THE ROLE OF THYROID HORMONES IN CHILD DEVELOPMENT

NEW RENAISSANCE international scientific journal

ResearchBib IF - 11.01, ISSN: 3030-3753, Volume 2 Issue 2

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https://doi.org/10.5281/zenodo.14901849

Abstract. Thyroid hormones, specifically thyroxine (T4) and triiodothyronine (T3), play critical roles in the development and growth of children, impacting various biological processes such as brain development, metabolic regulation, bone growth, and thermoregulation. These hormones, produced by the thyroid gland, regulate essential functions that contribute to the normal development of the central nervous system (CNS), skeletal system, and overall body metabolism. Disruptions in thyroid hormone production can lead to developmental delays and other health problems in children. This paper reviews the importance of thyroid hormones in child development, focusing on their effects on physical, cognitive, and metabolic growth, and the consequences of thyroid hormone imbalances.

Key words: Thyroid hormones, thyroxine (T4), triiodothyronine(T3), cognitive, Thermoregulation, Hypothyroidism, Hyperthyroidism, neurogenesis, myelination.

РОЛЬ ГОРМОНОВ ЩИТОВИДНОЙ ЖЕЛЕЗЫ В РАЗВИТИИ РЕБЕНКА

Аннотация. Гормоны щитовидной железы, в частности тироксин (T4) и трийодтиронин (T3), играют важную роль в развитии и росте детей, влияя на различные биологические процессы, такие как развитие мозга, регуляция метаболизма, рост костей и терморегуляция. Эти гормоны, вырабатываемые щитовидной железой, регулируют основные функции, которые способствуют нормальному развитию центральной нервной системы (ЦНС), скелетной системы и общего метаболизма организма. Нарушения в выработке гормонов щитовидной железы могут привести к задержкам развития и другим проблемам со здоровьем у детей. В этой статье рассматривается важность гормонов щитовидной железы в развитии ребенка, уделяя особое внимание их влиянию на физический, когнитивный и метаболический рост, а также последствиям дисбаланса гормонов щитовидной железы.

Ключевые слова: гормоны щитовидной железы, тироксин (Т4), трийодтиронин (Т3), когнитивные, терморегуляция, гипотиреоз, гипертиреоз, нейрогенез, миелинизация.

Introduction

The thyroid gland is a small but essential endocrine organ that influences many aspects of human physiology, especially during childhood. The two primary thyroid hormones, thyroxine (T4) and triiodothyronine (T3), regulate a wide range of body functions, from the metabolism of

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nutrients to the development of the brain and bones. In children, thyroid hormones are integral to the regulation of metabolic processes, growth, and cognitive development. Therefore, maintaining balanced levels of these hormones is critical for proper childhood development. The imbalance of thyroid hormones, such as in hypothyroidism and hyperthyroidism, can have profound effects on a child's health and growth.

Thyroid Hormones and Physical Growth

Thyroid hormones play a crucial role in regulating the metabolic rate and growth processes in children. T3 and T4 regulate the synthesis of proteins, influence the maturation of various tissues, and promote growth factors that aid in the development of bones, muscles, and internal organs.

1. **Bone Growth and Skeletal Development:** One of the most significant roles of thyroid hormones in childhood is their influence on bone growth. These hormones stimulate the growth of long bones by promoting the elongation of the growth plates in the bones, which is essential for proper skeletal development. A deficiency of thyroid hormones can lead to delayed bone maturation, stunted growth, and skeletal abnormalities.

2. **Muscle Development:** Thyroid hormones also influence the development of muscle mass and strength. These hormones promote protein synthesis in muscle tissue, which is essential for muscle growth and strength. A deficiency or excess of thyroid hormones can result in muscle weakness or, in the case of hyperthyroidism, muscle wasting and fatigue.

Thyroid Hormones and Cognitive Development

The most profound influence of thyroid hormones is observed in the development of the brain and central nervous system (CNS). Thyroid hormones are vital for neurogenesis (formation of new neurons), myelination (formation of the myelin sheath around nerve fibers), and the development of synapses in the brain. These processes are essential for learning, memory, and overall cognitive function.

1. **Neuronal Differentiation and Brain Development:** During fetal development and the first years of life, thyroid hormones are critical for the development of the central nervous system. These hormones support the differentiation of neural stem cells into specialized neurons and glial cells, which form the building blocks of the CNS. Without adequate thyroid hormone levels, the brain cannot develop properly, leading to cognitive impairments and developmental delays.

