hunger" in developing demographics, where macronutrient sufficiency often masks severe deficits in essential vitamins and minerals. The empirical results demonstrate a significant imbalance in the actual diet compared to established physiological norms. Specifically, the regional preschool diet is characterized by an excessive intake of refined carbohydrates and bakery products, coupled with a chronic deficiency in high-biological-value proteins, fresh fruits, vegetables, and dairy products. Consequently, the anthropometric and clinical evaluations revealed that 18 percent of the observed children exhibited early signs of being overweight due to carbohydrate-heavy diets, while 14 percent displayed subclinical signs of micronutrient deficiencies, predominantly iron-deficiency anemia and inadequate calcium intake. The discussion emphasizes that the current nutritional practices in both institutional and home settings fail to meet the dynamic physiological requirements of this vulnerable age group. Ultimately, the study concludes that a comprehensive, scientifically grounded reform of kindergarten menus, combined with targeted parental nutritional education, is urgently required to optimize child development and prevent future metabolic and endocrine disorders.

Keywords: Preschool children, child nutrition, hygienic assessment, anthropometry, micronutrient deficiency, early childhood development, public health, dietary imbalance, hidden hunger.

MAKTABGACHA YOSHDAGI BOLALARNI TO'G'RI OVQATLANISHLARINI GIGIYENIK BAHOLASH: MINTAQAVIY EPIDEMIOLOGIK TADQIQOT

Annotatsiya. Maktabgacha yoshdagi bolalik davri intensiv jismoniy, motor va kognitiv rivojlanish bilan tavsiflanadi va bu yuqori darajada muvozanatlashgan hamda biologik jihatdan to'liq ovqatlanishni talab qiladi. Ushbu tadqiqot Andijon viloyatidagi maktabgacha ta'lim muassasalariga qatnaydigan bolalarning amaldagi ovqatlanishiga keng qamrovli gigiyenik baho beradi. Istiqbolli kesma metodologiyasidan foydalangan holda, tadqiqot 3 yoshdan 6 yoshgacha bo'lgan 450 nafar bolaning kunlik ovqatlanish ratsioni, antropometrik ko'rsatkichlari va mikronutriyentlar holatini baholadi. Kiritilgan adabiyotlar sharhi rivojlanayotgan demografik guruhlarda "yashirin ochlik" degan muhim tushunchani yoritib beradi, bunda

makronutriyentlarning yetarliligi ko'pincha muhim vitaminlar va minerallardagi jiddiy tanqislikni yashiradi. Empirik natijalar amaldagi ratsionning belgilangan fiziologik me'yorlarga nisbatan sezilarli darajada nomutanosibligini ko'rsatadi. Xususan, mintaqaviy maktabgacha yoshdagi bolalar ratsioni tozalangan uglevodlar va non mahsulotlarini ortiqcha iste'mol qilish, shuningdek, yuqori biologik qiymatga ega oqsillar, yangi mevalar, sabzavotlar va sut mahsulotlarining surunkali yetishmovchiligi bilan tavsiflanadi. Natijada, antropometrik va klinik baholashlar kuzatilgan bolalarning 18 foizida uglevodga boy ovqatlanish tufayli ortiqcha vaznning ilk belgilari borligini, 14 foizida esa mikronutriyentlar yetishmovchiligining subklinik belgilari, asosan temir tanqisligi kamqonligi va kalsiyni yetarli darajada iste'mol qilmaslik holatlari mavjudligini aniqladi. Muhokama qismi shuni ta'kidlaydiki, ta'lim muassasalaridagi va uydagi joriy ovqatlanish amaliyoti ushbu zaif yosh guruhining dinamik fiziologik talablariga javob bermaydi. Xulosa qilib aytganda, tadqiqot bolalar rivojlanishini optimallashtirish hamda kelajakdagi metabolik va endokrin kasalliklarning oldini olish uchun bog'cha menyularini har tomonlama, ilmiy asoslangan holda isloh qilish va ota-onalarga ovqatlanish bo'yicha maqsadli ta'lim berish zudlik bilan talab etiladi degan xulosaga keladi.

Kalit so'zlar: Maktabgacha yoshdagi bolalar, bolalar ovqatlanishi, gigiyenik baholash, antropometriya, mikronutriyentlar yetishmovchiligi, erta yoshdagi rivojlanish, jamoat salomatligi, ovqatlanish nomutanosibligi, yashirin ochlik.

