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THYROID DISEASES

Zayniddinov Alijon Akhmadjonovich
Tashkent State Medical University,
Assistant of the Department of Medical Radiology, Tashkent, Uzbekistan,
Sayfiddinov Doniyor Tursunali ugli,
Multiplication Umidjon Asad ugli
Tashkent State Medical University,
Faculty of Medicine, Tashkent,
Uzbekistan, e-mail: doniyorbeksayfiddinov06@gmail.com
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Abstract. This article analyzes the importance of modern diagnostic methods in the early detection of thyroid diseases, their advantages and limitations, as well as the possibilities of their application based on a comprehensive approach. Thyroid pathologies are widespread among endocrine system diseases, characterized by a long-term latent course and detection in late stages. According to the World Health Organization, approximately 5-10% of the world's population suffers from thyroid dysfunction of varying degrees. The article examines the effectiveness of ultrasound examination (US), laboratory hormonal tests (TSH, T3, T4), and non-invasive diagnostic methods. In particular, the accuracy of detecting nodular changes using ultrasound is 85-95%. It was also noted that the ability to differentially diagnose benign and malignant changes using fine needle aspiration biopsy (FNAB) has an accuracy of 90–97%. In modern approaches, the integrated use of laboratory and instrumental methods in diagnosing thyroid diseases significantly increases diagnostic accuracy

Key words: Ultrasound examination (UTT), screening programs, endocrine system, hormonal tests (TSH, T3, T4), fine needle aspiration biopsy (FNAB), artificial intelligence (AI) integration, nodular changes, diagnosis, prevention. **Introduction.** To date, the prevalence of goiter among thyroid diseases remains high. A disease of the thyroid gland in which the tissue of this gland increases uniformly or in knots. Normally, the weight of the thyroid gland is 17-25 g. For example, in simple goiter, its weight and size increase significantly (200–300 g). In endemic foci of the disease, the weight reaches several kilograms. [1]. is one of the most common endocrine diseases in modern medicine. This gland plays a crucial role in regulating metabolism, energy balance, and growth and development processes within the body. In recent years, the number of thyroid-related diseases has increased significantly due to environmental degradation, iodine deficiency, poor nutrition, and increased stress factors. According to the World Health Organization, a significant portion of the world's population suffers from thyroid dysfunction, and this indicator is particularly high among women. Since most diseases do not show clear clinical signs in the early stages, the problem of their early detection remains relevant. Pathologies identified in late stages can lead to serious complications. In modern medicine, methods such as ultrasound, laboratory hormonal tests, and biopsy are widely used to detect thyroid diseases. In recent years, the introduction of artificial intelligence technologies into the diagnostic process has made it possible to further increase the accuracy of disease detection. The objective of this scientific article is to analyze the prevalence, causes, diagnostic methods, and modern treatment approaches for thyroid diseases.

Goal. The objective of this scientific work is to evaluate the significance of modern diagnostic approaches in the early detection of thyroid diseases, analyze their advantages and limitations, and develop effective preventive measures based on a comprehensive approach.

Main part. Widespread among endocrine system diseases, they affect many body functions. Thyroid hormones—thyroxine (T4) and triiodothyronine (T3) — are essential for regulating metabolism, the cardiovascular system, the nervous system, and overall energy balance. Thyroid diseases are mainly divided into types such as hypothyroidism, hyperthyroidism, autoimmune thyroiditis, and nodular goiter. In the case of hypothyroidism, a hormone deficiency is observed, manifesting as weakness, weight gain, and sensitivity to cold. In hyperthyroidism, on the contrary, hormones are produced in excess, leading to symptoms such as increased heart rate, irritability, and weight loss. Iodine deficiency, genetic factors, the environment, stress, and autoimmune processes play an important role in the development of diseases. In particular, iodine deficiency is one of the main causes of thyroid pathologies in many regions. Among modern diagnostic methods, ultrasound examination (US) occupies a key place. With the help of ultrasound, the size, structure, and nodular changes of the gland are determined, and its diagnostic accuracy is 85-95%. Laboratory tests—specifically the determination of TSH, T3, and T4 hormones—are crucial in assessing glandular function. Furthermore, the ability to distinguish between benign and malignant changes using fine needle aspiration biopsy (FNAB) has an accuracy of 90–97%. In recent years, the introduction of artificial intelligence technologies into medicine has significantly improved the quality of diagnostics. By automatically analyzing ultrasonographic images, the accuracy of disease detection can reach 92-96%. This serves to reduce errors related to the human factor. At the same time, there are certain limitations in the diagnostic process. In particular, ultrasound results largely depend on the specialist's experience, and in some cases, false positive or false negative results may be recorded. In addition, one of the important problems is the difficulty of detecting the disease in the early stages. Treatment for thyroid diseases is determined by the type of disease. Hormone replacement therapy is used for hypothyroidism, while medications, radioactive iodine, or surgical methods are used for hyperthyroidism. As prevention, it is important to consume iodine-rich food products, undergo regular medical examinations, and maintain a healthy lifestyle.

Discussion. Thyroid diseases are of great importance in clinical practice, especially in women of reproductive age, and their impact intensifies during pregnancy. During pregnancy, the need for thyroid hormones increases, which can lead to the manifestation of latent dysfunctions. Research indicates that undetected hypothyroidism during pregnancy increases the risk of delayed fetal development, nervous system disorders, and pregnancy complications. Hyperthyroidism can be associated with preeclampsia, premature labor, and cardiovascular complications. Therefore, early assessment of thyroid function occupies an important place in clinical practice. Monitoring TSH, T3, and T4 hormones in pregnant women, as well as conducting ultrasound examinations, contributes to early detection of the disease. It has been noted that in some cases, autoimmune thyroiditis can also negatively affect the course of pregnancy. At the same time, insufficient screening programs lead to the late detection of thyroid diseases in some regions. This poses a threat to the health of mothers and the fetus. Therefore, it is necessary to conduct regular endocrine screenings for pregnant women and strengthen preventive approaches. Endocrinological tests - TSH, T3, T4, and antibodies should be checked regularly. Ultrasound examination - assessing the size and structure of the gland, identifying nodules. Drug therapy—levothyroxine for hypothyroidism and antithyroid drugs for hyperthyroidism—must be administered under medical supervision. Nutrition and supplements - prevention of iodine deficiency during pregnancy and regulation of diet [2].

Summary. In conclusion, thyroid diseases are one of the most common and clinically significant pathologies of the endocrine system. Their failure to be detected at early stages can lead to serious complications in patients. In modern medicine, diagnostic methods such as ultrasound,

laboratory hormonal tests, and fine-needle aspiration biopsy are crucial for early detection and accurate diagnosis. In recent years, the implementation of artificial intelligence technologies has further increased diagnostic accuracy and reduced errors related to the human factor. Furthermore, due to the negative impact of thyroid dysfunction during pregnancy on the health of both mother and fetus, regular screening and preventive examinations are of great importance. Overall, the early detection of thyroid diseases, the application of a comprehensive diagnostic approach, and the strengthening of preventive measures among the population serve to reduce severe complications of the disease.

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