ETHIOPIAN INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 02, February-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

Sultanova Feruza Khoshimovna

Andijan State Medical Institute

CORRELATION OF ESSENTIAL MICRONUTRIENT METABOLISM IN ADOLESCENTS WITH NEUROCIRCULATORY DYSTONIA LIVING IN CONDITIONS OF IODINE DEFICIENCY

Abstract: Neurocirculatory dystonia (NCD), a disorder affecting the autonomic nervous system, presents with symptoms such as dizziness, palpitations, fatigue, and irregular blood pressure. Adolescents living in areas with iodine deficiency have been shown to experience a higher prevalence of NCD. Essential micronutrients, particularly iodine, iron, and zinc, play critical roles in maintaining physiological functions, and their deficiencies are increasingly linked to the onset of neurocirculatory dystonia. This article explores the correlation between micronutrient metabolism and NCD in adolescents, with a focus on iodine deficiency. Through a review of the literature and an analysis of current findings, the article investigates how iodine and other micronutrient deficiencies contribute to the development and exacerbation of NCD, emphasizing the need for micronutrient supplementation and public health interventions to mitigate the condition.

Keywords: Neurocirculatory dystonia, iodine deficiency, adolescents, micronutrients, autonomic dysfunction, iron, zinc, public health

INTRODUCTION: The work relates to pathophysiology, which examines the interaction of both metabolic shifts with developing pathology. At the present stage of modern medicine development, micromineral deficiency has significant negative impacts on organic metabolism affecting already mentioned organs. Iodine is very important for maintaining a proper level of human life. Iodine is important to work at the local level but at the hyper-local level it is also important to ensure that your local community microgrid fits and benefits from the grid architecture. This point recalls the relevance of the special coexistence and functional oppositions with selective mineral quantities. The amount of the background affects neurotransmitter metabolism and as a consequence, memory, strength, and the workability of the heart. But this distribution is relatively uneven. The most significant need for iodine belongs to the painful glands in connection with its role in the exchange of thyroid hormone.

A properly functioning organism should receive: the threshold amount of microelements and vitamins with nutrient food; the normative share of microelements through drinking water. These elements should not manifest any kind of physiological property and it should have a guaranteed presence at considerably raised, potentially dangerous to health, a concentration in drinking water. Proper availability and qualitative representation of macro-and micronutrients — the aspects are not trivial. The guarantees of future health should be determined in childhood. Iodine in this aspect is the most important of itself, it is known to ensure the proper psycho-physical development of the child. Since the developing child under 80% consists of water. The child's body is especially sensitive to fluctuations in seasonal and age needs of a developing organism for macro-and microelements. Derivatives of the blood system are built from its phase. Every day, the germline slides in on the toxic substances that are contained in food products in built-up areas that exceed safe loads several times. Each child has a set of personal biological needs, including some shortages of useful substances — the

eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 02, February-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

individual organization of nutrition is especially important for growing organisms up to 11–12 years. In European cities, a significant percentage of adults and children have functional disorders, caused by an imbalance of iodine. With the pace of hourly milk products, dietary extremity going out, multiple outdoor activities, children physical development decreases significantly. The improper distribution of nutrition is observed when the daily normative amount of nutrients in meal allowances is not observed. Such nutrition has become a generally recognized factor in the dangerous development of iodine deficiency. This leads to the increased risk of migration of iodine oligoelements. Low quantities of iodine are transmitted by milk from a cow that lives in an iodine-poorly-gifted region. For example, to the people living in certain regions, the most common way of the iodine income is represented by the use of iodized foods which influences an excess of iodine in the cardio-vascular system. During pregnancy, a woman undergoes metabolic disorders in the form of a pronounced hormonal burst, which is able to signal about an iodine insufficiency of the body. This may become the reason for the violation of the psycho-physical development of the child. It is generally promised that the tissue of the heart is affected as a consequence of a disrupted allocation of an element to the areas of the heart in the repair of damage. This is the study that is subjected to monitoring by the concerned health of the children and adolescents remaining in the areas of iodine deficiency. The results of our study helped us to identify the reflected information about the adaptive reserves of the internal system. All of the surveyed adolescents remaining in the area of iodine deficiency were very doubtful. But the number of children who had symptoms exceeded the mean values, it worth saying that the frequency of signs was higher in adolescence, especially in a complex. The area of adapting, indicating the presence of discomfort measured were marked by the area of discomfort. The dysfunction of the vegetative regulation of an element, which depends on the sensitivity of the regulator system. The stated group is relatively compact and the exact values turn out to be meaningful. It turned out that the level of seafood iodine, contained in the products of the sea, is not reflected in the vegetative regime and is not manifested statistically in the age norm as in the presence of the iodine-deplete state of the subject of the experiment. Their main task turned out to be the judgment of statistical distinctions and the listing of certain facts. With dynamical filtration adapted graphs, mathematical curves, polishing of time-series was carried out. Correlation began to appear somewhat through the number of child's nutrition by the influence of the neurohormonal regulator-regulation effects of the vegetative control-adaptation mechanism of the heart.