ГИГИЕНИЧЕСКАЯ ОЦЕНКА ПРАВИЛЬНОГО ПИТАНИЯ ДЕТЕЙ ДОШКОЛЬНОГО ВОЗРАСТА: РЕГИОНАЛЬНОЕ ЭПИДЕМИОЛОГИЧЕСКОЕ ИССЛЕДОВАНИЕ

Аннотация. Период дошкольного детства характеризуется интенсивным физическим, моторным и когнитивным развитием, что требует высокосбалансированного и биологически адекватного питания. Данное исследование дает всестороннюю гигиеническую оценку фактического питания детей дошкольного возраста, посещающих дошкольные образовательные учреждения Андижанской области. Используя проспективную кросс-секционную методологию, исследование оценило ежедневный рацион, антропометрические показатели и микронутриентный статус 450 детей в возрасте от 3 до 6 лет. Интегрированный обзор литературы освещает критическую концепцию «скрытого голода» в развивающихся демографических группах, когда достаточное количество макронутриентов часто маскирует серьезный дефицит основных витаминов и минералов. Эмпирические результаты демонстрируют значительный дисбаланс фактического рациона по сравнению с установленными физиологическими нормами. В частности, региональный рацион дошкольников характеризуется избыточным потреблением рафинированных углеводов и хлебобулочных изделий в сочетании с хроническим дефицитом белков высокой биологической ценности, свежих фруктов, овощей и молочных продуктов. Следовательно, антропометрические и клинические оценки выявили, что у 18 процентов наблюдаемых детей проявлялись ранние признаки избыточного веса из-за высокоуглеводного питания, в то время как у 14 процентов наблюдались субклинические признаки дефицита микронутриентов, преимущественно железодефицитная анемия и недостаточное потребление кальция. В обсуждении подчеркивается, что текущие методы питания как в учреждениях, так и дома не отвечают динамичным физиологическим потребностям этой уязвимой возрастной группы. В конечном итоге исследование приходит к выводу, что для оптимизации развития детей и предотвращения будущих метаболических и эндокринных нарушений срочно требуется

комплексная, научно обоснованная реформа меню детских садов в сочетании с целенаправленным просвещением родителей по вопросам питания.

Ключевые слова: Дети дошкольного возраста, детское питание, гигиеническая оценка, антропометрия, дефицит микронутриентов, развитие в раннем детстве, общественное здравоохранение, дисбаланс питания, скрытый голод.

INTRODUCTION

The preschool period, encompassing children aged three to seven years, represents a highly critical biological window characterized by rapid anatomical growth, intensive organ system maturation, and the fundamental formation of the immune and central nervous systems. Consequently, the nutritional status of a child during these formative years directly dictates their immediate health, cognitive capabilities, and long-term physiological resilience. Proper nutrition in preschool childhood is not merely a matter of caloric sufficiency to prevent starvation; it requires a highly precise, biologically adequate balance of macronutrients (proteins, fats, and carbohydrates) and essential micronutrients (vitamins and trace minerals). Any prolonged deviation from these physiological norms, whether resulting in undernutrition or the overconsumption of empty calories, initiates complex metabolic cascades that significantly increase the vulnerability of the developing organism to infectious diseases, structural developmental delays, and the early onset of chronic non-communicable diseases.

A comprehensive review of modern pediatric hygiene and public health literature reveals a disturbing global trend defined as the "double burden of malnutrition." In many transitional and rapidly urbanizing regions, traditional forms of severe protein-energy malnutrition (stunting and wasting) are progressively being replaced by a complex combination of micronutrient deficiencies—often termed "hidden hunger"—and escalating rates of childhood obesity. Epidemiological data provided by the World Health Organization strongly indicate that the widespread availability and aggressive marketing of ultra-processed, energy-dense, but nutrient-poor foods have fundamentally altered childhood dietary habits. In many developing healthcare architectures, regional dietary traditions heavily rely on refined carbohydrates, while high-biological-value animal proteins and fresh produce remain economically or culturally underutilized in daily family meals. This dietary shift places an immense physiological burden on the child's developing endocrine system, leading to early-stage insulin resistance and compromised bone mineral density.

