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DYNAMICS OF GROWTH AND BODY STRUCTURE OF PRESCHOOL CHILDREN IN TASHKENT

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Abstract:

The study examines the anthropometric characteristics and growth dynamics of preschool children in Tashkent, analyzing key indicators such as height, body mass, chest circumference, and body proportions. The research includes 1250 healthy children aged 2 to 7 years, divided into age groups. Standardized anthropometric measurements were conducted following WHO recommendations. Statistical analysis identified critical growth periods, particularly between 5 and 6 years, with an average annual height increase of 4.8 cm. The findings reveal regional differences in body mass and chest development compared to international standards. The study highlights the importance of early monitoring of physical development, nutrition, and physical activity. The results contribute to forming regional growth standards and adapting health programs for preschool children.

Keywords: preschool children, anthropometry, growth dynamics, physical development, regional differences, body proportions, health monitoring

Аннотация:

В исследовании анализируются антропометрические характеристики и динамика роста детей дошкольного возраста в Ташкенте, включая ключевые показатели, такие как рост, масса тела, окружность грудной клетки и пропорции тела. В исследовании приняли участие 1250 здоровых детей в возрасте от 2 до 7 лет, разделенных на возрастные группы. Измерения проводились в соответствии с рекомендациями ВОЗ. Статистический анализ выявил критические периоды роста, особенно в возрасте 5-6 лет, при среднем годовом приросте роста 4,8 см. Выявлены региональные различия в массе тела и развитии грудной клетки по сравнению с международными стандартами. Исследование подчеркивает важность раннего мониторинга физического развития, питания и физической активности. Результаты могут использоваться для разработки региональных стандартов роста и адаптации программ здравоохранения для дошкольников.

Ключевые слова: дети дошкольного возраста, антропометрия, динамика роста, физическое развитие, региональные различия, пропорции тела, мониторинг здоровья

Annotatsiya:

Ushbu tadqiqot Toshkent shahridagi maktabgacha yoshdagi bolalarning antropometrik xususiyatlari va o‘sish dinamikasini tahlil qiladi. Tadqiqotga 2 yoshdan 7 yoshgacha bo‘lgan 1250 nafar sog‘lom bola jalb qilindi. O‘lchovlar JSST tavsiyalariga muvofiq amalga oshirildi. Statistik tahlil 5-6 yosh oralig‘ida o‘sishning keskin tezlashgan davrini aniqladi, o‘rtacha yillik o‘sish sur’ati

4,8 sm ni tashkil etdi. Tadqiqot natijalari bolalarning tana massasi va ko‘krak qafasining rivojlanishida xalqaro standartlarga nisbatan mintaqaviy farqlar mavjudligini ko‘rsatdi. Ushbu natijalar maktabgacha yoshdagi bolalar uchun sog‘liqni saqlash dasturlarini moslashtirish va mintaqaviy o‘sish standartlarini shakllantirish uchun muhimdir.

Kalit so‘zlar: maktabgacha yoshdagi bolalar, antropometriya, o‘sish dinamikasi, jismoniy rivojlanish, mintaqaviy farqlar, tana proporsiyalari, sog‘liq monitoringi

Introduction

Physical development in preschool children is a crucial indicator of their overall health and well-being. Anthropometric characteristics help assess growth patterns, identify potential deviations, and determine development rates. The dynamics of body parameters between the ages of 2 and 7 serve as a key indicator of children's health, helping to identify trends in physical development at the regional level. Modern research (Singh et al., 2022; Zhang & Li, 2023) emphasizes the importance of regularly monitoring anthropometric parameters, as they depend on various factors, including genetics, nutrition, social conditions, and levels of physical activity.

The aim of this study is to analyze in detail the dynamics of growth and anthropometric characteristics of the torso in preschool children of the indigenous population of Tashkent, identify patterns of their physical development, study the influence of various factors, and compare the obtained data with international standards.

Materials and Methods

A total of 1250 preschool children (aged 2 to 7 years) attending childcare facilities in Tashkent participated in the study. All subjects were healthy, with no chronic illnesses or deviations in physical development. The children were divided into age groups (2, 3, 4, 5, 6, and 7 years) to assess age-related trends.

Measurements were conducted in medical offices of kindergartens using standardized equipment and methodologies recommended by WHO (2021). Anthropometric parameters included:

- Standing and sitting height;
- Body weight;
- Torso length;
- Chest circumference at rest, during inspiration, and during full exhalation;
- Waist circumference and abdominal circumference;
- Upper segment length;
- Transverse and anteroposterior chest diameters;
- Chest height.

