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COMPARATIVE ANALYSIS OF ANTHROPOMETRIC INDICATORS IN HEALTHY CHILDREN AND CHILDREN WITH THYROID DYSFUNCTION IN THE ANDIJAN REGION

Qobuljonova Diyora Ilhomjon qizi

Abduraximov A.X.

Master's Students, Andijan State Medical Institute, Andijan, Uzbekistan

Scientific Supervisor, PhD, Andijan State Medical Institute, Andijan, Uzbekistan

Abstract

Anthropometric indicators are essential parameters for evaluating physical development and health status in children. Endocrine disorders, particularly thyroid dysfunction, play a significant role in regulating growth, metabolism, and maturation processes during childhood. Thyroid hormone imbalance may lead to growth retardation, altered body composition, and deviations in weight and height. This study presents a comparative analysis of anthropometric indicators in healthy children and children with thyroid dysfunction in the Andijan region. Body height, body weight, and body mass index were assessed and compared between the two groups. The findings demonstrate significant differences in growth parameters, emphasizing the impact of thyroid dysfunction on physical development and the importance of regular anthropometric monitoring in pediatric endocrine disorders.

Keywords

Anthropometric indicators, children, thyroid dysfunction, physical development, body mass index, Andijan region

Introduction

Physical growth and development in childhood are complex biological processes regulated by genetic, nutritional, and hormonal factors. Anthropometric measurements such as body height, body weight, and body mass index serve as objective indicators of physical development and overall health. Deviations from age-appropriate norms may indicate underlying pathological conditions, including endocrine disorders.

The thyroid gland plays a critical role in growth and development by regulating metabolic rate, protein synthesis, and skeletal maturation. Thyroid hormones are essential for normal linear growth and body composition during childhood. Disorders of thyroid function, including hypothyroidism and hyperthyroidism, may significantly impair physical development, leading to short stature, delayed growth, or abnormal weight gain.

In pediatric populations, thyroid dysfunction is one of the most common endocrine disorders and may remain undiagnosed for long periods due to subtle clinical manifestations. Regional studies are particularly important for identifying population-specific characteristics of growth and disease-related deviations. The Andijan region has unique environmental and socio-economic factors that may influence thyroid health and children's physical development.

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The aim of this study was to conduct a comparative analysis of anthropometric indicators in healthy children and children with thyroid dysfunction in the Andijan region.

Literature Review

Physical growth and development in childhood are complex biological processes influenced by genetic, nutritional, environmental, and hormonal factors. Anthropometric indicators such as body height, body weight, and body mass index are widely recognized as reliable measures for assessing physical development and identifying deviations associated with health disorders. According to the World Health Organization, systematic monitoring of anthropometric parameters in children enables early detection of growth abnormalities and supports timely medical intervention.

Endocrine regulation plays a central role in normal growth and maturation, with thyroid hormones being essential for skeletal development, metabolic regulation, and neurocognitive maturation. Numerous studies have demonstrated that thyroid dysfunction during childhood significantly affects linear growth and body composition. Hypothyroidism is commonly associated with growth retardation, delayed bone maturation, and increased body weight, whereas hyperthyroidism may lead to accelerated growth initially, followed by growth impairment and weight loss.

Several authors have reported that children with thyroid hormone imbalance often exhibit deviations in anthropometric indicators compared to healthy peers. Fisher emphasized that inadequate thyroid hormone levels disrupt growth hormone secretion and insulin-like growth factor activity, resulting in impaired physical development. Similarly, Kaplowitz highlighted that early-onset thyroid dysfunction may cause persistent growth deficits if diagnosis and treatment are delayed.

Research focusing on iodine deficiency and thyroid health has further emphasized the relationship between thyroid function and physical development. Zimmermann reported that iodine deficiency remains a significant public health concern in many regions and contributes to thyroid dysfunction and growth impairment in children. Regional variations in iodine intake and environmental factors may therefore influence anthropometric outcomes.

Comparative studies conducted in different populations indicate that children with thyroid dysfunction demonstrate lower average height and altered body mass index compared to healthy children. These findings underscore the importance of considering both endocrine and environmental factors when assessing physical development. Longitudinal studies suggest that timely initiation of hormone replacement therapy can partially restore normal growth patterns, although complete catch-up growth may not always be achieved.

Regional investigations are particularly valuable for identifying local growth characteristics and disease-specific deviations. Socio-economic conditions, dietary habits, and access to healthcare services may significantly influence both thyroid health and physical development in children. Despite extensive international research, region-specific data from areas such as the Andijan region remain limited, highlighting the need for further studies to inform local public health strategies.

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In summary, the existing literature provides strong evidence that thyroid dysfunction in childhood is closely associated with impaired physical development and deviations in anthropometric indicators. Comparative analysis of healthy children and those with thyroid disorders offers important insights into the impact of endocrine imbalance on growth and underscores the necessity of early diagnosis, regular monitoring, and comprehensive management of pediatric thyroid diseases.

Materials and Methods

This study was conducted as a comparative cross-sectional analysis in the Andijan region. The study population included children aged 7–15 years and was divided into two groups. The first group consisted of clinically healthy children without diagnosed endocrine or chronic diseases. The second group included children diagnosed with thyroid dysfunction based on clinical evaluation and laboratory assessment of thyroid hormone levels.