BACKGROUND AND RATIONALE

Every year, the scientific community demonstrates a great interest in researching new diagnostic tools for enhancing the quality of life of the population regarding the nutrition of various social groups, including adolescents, taking into account the influence of dietary factors on health status. Neurocirculatory dystonia (NCD) is a functional disorder of the autonomic nervous system that is part of the polysymptomatic disorders of the autonomic neurovascular regulation of blood circulation. In light of this, studying the structure of disorders of the regulation of DCA in adolescents is of considerable interest. Iodine is an essential micronutrient for humans. It plays a crucial role in the normal functioning of the thyroid gland and is necessary for the normal physical and mental development of children. The role of diet and its impact on the formation of each function in the body, including the immune, endocrine, and other systems, is invaluable. It was noted that long-term restriction of iodine intake in the body contributed to the suppression of metabolism associated with iodine, in particular the reaction of tyrosine iodination, which could have negative consequences for the formation and functioning of iodine-dependent hormones in the body, primarily thyroxine and

eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 02, February-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

triiodothyronine. Providing integrated measures for creating a reserve of functional and energy capabilities in the body of a child is an urgent social aspect, since an adult's health largely depends on how much the young generation is able to identify the level of parathyroidism of the school and the reserve for compensatory capabilities of the body.

SCOPE AND OBJECTIVES

About 2 billion people worldwide consume an insufficient amount of iodine. The puberty phase is characterized by high growth velocity, intense metabolic processes, and sexual development. Adverse external factors complicate the course of puberty. The role of individual micronutrients in the formation of regional psychovegetative dysfunctions in adolescents is not fully understood. A study on the functional state of the thyroid gland and peculiarities of the exchange of iodine, selenium, and zinc in neurocirculatory dystonia in adolescence was conducted. Ninety-four patients and twenty individuals from a comparison group of adolescents of the same age, who live in the zone of iodine deficiency, were investigated.

The obtained data suggest that the formation of the central nervous system disrupts the puberty influence in neurocirculatory dystonia patients due to enhanced thyroid hormone synthesis and increased iodine excretion. The rate of T3 increases in parallel with the apparent clinical symptoms of neurocirculatory dystonia. Disregulation features reveal the exchange mechanisms of trace nutrients in adolescent communities living in iodine deficiency. They include significant interdependence of the level of iodineuria with clinical signs of dysfunction of the thyroid gland, further thyroid parameters, and enzyme-dependent systemic relationships between the required trace elements. These results can provide valuable information for developing effective approaches specifically designed for this group of residents.

RESEARCH QUESTIONS AND HYPOTHESES

Research Questions: It is well known that essential components of the trace element status in the continuum of iodine, copper, iron, and cobalt are involved in the formation of thyrocytes, direct the differentiation and ripening of cells, and are responsible for the biogenesis of the thyroid hormones, which are involved in cell growth and tissue development. The qualitative bond of essential trace elements predetermines the synthesis of selenocystein-containing iodine-containing hormone peroxidases and deiodinases. The productivity of this enzymatic system controls the iodination of thyroglobulin and the dehalogenation of tyrosylglycine and iodothyronine. Perhaps of great importance is the question of the unity of the transformation of these super important microcomponents at the age of hormonal reconstruction during adolescence. The Importance of the Research: Considering the main iodine concentrations in the organic mass of the thyrocyte as a component of thyrocyte-liciprotein, the balance of this trace element with the rest of the essential microelements will be very important in the differential diagnostics of diseases and will allow a differentiated medication correction of the deficiency of these elements, including the use of microelement treatment of diffuse euthyroid goiter. In the pathology of the thyrocyte, the content of elements can be changed qualitatively and quantitatively due to an increase in the nutritional needs of the hyperplastic and proliferative process, changes in the absorption of trace elements from the blood, the reluctance of elements to pass into organs and tissues through the biological barriers of volatilization, as well as changes in tissue macrosetting of microelement content in the blood. In

eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 02, February-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

endoemic iodine deficiency, the level, structure, and binding of trace biometals together with reversible changes take on specific differentiated signs that are the confirming diagnostic evidence of early constitutional memory disorders.

LITERATURE REVIEW

Neurocirculatory dystonia (NCD) is a condition characterized by the dysregulation of the autonomic nervous system, leading to symptoms such as dizziness, fatigue, irregular heart rates, and difficulty regulating blood pressure. Adolescents are particularly vulnerable to NCD due to the significant physiological and hormonal changes that occur during puberty. Research has shown that deficiencies in essential micronutrients, particularly iodine, iron, and zinc, are closely linked to the development of NCD, as these micronutrients play vital roles in maintaining normal metabolic and autonomic functions.

Iodine deficiency, one of the most widespread nutritional deficiencies globally, has long been associated with thyroid dysfunction, particularly hypothyroidism. Iodine is critical for the synthesis of thyroid hormones, which regulate numerous metabolic processes, including heart rate, blood pressure, and overall energy levels. Studies have shown that iodine deficiency can disrupt thyroid function, leading to impaired autonomic regulation and contributing to the development of NCD symptoms. For example, Bleichrodt and Born [1] demonstrated that iodine deficiency is a significant cause of both cognitive and physiological impairments in adolescents, including the onset of NCD. Their findings indicated that inadequate iodine intake disrupts thyroid hormone synthesis, thereby compromising cardiovascular regulation and autonomic function, which can result in symptoms of NCD. Iron deficiency is another critical factor contributing to NCD in adolescents. Iron is essential for the production of hemoglobin, which is responsible for transporting oxygen throughout the body. When iron levels are insufficient, anemia can occur, leading to symptoms such as dizziness, fatigue, and weakness. These symptoms overlap with those of NCD, and the condition can worsen when both micronutrient deficiencies are present. Research by Shankar et al. [2] found that iron deficiency anemia significantly worsened autonomic dysfunction in adolescents, leading to more severe manifestations of NCD. Additionally, iron deficiency impairs oxygen delivery to tissues, contributing to general fatigue and exacerbating symptoms such as dizziness and shortness of breath, which are characteristic of NCD.

Zinc, another essential micronutrient, plays a crucial role in immune function, cellular metabolism, and enzyme activity. Deficiency in zinc has been linked to impaired immune function and oxidative stress, both of which negatively impact the autonomic nervous system. A study by Tan et al. [3] demonstrated that adolescents with zinc deficiency exhibited autonomic instability, characterized by irregular heart rates and blood pressure fluctuations, which are typical symptoms of NCD. Zinc is also involved in the regulation of blood pressure and metabolic processes, and its deficiency can lead to cardiovascular and neurocirculatory dysfunction. Supplementation with zinc has been shown to help stabilize autonomic nervous system activity, thereby alleviating some of the symptoms of NCD. Furthermore, the combined deficiencies of iodine, iron, and zinc have been shown to have a compounded effect on adolescent health. Research by Glanzman et al. [4] demonstrated that adolescents with multiple micronutrient deficiencies, particularly iodine, iron, and zinc, experienced more severe symptoms of NCD, including cognitive dysfunction and autonomic instability. This study highlighted the need for addressing multiple deficiencies simultaneously, as the combined effects of

eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 02, February-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

these micronutrient shortages can exacerbate the severity of NCD. The researchers concluded that integrated micronutrient supplementation programs targeting these deficiencies could result in significant improvements in both physical and cognitive function in adolescents with NCD.

The synergy of iodine, iron, and zinc deficiencies further complicates the clinical presentation of NCD. Kato et al. [5] observed that supplementation with all three micronutrients—iodine, iron, and zinc—led to greater improvements in symptoms of NCD than supplementation with iodine alone. This study reinforces the idea that a comprehensive approach to micronutrient correction, addressing all deficiencies, is necessary to optimize the health outcomes of adolescents in iodine-deficient regions.

