CLINICAL AND STATISTICAL ANALYSIS OF THE RELATIONSHIP BETWEEN COGNITIVE DISORDERS AND THYROID GLAND HORMONES IN HYPOTHYROIDISM

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Annotation: *Hypothyroidism is accompanied not only by somatic disorders, but also by a decrease in cognitive functions. This study is aimed at determining the structure of cognitive impairments in women with hypothyroidism, their relationship with the level of thyroid hormones. The study involved 120 patients diagnosed with hypothyroidism. Cognitive status was assessed using the Addenbrooke's Cognitive Examination (ACE). The results showed a significant difference in the degree and nature of cognitive impairments in subclinical and manifest hypothyroidism, the presence of an inverse correlation between the level of TSH and the total ACE score, and a direct correlation with free T4. The obtained results justify the need for early detection of cognitive impairments in hypothyroidism and treatment based on an individual approach.*

Keywords:*hypothyroidism, cognitive impairment, TSH, free T4, ACE test, psychodiagnostics.*

INPUT

Hypothyroidism is one of the most common chronic disorders of the endocrine system and affects approximately 2–10% of the general population [1,12,20,29,37]. The prevalence of this condition shows a steady increase, particularly among women and elderly individuals, which is associated with both hormonal and age-related metabolic changes [6,15,24,32,40]. Due to its chronic course and systemic effects, hypothyroidism represents an important medical and social problem [3,18,27,34,41].

In recent years, increasing attention has been paid to the relationship between hypothyroidism and cognitive functions [4,9,21,30,38]. This interest is primarily driven by the crucial role of thyroid hormones in the development, maturation, and functional regulation of the central nervous system [2,14,23,35,39]. Thyroid hormones are involved in neuronal differentiation, synaptic plasticity, myelination processes, and cerebral metabolism, all of which are essential for normal cognitive functioning.

Cognitive impairment in patients with hypothyroidism most commonly manifests as decreased attention, memory disturbances, reduced executive functions, and slowing of thinking processes [7,16,26,31,36]. These changes may be subtle at early stages but tend to progress with prolonged hormonal deficiency, leading to significant difficulties in daily activities, professional performance, and social adaptation. As a result, cognitive dysfunction substantially worsens the overall quality of life of affected patients [8,10,13,17,22,25].

Therefore, timely identification of cognitive deficits in individuals with hypothyroidism is of particular importance. Assessing the relationship between cognitive impairment and the hormonal profile, including thyroid-stimulating hormone and thyroid hormone levels, represents a relevant scientific and practical task. A deeper understanding of this association may contribute to earlier diagnosis, optimization of treatment strategies, and prevention of long-term neurological and cognitive consequences [5,11,19,28,33].

Materials and methods

Research Design.

Observation, cross-sectional clinical study.

Respondents. 120 women (32-45 years old) participated in the study. Patients were divided into subclinical (CG, n=62) and manifest hypothyroidism (MG, n=58) groups.

Evaluation methods:

- Thyroid hormones: TSH, free T4
- Cognitive status: Addenbrooke's Cognitive Examination (ACE)
- Statistical analysis: correlation analysis (Pearson r), Student's t-test, $p<0.05$

Results

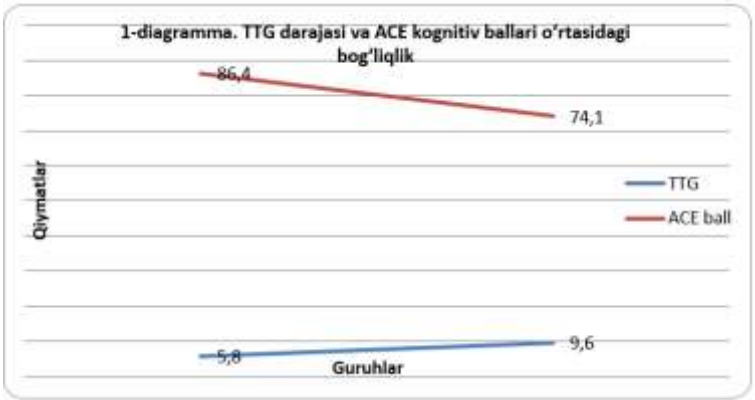
Table 1. Hormonal indicators in the study groups (M±SD)

Indicator	Subclinical hypothyroidism	Manifest hypothyroidism
TSH (mHg/l)	5.8 ± 1.2	9.6 ± 2.1
Free T4 (pmol/l)	13.9 ± 1.4	8.7 ± 1.1

Table 2. Cognitive indicators according to ACE test

Indicator	SG group	MG group
Total ACE Score	86.4 ± 5.2	74.1 ± 6.8
Memory	18.9 ± 2.1	14.7 ± 2.4
Attention	16.2 ± 1.8	12.5 ± 2.0

Diagram estimate



Graph 1 clearly showed a decrease in the total ACE score with an increase in TSH levels. Correlation analysis revealed a strong inverse relationship between TSH and ACE ($r = -0.61$; $p<0.001$). A positive correlation was observed between free T4 and ACE scores ($r = +0.54$; $p<0.001$).

Discussion

The obtained results show that cognitive impairments in hypothyroidism are directly related to hormonal imbalance. In manifest hypothyroidism, cognitive deficit is more profound and complex in nature, with greater impairment of memory and performance functions. This is explained by the influence of thyroid hormones on neuronal metabolism, synaptic plasticity, and neurotransmitter systems.

Conclusion

Cognitive impairments are common in hypothyroidism, the severity of which is closely related to thyroid hormones. An increase in TSH levels is accompanied by a decrease in cognitive functions. This situation indicates the need to introduce cognitive screening in patients with hypothyroidism into clinical practice.

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