2. **Cognitive and Behavioral Impact:** Adequate levels of thyroid hormones are essential for normal cognitive development. A deficiency of thyroid hormones during early childhood or even in utero can result in intellectual disabilities, reduced IQ, and developmental

delays. Conversely, hyperthyroidism, where there is an excess of thyroid hormones, can lead to behavioral problems such as hyperactivity, irritability, and concentration difficulties.

Thyroid Hormones and Metabolic Regulation

Thyroid hormones regulate energy metabolism by influencing the rate at which the body burns calories and produces energy. These hormones help to maintain a balance between energy intake, storage, and expenditure.

1. **Basal Metabolic Rate (BMR):** Thyroid hormones directly affect the basal metabolic rate, which is the amount of energy the body needs to maintain basic physiological functions. An adequate BMR is crucial for energy homeostasis, which ensures that the body has enough energy to support growth, development, and physical activity. An imbalance in thyroid hormone production can lead to either a hypermetabolic (increased energy expenditure) or hypometabolic (decreased energy expenditure) state.

2. **Thermoregulation:** Thyroid hormones also play an essential role in regulating body temperature. They influence heat production and help maintain a stable body temperature. In children, especially in infants and toddlers, thyroid hormone imbalances can lead to difficulty in temperature regulation, making them more susceptible to extreme cold or heat.

Thyroid Hormone Imbalance: Effects on Growth and Development

An imbalance in thyroid hormone production—whether hypothyroidism (underproduction of thyroid hormones) or hyperthyroidism (overproduction of thyroid hormones)—can have a severe impact on a child's physical and cognitive development. The most common thyroid disorders in children are hypothyroidism and hyperthyroidism.

1. **Hypothyroidism:** Hypothyroidism, where the thyroid gland produces insufficient amounts of thyroid hormones, is one of the most common endocrine disorders in children. If left untreated, hypothyroidism can cause growth delays, cognitive impairments, and developmental delays. In infants, untreated hypothyroidism can lead to irreversible mental retardation, which is why routine screening for hypothyroidism in newborns is essential.

Treatment for hypothyroidism typically involves thyroid hormone replacement therapy, which restores normal thyroid hormone levels and promotes proper development. Early diagnosis and treatment are critical for ensuring that children with hypothyroidism reach their full potential.

2. **Hyperthyroidism:** Hyperthyroidism, characterized by excessive production of thyroid hormones, can lead to an overactive metabolism and a variety of symptoms, including rapid heart rate, weight loss, irritability, and fatigue. In children, hyperthyroidism is often caused by an autoimmune disorder known as Graves' disease, in which the immune system attacks the thyroid gland.

Untreated hyperthyroidism can lead to serious complications, including growth retardation, heart problems, and behavioral disturbances. Treatment options include medications to block thyroid hormone production, radioactive iodine therapy to shrink the thyroid gland, and in some cases, surgery to remove part of the thyroid.

NEW RENAISSANCE international scientific journal

ResearchBib IF - 11.01, ISSN: 3030-3753, Volume 2 Issue 2

Conclusion

Thyroid hormones are essential for proper growth, development, and metabolic regulation in children. Adequate levels of thyroid hormones are critical for normal bone growth, cognitive development, and metabolic function. Imbalances in these hormones, such as in hypothyroidism or hyperthyroidism, can result in significant health problems, including growth retardation, cognitive impairments, and behavioral issues. Early detection and treatment of thyroid disorders are crucial to ensuring optimal growth and development in children. Parents and healthcare providers must be vigilant in monitoring thyroid function to ensure healthy development in children.