Statistical data analysis was performed using variation statistics methods. The significance of differences was assessed using Student’s t-test and

correlation analysis to identify interrelationships between anthropometric indicators. Data were analyzed using Microsoft Excel 2022 and SPSS Statistics 27. A statistical significance level of $P<0.05$ was considered.

Results and Discussion

Growth and Body Mass Dynamics

The study results showed that children's height increased from 93.4 cm at 2 years to 117.2 cm at 7 years. The average annual growth rate was 4.8 cm, which corresponds to global standards. However, growth rates varied by age groups: the most significant surge was observed between 4 and 6 years, with a 9.7% increase at 5 years and 6.18% at 6 years. This confirms the hypothesis of critical periods of accelerated growth in preschoolers.

Body weight also showed a steady increase: from 14.5 kg at 2 years to 20.8 kg at 7 years, with an average annual gain of 1.3 kg. However, analyzing the growth rate of body weight reveals that the most pronounced mass gain occurs between 6 and 7 years (3.03% and 3.39%, respectively). This may be related to muscle mass increase, active musculoskeletal system development, and the body's preparation for the next stage of physical growth.

Moreover, the ratio of height to body weight allows for assessing the harmony of physical development. The study revealed that the Body Mass Index (BMI) of preschool children remains within physiological norms; however, individual variations are observed, influenced by nutritional habits, physical activity levels, and genetic factors. Analyzing trends in height and body mass enables recommendations for tailored nutrition and physical activity programs for different age groups.

Changes in Body Proportions

Data analysis from tables shows that as children age, significant changes occur in body proportions, associated with active skeletal and muscular system growth, internal organ development, and the body's adaptation to changing physiological needs:

- **Torso length** increases from 28.9 cm (2 years) to 35.7 cm (7 years), indicating proportional skeletal development. This is linked to intensive spinal growth, which contributes to an increase in overall body length. Torso growth directly correlates with lower limb length, confirming proportional development across all segments of the musculoskeletal system.
- **Chest circumference at rest** increases from 50.8 cm at 2 years to 55.2 cm at 7 years, and during inspiration, from 52.5 cm to 56.5 cm, reflecting respiratory system development. In-

creasing chest circumference is associated with lung volume expansion and the body's growing oxygen demands. This is particularly important for adequate gas exchange and physical endurance formation.

•**Waist circumference** grows from 49.2 cm at 2 years to 52.7 cm at 7 years, while **abdominal circumference** increases from 50.7 cm to 53.4 cm, indicating gradual abdominal muscle and internal organ development. Stable waist growth suggests normal digestive system and metabolic development.

•**Transverse chest diameter** increases from 14.0 cm at 2 years to 15.3 cm at 7 years, and the **anteroposterior diameter** from 12.8 cm to 15.7 cm. This is linked to skeletal structure development and increased respiratory volumes. The more intense growth of the transverse diameter compared to the anteroposterior diameter confirms adaptive changes in chest structure, essential for expanding lung capacity.

•**Chest height** increases from 16.8 cm at 2 years to 20.6 cm at 7 years, reflecting lung volume growth and rib cage development. This metric is crucial for assessing the respiratory system and posture formation, as increasing chest height strengthens intercostal muscles and the diaphragm, ensuring effective breathing.

Conclusion

1. Between the ages of 2 and 7, there is a stable increase in anthropometric parameters such as height, body mass, chest circumference, and torso height. The average annual height increase is 4.8 cm, aligning with global standards. However, body mass gain is lower compared to similar age groups in developed countries, possibly due to regional differences in diet and physical activity.

2. The most significant growth rates (G) are observed between 5-6 years, highlighting the need for enhanced nutritional and physical activity control during this period. This stage involves intensive muscle and bone system development, requiring increased intake of protein, calcium, and other micronutrients. The findings emphasize the importance of early prevention of possible physical development disorders.

3. The dynamics of chest development confirm the importance of monitoring the respiratory system and shaping proper body proportions. A substantial increase in chest circumference during inspiration at 6 years (2.88%) indicates age-related changes in lung function development.

4. Comparison with international studies confirms alignment with global standards but identifies regional peculiarities requiring further study. Key differences include:

- Lower body mass among Tashkent children compared to their European and Chinese peers, possibly linked to diet and physical activity differences.
- Variations in anteroposterior chest diameter growth rates, which may indicate specific features in respiratory system and posture development.
- Differences in overall torso length, potentially influenced by genetic and climatic factors.

5. The obtained data can be used for assessing preschool children's physical development, establishing normative indicators, and evaluating the effectiveness of health improvement programs. These metrics can be integrated into early health monitoring programs to detect deviations at early stages and adjust nutrition and physical activity programs accordingly.

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