In the Republic of Uzbekistan, the state has actively prioritized early childhood education and health, aiming to increase preschool enrollment and improve institutional standards. The preschool educational institution plays a massive role in shaping the child's nutritional profile, as children attending full-day kindergartens receive up to seventy-five percent of their daily caloric and nutritional requirements from the institutional menu. Therefore, the hygienic assessment of these centralized menus, along with an evaluation of the supplementary nutrition provided at home, is an absolute public health imperative. Historically, menu planning in many regional institutions has focused primarily on meeting overall caloric quotas and adhering to tight economic budgets, frequently overlooking the strict biological ratios of essential amino acids, polyunsaturated fatty acids, and critical trace elements like iron, iodine, and calcium.

The specific micro-epidemiological environment of the Andijan region in the Fergana Valley requires targeted scientific investigation. The region possesses distinct culinary traditions, socioeconomic dynamics, and seasonal variations in food availability that directly impact the daily diet of preschool children. Currently, there is a distinct lack of granular, scientifically rigorous data

regarding the actual nutritional status and the specific hygienic deficiencies of the diets consumed by preschool children in this densely populated area. Therefore, the primary objective of this expansive research is to conduct a meticulous, evidence-based hygienic assessment of the actual nutrition provided to preschool children in the Andijan region. By analyzing institutional menus, surveying parental feeding practices, and correlating these findings with objective anthropometric and clinical health indicators, this study aims to identify the precise nutritional vulnerabilities within this demographic and establish a robust scientific foundation for reforming regional pediatric nutritional guidelines.

MATERIALS AND METHODS

To achieve a high degree of epidemiological accuracy and scientific validity, a prospective, cross-sectional, and analytical study was meticulously designed and executed over an uninterrupted period of twelve months. The research was strategically conducted across the Andijan region, encompassing ten distinctly selected state-funded preschool educational institutions to ensure a highly representative sample reflecting both urban centers and peri-urban agricultural districts. The comprehensive study protocol was submitted to the regional health ministry and the institutional bioethics review board, receiving unconditional formal approval. Absolute adherence to international ethical standards for medical and pediatric research was strictly maintained. Written, informed consent was systematically obtained from the parents or legal guardians of all participating children prior to their official enrollment in the clinical and anthropometric evaluation phases of the study.

The clinical study population comprised 450 preschool children, consisting of 235 boys and 215 girls, evenly distributed between the ages of three and six years. To ensure the purity of the nutritional data and eliminate confounding metabolic variables, children with previously diagnosed severe congenital anomalies, chronic gastrointestinal disorders affecting nutrient absorption (such as celiac disease or severe food allergies), and primary endocrine pathologies were explicitly excluded from the analysis. The research methodology was multifaceted, integrating institutional document analysis, parental sociological surveying, and objective clinical anthropometry.

The first phase of the research involved a rigorous hygienic assessment of the organized institutional nutrition. Researchers collected and systematically analyzed the ten-day standardized menus from each of the participating preschools. The calculation method was utilized to determine the exact chemical composition and energy value of the daily rations provided to the children. The menus were meticulously broken down to quantify the absolute amounts of proteins (differentiating between animal and plant sources), fats, carbohydrates, essential vitamins (Vitamin C, Vitamin A, B-complex), and critical minerals (Calcium, Phosphorus, Iron). These calculated values were subsequently compared against the strictly defined physiological norms and sanitary-hygienic requirements established by the Ministry of Health for children in the respective age categories.

The second phase involved capturing the nutritional reality outside the institution. A comprehensive, culturally validated sociological questionnaire was distributed to the parents of all 450 participants. This instrument was explicitly designed to assess the child's dietary intake at home, including breakfast habits prior to arriving at kindergarten, evening meals, weekend diets, and the frequency of consuming fast food, sugary carbonated beverages, and heavily processed snacks. This combined approach allowed the researchers to calculate the true, holistic 24-hour nutritional profile of each child.

The third and most critical phase involved the objective clinical and anthropometric evaluation of the children to identify the physiological consequences of their dietary habits. Anthropometric measurements were conducted by trained pediatricians utilizing highly calibrated medical

equipment. Height was measured to the nearest millimeter using a stadiometer, and body mass was recorded to the nearest hundred grams using digital medical scales. The collected data were processed using the World Health Organization's Anthro and AnthroPlus software, which calculates specific Z-scores for Body Mass Index-for-age, Height-for-age, and Weight-for-age, allowing for the precise classification of stunting, wasting, normal weight, overweight, and obesity. Additionally, clinical examinations focused on identifying external signs of micronutrient deficiencies, specifically examining the skin, mucous membranes, hair, and teeth for classical signs of hypovitaminosis, calcium deficiency, and clinical pallor indicative of anemia.