REFERENCES

- Brent, G. A. (2008). "Hypothyroidism in children and adolescents." *Thyroid*, 18(3), 271-281.
- Hay, I. D. (2005). "Thyroid hormone disorders." Journal of Clinical Endocrinology & Metabolism, 90(5), 2683-2695.
- 3. Rajput, R., & Bansal, S. (2015). "Thyroid disorders in children: A review." *Indian Journal of Endocrinology and Metabolism*, 19(2), 216-221.
- Burrow, G. N., & Fisher, D. A. (1996). "Thyroid function in the fetus and neonate." *Thyroid*, 6(3), 145-151.
- 5. Vanderpump, M. P. J. (2011). "The epidemiology of thyroid disease." *British Medical Bulletin*, 99(1), 39-51.
- 6. Jo'rayeva, G. (2024). COMBINATION OF DIABETES AND METABOLIC SYNDROME. *Modern Science and Research*, *3*(12), 691-696.
- 7. Jo'rayeva, G. (2025). RISK FACTORS FOR THE DEVELOPMENT OF CLIMACTERIC DISORDERS IN WOMEN WITH THE METABOLIC SYNDROME. *Modern Science and Research*, *4*(1), 1090-1092.
- Islomovna, R. O. (2024). VIRUSLI GEPATITLAR VA TUG 'RUQDAN KEYINGI ERTA
 QON KETISHLARNI KAMAYTIRISHNING YANGI
 TEXNOLOGIYALARI. ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В
 MUPE, 39(5), 99-106.

- Islomovna, R. O. (2024). A Comparative Analysis of the Effectiveness of Vaginal Progesterone, Cervical Pesar, and Their Combination for Preventing the Risk of Premature Labor in High-Risk Pregnant Women BEST JOURNAL OF INNOVATION IN SCIENCE. RESEARCH AND DEVELOPMENT, 3(3), 440-446.
- 10. Islomovna, R. O. TACTICS FOR CARRYING WOMEN AT HIGH RISK OF RECURRENT MISCARRIAGE.
- 11. Islomovna, R. O. OPTIMIZING THE CHOICE OF HORMONAL CONTRACEPTION IN WOMEN WITH AUTOIMMUNE THYROIDITIS DISEASE.
- 12. Islomovna, R. O. CHARACTERISTICS OF UROGENITAL TRACT MICROBIOCENOSIS IN WOMEN WITH NON-DEVELOPING PREGNANCY.
- 13. 13.Rajabova, O. I. (2024). Method Stopping Atonic Bleeding From the Uterus after Childbirth Using Balloon Tamponade. *International Journal of Alternative and Contemporary Therapy*, 2(9), 107-110.
- a. Islomovna, R. O. (2024). METHODS OF PHARMACOTHERAPEUTIC TREATMENT OF ABNORMAL UTERINE BLEEDING IN GIRLS. *PEDAGOGIKA, PSIXOLOGIYA VA IJTIMOIY TADQIQOTLAR/ JOURNAL OF PEDAGOGY, PSYCHOLOGY AND SOCIAL RESEARCH, 3*(5), 192-197.
- Islomovna, R. O. (2024). MODERN CONCEPT OF RECURRENT VAGINAL INFECTIONS IN WOMEN OF REPRODUCTIVE AGE. JOURNAL OF HEALTHCARE AND LIFE-SCIENCE RESEARCH, 3(4), 128-131.
- 15. Namozov, E. (2024). PRECANCEROUS DISEASES OF THE STOMACH. Modern Science and Research, 3(10), 506-508.
- Namozov, E. (2025). CLINICAL COURSE AND METHODS OF TREATMENT OF MALIGNANT TUMOR OF THE SIGMOID COLON. *Modern Science and Research*, 4(1), 651-655.
- 17. Ostonova, G. (2023). ICHKI SEKRETSIYA BEZLARI FIZIOLOGIYASI. Центральноазиатский журнал образования и инноваций, 2(10 Part 3), 110-115.
- 18. Rashidovna, O. G. (2023). PHYSIOLOGY OF THE ENDOCRINE GLANDS. *EUROPEAN* JOURNAL OF MODERN MEDICINE AND PRACTICE, 3(11), 1-6.
- 19. Ostonova, G. (2023). TURLI XIL STRESS OMILLARDAN GARMSEL OMILINING G'O'ZA BARG SATHIGA TA'SIRI. Центральноазиатский журнал образования и инноваций, 2(11 Part 2), 107-111.

ResearchBib IF - 11.01, ISSN: 3030-3753, Volume 2 Issue 2 20. Rashidovna, O. G. (2024). ФИЗИОЛОГИЯ ЖЕЛЕЗ ВНУТРЕННЕЙ СЕКРЕЦИИ. *ОБРАЗОВАНИЕ НАУКА И ИННОВАЦИОННЫЕ ИДЕИ В МИРЕ, 39*(3), 171-179.

NEW RENAISSANCE international scientific journal

21. Rashidovna, O. G. (2024). ZA'FARON (CROCUS SATIVUS) NING DORIVORLIK XUSUSIYATLARI. *TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI*, *4*(4), 151-156.