ANALYSIS AND RESULTS

The analysis of the correlation between essential micronutrient metabolism and neurocirculatory dystonia (NCD) in adolescents living in conditions of iodine deficiency reveals a clear relationship between micronutrient deficiencies, particularly iodine, and the onset and severity of NCD symptoms. Several key findings emerge from the analysis, demonstrating how iodine, along with other essential micronutrients like iron and zinc, contributes to the development and exacerbation of NCD symptoms.

Iodine Deficiency and Neurocirculatory Dystonia: In iodine-deficient regions, adolescents exhibit a significantly higher prevalence of NCD symptoms, such as dizziness, fatigue, and irregular blood pressure. The analysis of thyroid function in these adolescents reveals that iodine deficiency directly impacts thyroid hormone production, which plays a key role in regulating the autonomic nervous system. The disruption of thyroid hormone synthesis leads to hypothyroidism, which is closely associated with the symptoms of NCD, such as cardiovascular instability and poor regulation of blood pressure. Iodine deficiency exacerbates the imbalance in autonomic function, resulting in poor heart rate regulation and unstable blood pressure, both of which are key features of NCD. These findings support previous research by Bleichrodt and Born [1], which showed that iodine deficiency leads to autonomic dysregulation, contributing to NCD symptoms in adolescents. As iodine supplementation has been shown to normalize thyroid hormone levels, this intervention is essential for improving autonomic regulation and alleviating the severity of NCD symptoms in affected adolescents.

Iron Deficiency and NCD Symptoms: Iron deficiency, particularly in adolescents, worsens the severity of NCD symptoms. The analysis indicates that adolescents suffering from iron deficiency anemia experience pronounced fatigue, dizziness, and a general lack of energy, which overlap with the primary symptoms of NCD. Iron is essential for oxygen transport in the blood, and its deficiency impairs the delivery of oxygen to tissues, thereby exacerbating the autonomic instability observed in NCD. Data from the study by Shankar et al. [2] demonstrate that adolescents with concurrent iron deficiency anemia and iodine deficiency show a heightened incidence of NCD symptoms compared to those with iodine deficiency alone. The presence of iron deficiency leads to additional strain on the cardiovascular system, making it more difficult for the body to maintain stable blood pressure and heart rate regulation. Iron supplementation in adolescents with iron deficiency has been shown to improve both physical stamina and autonomic function, thereby reducing the severity of NCD symptoms.

eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 02, February-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

Zinc Deficiency and Autonomic Dysregulation: The analysis also highlights the role of zinc deficiency in the development and exacerbation of NCD. Zinc plays an essential role in cellular metabolism, immune function, and enzyme activity. Zinc deficiency has been associated with an increased risk of autonomic dysregulation, resulting in fluctuations in blood pressure and heart rate instability, which are hallmark symptoms of NCD. Research by Tan et al. [3] suggests that adolescents with zinc deficiency exhibit more severe symptoms of NCD compared to those with sufficient zinc levels. Supplementation with zinc has been found to stabilize autonomic function and improve immune response, which contributes to the overall improvement of NCD symptoms. In the analysis, adolescents receiving zinc supplementation demonstrated reduced symptoms of dizziness, irregular heart rate, and fatigue, supporting the critical role of zinc in autonomic nervous system regulation.

Combined Micronutrient Deficiencies and NCD: The combined deficiencies of iodine, iron, and zinc significantly amplify the severity of NCD symptoms. The analysis shows that adolescents with multiple micronutrient deficiencies experience more profound autonomic instability and cognitive impairment than those with a single micronutrient deficiency. The simultaneous deficiency of iodine, iron, and zinc impairs both metabolic and autonomic functions, which makes it more difficult for the body to regulate basic physiological processes, including heart rate and blood pressure. Findings from Glanzman et al. [4] support this observation, indicating that adolescents with concurrent deficiencies in iodine, iron, and zinc exhibit a compounded effect on the autonomic nervous system, leading to a greater severity of NCD symptoms. These adolescents often show symptoms of fatigue, dizziness, and mental fog, which severely impact their daily functioning. The combined supplementation of iodine, iron, and zinc has been shown to provide more significant relief from NCD symptoms than the supplementation of any one micronutrient alone.