The vast repository of nutritional, sociological, and clinical data was subjected to rigorous quantitative processing utilizing advanced biostatistical software packages. Continuous variables were tested for normal distribution and expressed as mathematical means accompanied by their standard deviations. Categorical variables were presented as absolute frequencies and percentages. The statistical significance of the disparities between the actual observed values and the established hygienic norms was calculated utilizing the Student's t-test for continuous data and Pearson's Chi-square test for categorical outcomes. A probability value of less than 0.05 was maintained as the absolute threshold for declaring statistical significance across all analytical procedures.

RESULTS

The systematic hygienic evaluation and statistical analysis of the collected data revealed profound and highly concerning imbalances in the actual nutrition of preschool children in the Andijan region, exposing significant deviations from established physiological norms. The analysis of the institutional ten-day menus demonstrated that while the overall daily caloric quota was generally met, and in some cases exceeded, the internal chemical structure of the diet was fundamentally flawed. The primary hygienic violation was a severe disruption in the optimal biological ratio of macronutrients. According to pediatric standards, the ideal ratio of proteins, fats, and carbohydrates for this age group should be approximately 1 to 1 to 4. However, the calculated regional ratio drastically skewed towards carbohydrates, averaging 1 to 0.8 to 5.5.

A granular analysis of the protein component revealed that while total protein intake approached the lower limit of the norm, there was a critical deficiency in proteins of high biological value. The consumption of meat, fish, eggs, and hard cheeses was statistically significantly lower than the recommended hygiene standards, often substituted with cheaper, incomplete plant-based proteins derived from legumes and excessive bread consumption. Similarly, the fat component of the diet was imbalanced. The intake of essential polyunsaturated fatty acids, crucial for brain myelination and cognitive development, was deficient due to a heavy reliance on saturated animal fats and refined vegetable oils in the preparation of hot meals, while the inclusion of marine fish and unrefined seed oils was virtually non-existent in the institutional menus.

The carbohydrate overload was the most visually striking anomaly. The daily diets were heavily saturated with refined carbohydrates, primarily sourced from excessive servings of white bread, sweetened tea, commercial baked goods, and pasta. Conversely, the analysis exposed a chronic, severe deficit in the consumption of complex carbohydrates and dietary fiber. The daily inclusion of fresh, unheated fruits and raw vegetables was recorded at levels forty to fifty percent below the mandatory physiological requirements. This severe lack of fresh produce directly correlated with the calculated micronutrient deficiencies. The institutional and home diets demonstrated profound, statistically significant shortfalls in the daily intake of Ascorbic Acid (Vitamin C), Cholecalciferol (Vitamin D), Calcium, and biologically available Heme Iron.

The parental questionnaires confirmed that the home environment frequently exacerbated these institutional deficiencies rather than correcting them. The sociological data revealed that over sixty percent of the children routinely consumed high-sugar snacks, commercial fruit juices, and fast food during the evening and on weekends. Alarmingly, twenty-five percent of parents reported that their children frequently skipped a nutritious home breakfast, relying entirely on the mid-morning kindergarten meal, thereby disrupting their metabolic rhythm.

The physiological consequences of these dietary imbalances were objectively quantified through the anthropometric and clinical evaluations. The WHO Anthro software analysis revealed that the carbohydrate-heavy, sedentary lifestyle combination is driving a noticeable metabolic shift within this young demographic. Eighteen percent of the 450 observed children exhibited Z-scores classifying them as overweight, with an additional four percent meeting the clinical criteria for early childhood obesity. Conversely, traditional undernutrition (wasting) was relatively rare, observed in less than three percent of the cohort. However, the clinical examinations heavily underscored the presence of the "hidden hunger" phenomenon. Fourteen percent of the children displayed subclinical signs of micronutrient deficiencies. Pediatricians noted a high prevalence of early dental caries, indicative of chronic calcium and fluoride imbalances, and clinical pallor of the mucous membranes. Reviewing concurrent medical records available in the preschools confirmed that roughly twelve percent of the cohort possessed laboratory-confirmed, mild to moderate iron-deficiency anemia, directly correlating with the documented lack of red meat and Vitamin C in their daily rations.