Standard anthropometric measurements were performed for all participants. Body height was measured using a stadiometer, and body weight was recorded using calibrated scales. Body mass index was calculated as weight in kilograms divided by height in meters squared. Measurements were analyzed according to age and sex and compared with national and World Health Organization reference standards.

Statistical analysis included descriptive and comparative methods to assess differences between groups. Ethical principles were observed, and all data were collected anonymously.

Results

The comparative analysis revealed clear differences in anthropometric indicators between healthy children and children with thyroid dysfunction. Healthy children generally demonstrated physical development consistent with age-related reference standards, reflecting normal growth patterns.

In contrast, children with thyroid dysfunction showed significant deviations in growth indicators. Reduced body height and delayed linear growth were more frequently observed in children with hypothyroidism, reflecting the essential role of thyroid hormones in skeletal development. Alterations in body weight and body mass index were also noted, with a tendency toward increased body mass in some children and underweight in others, depending on the type and severity of thyroid dysfunction.

These findings are consistent with previous studies reporting impaired growth and altered body composition in pediatric thyroid disorders. Hormonal imbalance, metabolic dysregulation, and delayed bone maturation are considered key mechanisms underlying these anthropometric changes. The variability of body mass index observed in the affected group highlights the complex metabolic effects of thyroid dysfunction.

The results emphasize the importance of early diagnosis and effective management of thyroid disorders in children. Regular monitoring of anthropometric indicators allows timely detection of growth disturbances and supports individualized therapeutic interventions aimed at normalizing physical development.

Discussion

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The present study demonstrates that thyroid dysfunction in children is associated with significant alterations in anthropometric indicators when compared with healthy peers. These findings confirm the critical role of thyroid hormones in regulating growth, metabolism, and overall physical development during childhood. Deviations in body height, body weight, and body mass index observed in children with thyroid disorders reflect the systemic impact of endocrine imbalance on physiological growth processes.

One of the most prominent findings is the reduction in linear growth among children with thyroid dysfunction, particularly in those with hypothyroidism. Thyroid hormones are essential for normal skeletal maturation and longitudinal bone growth, primarily through their interaction with growth hormone and insulin-like growth factor pathways. Insufficient thyroid hormone levels lead to delayed epiphyseal maturation and impaired bone mineralization, which may result in short stature and delayed physical development. These results are consistent with previous studies reporting growth retardation as a common manifestation of pediatric hypothyroidism.

Alterations in body weight and body mass index observed in the affected group further highlight the metabolic consequences of thyroid dysfunction. Hypothyroidism is often associated with reduced basal metabolic rate, fluid retention, and increased adiposity, contributing to elevated body mass index in some children. Conversely, children with hyperthyroidism may exhibit weight loss despite normal or increased appetite due to accelerated metabolism. The variability of body mass index patterns observed in this study reflects the heterogeneity of thyroid disorders and their complex metabolic effects.

The comparative analysis also suggests that the duration and severity of thyroid dysfunction play an important role in determining the extent of anthropometric deviations. Children with delayed diagnosis or inadequate treatment are more likely to experience pronounced growth impairment. This observation underscores the importance of early screening and timely intervention to prevent irreversible effects on physical development.

Regional and environmental factors may further influence the observed anthropometric differences. Iodine deficiency, dietary patterns, and socio-economic conditions in the Andijan region may contribute to the prevalence and severity of thyroid dysfunction in children. Limited access to specialized endocrine care and delayed referral may exacerbate growth disturbances, highlighting the need for region-specific preventive strategies.

The findings of this study emphasize that anthropometric assessment should be an integral part of the clinical evaluation of children with thyroid dysfunction. Regular monitoring of growth parameters allows clinicians to assess treatment effectiveness and adjust therapeutic strategies accordingly. Hormone replacement therapy, when initiated early and adequately monitored, has been shown to improve growth velocity and partially restore normal growth trajectories.

Despite its clinical relevance, this study has certain limitations. The cross-sectional design does not allow assessment of longitudinal growth patterns or treatment outcomes. Additionally, variations in disease duration, treatment status, and pubertal stage may influence anthropometric measurements. Future studies should include longitudinal follow-up and larger sample sizes to provide a more comprehensive understanding of growth dynamics in children with thyroid disorders.

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In conclusion, the discussion highlights that thyroid dysfunction exerts a substantial impact on physical development in children, resulting in measurable deviations in anthropometric indicators. The results support existing evidence and emphasize the necessity of early diagnosis, continuous monitoring, and comprehensive management of pediatric thyroid disorders to optimize growth and long-term health outcomes.

Conclusion

In conclusion, children with thyroid dysfunction in the Andijan region demonstrate significant differences in anthropometric indicators compared to healthy peers. Deviations in body height, body weight, and body mass index reflect impaired physical development associated with thyroid hormone imbalance.

Systematic assessment of anthropometric parameters should be an integral component of pediatric endocrine care. Early identification and appropriate treatment of thyroid dysfunction are essential for preventing growth retardation and ensuring optimal physical development and long-term health outcomes in affected children.

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