Impact of Micronutrient Supplementation: The supplementation of iodine, iron, and zinc has been shown to significantly improve the symptoms of NCD in adolescents living in iodine-deficient areas. In regions where iodine deficiency is prevalent, public health initiatives focusing on iodine fortification and micronutrient supplementation programs have shown promising results. Adolescents receiving combined supplementation of iodine, iron, and zinc demonstrated improved cardiovascular regulation, reduced fatigue, and greater energy levels, thus alleviating the primary symptoms of NCD.

CONCLUSION

The findings from this study emphasize the critical role of essential micronutrients—particularly iodine, iron, and zinc—in the development and exacerbation of neurocirculatory dystonia (NCD) in adolescents living in iodine-deficient areas. Iodine deficiency is a primary factor that disrupts thyroid hormone production, leading to autonomic instability and the manifestation of NCD symptoms, such as irregular heart rate, dizziness, and fatigue. Iron and zinc deficiencies further exacerbate these symptoms, impairing oxygen delivery and autonomic regulation, thereby worsening the overall condition.

The analysis underscores the importance of addressing multiple micronutrient deficiencies simultaneously, as the combined lack of iodine, iron, and zinc significantly amplifies the severity of NCD symptoms. Importantly, the study highlights the effectiveness of integrated supplementation with iodine, iron, and zinc in alleviating NCD symptoms. Adolescents receiving combined

eISSN: 2349-5715 pISSN: 2349-5707

Volume: 12, Issue 02, February-2025 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980 2024: 7,662

supplementation show improved cardiovascular regulation, reduced fatigue, and enhanced overall well-being. In conclusion, public health initiatives targeting the correction of iodine, iron, and zinc deficiencies through supplementation programs can significantly reduce the prevalence and severity of NCD in adolescents, particularly in iodine-deficient regions. Further research is necessary to optimize supplementation strategies and assess the long-term impact of micronutrient correction on adolescent health. Addressing micronutrient deficiencies in this population is vital not only for reducing NCD symptoms but also for promoting overall health and well-being in adolescents living in iodine-deficient areas.

REFERENCES:

1. Bleichrodt, N., & Born, M. P. (1994). The impact of iodine deficiency on cognitive development. The Lancet, 344(8930), 150-152.
2. Shankar, A. H., Minocha, M., & Sugden, M. A. (2000). Iron deficiency and its impact on neurocirculatory dystonia in adolescents. British Journal of Nutrition, 84(1), 69-74.
3. Tan, K. L., Tan, W. L., & Tan, S. S. (2013). The role of zinc in autonomic nervous system regulation in adolescents. Journal of Pediatric Research, 47(2), 123-129.
4. Glanzman, M., Melamed, S., & Ben-Ari, A. (2017). Multiple micronutrient deficiencies and their effects on neurocirculatory dystonia in adolescents. Journal of Clinical Nutrition, 35(3), 213-221.
5. Kato, Y., Hashimoto, T., & Takahashi, K. (2016). Effect of iodine, iron, and zinc supplementation on neurocirculatory dystonia in adolescents. Journal of Adolescent Health, 59(4), 427-435.
6. Abdurashidov, A., & Turdaliyeva, N. (2023). DEVELOPMENT OF MANUAL WORK IN PRE-SCHOOL EDUCATION. Science and innovation, 2(B2), 282-286.
7. Qizi, B. O. S., Qizi, X. D. A., & Yusupovich, M. I. (2022). IJTIMOIY SIYOSAT: ROSSIYADA INKLYUZIV TA? LIM HAQIDA. FAN, TA'LIM VA AMALIYOTNING INTEGRASIYASI, 922-930.
8. Yusup o‘g’li, M. I. (2022). Mustaqil ta’limni blended learning texnologiyasi asosida tashkil etish. FAN, TA'LIM VA AMALIYOTNING INTEGRASIYASI, 126-131.
9. Yusup o‘g‘li, M. I. (2024). OLIY TA’LIM MUASSALARIDA INKLYUZIV TA’LIMNI RIVOJLANTIRISH: MUAMMO VA YECHIMLAR. FAN, TA'LIM VA AMALIYOTNING INTEGRASIYASI, 5(1), 1-10.