DISCUSSION

The empirical evidence generated by this comprehensive hygienic assessment provides a definitive, highly concerning snapshot of the nutritional reality facing preschool children in the studied region. The data powerfully validate the hypothesis that achieving mere caloric sufficiency is entirely inadequate for securing the health of a developing child. The extreme carbohydrate skew observed in the daily menus is a systemic structural failure that demands immediate public health intervention. The reliance on refined flour products and added sugars as cheap, easily accessible energy sources fundamentally disrupts the child's endocrine system [1]. This constant influx of high-glycemic-index foods forces continuous, massive spikes in insulin secretion, establishing the precise metabolic groundwork for early childhood obesity and pre-diabetic states, perfectly explaining the alarming eighteen percent overweight prevalence identified in the anthropometric phase of the study [2].

The chronic deficiency in high-biological-value proteins represents a severe threat to the immunological and anatomical development of the preschooler. Essential amino acids, derived primarily from animal sources, are the mandatory building blocks for the rapid synthesis of muscle tissue, enzymes, and antibodies. When these proteins are systemically underrepresented in the diet, the child's physical growth trajectory can be blunted, and their susceptibility to common viral and bacterial respiratory infections increases dramatically [3]. Furthermore, the lack of dietary diversity, specifically the severe deficit in fresh fruits and vegetables, highlights a critical failure in both institutional catering logistics and parental nutritional literacy. Fresh produce is the primary vehicle for delivering essential water-soluble vitamins and dietary fiber, which are strictly required for maintaining a healthy gastrointestinal microbiome and facilitating the absorption of other critical nutrients [4].

The clinical manifestation of iron-deficiency anemia and poor dental health among the cohort perfectly illustrates the dangerous consequences of the "hidden hunger" epidemic. Iron is an

absolute prerequisite for hemoglobin synthesis and optimal cognitive and neurological development in early childhood. The regional diet's reliance on plant-based, non-heme iron (which has an extremely low bioavailability), coupled with a severe lack of Vitamin C (which is necessary to enhance iron absorption), creates a mathematically inevitable deficit [5]. This hidden deficiency directly impairs the child's attention span, learning capacity, and physical stamina, severely undermining the primary educational goals of the preschool institution.

Addressing these deep-rooted hygienic violations requires a massive, coordinated paradigm shift in how pediatric nutrition is managed at the regional level. Relying on outdated menu templates designed primarily around budget constraints rather than modern biological science is no longer acceptable. Health ministries and educational boards must collaborate to mandate and heavily subsidize the inclusion of high-quality proteins, fortified dairy products, and mandatory daily servings of fresh local fruits and vegetables into the standard kindergarten rations. However, reforming the institutional menu is only half the battle. The parental survey data explicitly prove that the home environment is frequently highly obesogenic. Therefore, healthcare providers and educators must launch aggressive, culturally tailored educational campaigns aimed at parents. These campaigns must dismantle the regional misconception that a "chubby" child is a healthy child, and educate families on the hidden dangers of refined sugars, sweet teas, and the absolute necessity of establishing a balanced, diverse home diet that complements the institutional meals [6].

CONCLUSION

The comprehensive hygienic assessment of the nutritional status of preschool children in the Andijan region unequivocally demonstrates that the current dietary practices are fundamentally misaligned with the strict physiological requirements of early childhood development. The research definitively proves that the regional preschool diet is characterized by a dangerous structural imbalance—specifically, an extreme over-reliance on refined carbohydrates and a chronic, systemic deficiency in high-biological-value proteins, essential polyunsaturated fats, and fresh produce. This nutritional architecture directly catalyzes the dual crisis observed in the clinical data: a rapidly rising incidence of early childhood overweight and obesity, running simultaneously parallel to high rates of hidden micronutrient deficiencies, predominantly iron and calcium. The paramount conclusion of this study is that achieving a healthy pediatric population requires an immediate departure from caloric-focused feeding toward precision, nutrient-dense nutrition. To safeguard the physical, cognitive, and metabolic future of the younger generation, regional authorities must urgently implement scientifically rigorous, standardized menu reforms within all preschool educational institutions. Simultaneously, massive public health initiatives must be deployed to elevate parental nutritional literacy, ensuring that the critical window of preschool development is fueled by a holistic, biologically complete, and hygienically safe diet.

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