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## DYNAMICS OF THYROID CANCER INCIDENCE IN SOME REGIONS OF THE RUSSIAN FEDERATION (LENINGRAD, SARATOV AND SAMARA REGIONS) OVER THE LAST 10 YEARS

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## ДИНАМИКА ЗАБОЛЕВАЕМОСТИ РАКОМ ЩИТОВИДНОЙ ЖЕЛЕЗЫ В ОТДЕЛЬНЫХ РЕГИОНАХ РОССИЙСКОЙ ФЕДЕРАЦИИ (ЛЕНИНГРАДСКАЯ, САРАТОВСКАЯ И САМАРСКАЯ ОБЛАСТИ) ЗА ПОСЛЕДНИЕ 10 ЛЕТ

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**Objective.** To carry out a comparative analysis of the dynamics of thyroid cancer incidence in some regions of the Russian Federation (Leningrad, Saratov and Samara regions) over the last 10 years.

**Materials and methods.** Statistical data from the official statistical reports of the Ministry of Health of the Russian Federation for the Leningrad, Saratov and Samara regions, were analyzed and compared with the data of the literature available on the studied problem from the open statistical and information databases ELibrary.Ru, Web of Science, PUBMED.

**Results.** The conducted study revealed a number of important trends and regularities in the dynamics of thyroid cancer incidence in the Russian Federation. On the basis of the data obtained we can draw a conclusion that thyroid cancer is a relatively rare disease, but the dynamics of its prevalence is inexorably growing.

**Conclusions.** The obtained results can be used to develop more effective measures for prevention and early diagnosis of thyroid cancer. For timely detection of possible changes and development of effective preventive and treatment measures, it is necessary to continue monitoring the incidence of thyroid cancer all over the country.

**Keywords.** Thyroid cancer, incidence, diagnosis, early detection of recurrence, prediction of recurrence, prevention.

**Цель.** Сравнительный анализ динамики заболеваемости раком щитовидной железы в отдельных регионах Российской Федерации (Ленинградская, Саратовская и Самарская области) за последние 10 лет.

**Материалы и методы.** В соответствии с целью исследования осуществлен сравнительный анализ статистических данных из отчетов Минздрава РФ по Ленинградской, Саратовской и Самарской областям с данными научной литературы по исследуемой проблеме из открытых статистических и информационных баз данных ELibrary.Ru, Web of Science, PUBMED.

**Результаты.** Проведённое исследование позволило выявить ряд важных тенденций и закономерностей в динамике распространенности рака щитовидной железы в Российской Федерации. На основании полученных данных можно заключить, что рак щитовидной железы является относительно редким заболеванием, но динамика его распространенности неумолимо растёт.

**Выводы.** Полученные результаты могут быть использованы для разработки более эффективных мер профилактики и ранней диагностики рака щитовидной железы. Для своевременного выявления возможных изменений и разработки эффективных мер профилактики и лечения необходимо продолжать мониторинг заболеваемости раком щитовидной железы на всей территории Российской Федерации.

**Ключевые слова.** Рак щитовидной железы, распространенность, диагностика, раннее выявление рецидивов, прогнозирование рецидивов, профилактика.

## INTRODUCTION

Thyroid cancer (TC) is a malignant neoplasm resulting from abnormal growth of cells in the thyroid gland (TG) [1]. These cells can be either follicular or parafollicular (C-cells). TC is the most common malignant tumor of the endocrine system [2; 3] and is classified into four types.

Papillary TC is the most common type of thyroid cancer, accounting for 60–70 % of cases [4; 5]. It develops slowly and often has an asymptomatic course. Metastases are rare, and the mortality rate is low.

Follicular TC, in turn, constitutes about 20–30 % of all malignant tumors of the thyroid gland. It most commonly occurs in elderly individuals. This form of cancer is characterized by its ability to invade blood vessels [6]. Malignant cells originate from the follicles of the thyroid gland, leading to tumor formation. As the gland enlarges, it becomes easily palpable and causes discomfort or pain. The prognosis for follicular cancer is less favorable than for papillary one. The probability of death directly depends on the rate of spread [6; 7].

Undifferentiated TC, which occurs only in 5–10 % of cases, is a rare but highly aggressive form of TC. It spreads rapidly and is difficult to treat, which leads to high mortality [5; 6]. Microscopic examination reveals a significant difference of tumor cells from healthy ones. This type of cancer often develops from an already existing differentiated tumor or, less commonly, from a nodular goiter.

Medullary TC is the rarest form of thyroid cancer, occurring in only 5 % of patients with endocrine malignancies [7]. It is characterized

by an aggressive course and rapid metastatic spread. It develops from C-cells, which are responsible for calcitonin production. Medullary TC is quite difficult to diagnose in its early stages.

It should be noted that according to the AJCC classification system, TC is divided into four stages, denoted by Roman numerals from I to IV [8]:

Stage I: the tumor is small and located only within the thyroid gland, without affecting its capsule. Symptoms are virtually absent.

Stage II: the tumor grows and extends beyond the thyroid gland, sometimes affecting the lymph nodes nearby. A lump in the neck and hoarseness may appear.

Stage III: the tumor spreads beyond the thyroid gland, affecting lymph nodes and causing neck pain.

Stage IV: the tumor metastasizes to other organs and tissues, such as the lungs or bones, causing a variety of symptoms depending on the site of spread [9; 10].

In recent decades, the incidence of TC has been increasing in many countries, including the Russian Federation, which highlights the relevance of our study.

Therefore, the objective of this study is a comparative analysis of the dynamics of thyroid cancer incidence in selected regions of the Russian Federation (the Leningrad, Saratov, and Samara regions) over the last 10 years.

## MATERIALS AND METHODS

In accordance with the aim of the study, a comparative analysis of the official data from statistical reports of the Ministry of Health of

the Russian Federation for the Leningrad, Saratov, and Samara regions, and the data from scientific literature on the subject obtained from open statistical and information databases such as ELibrary.Ru, Web of Science, and PUBMED was carried out.

## RESULTS AND DISCUSSION

Available statistical data for the period from 2014 to 2023 were analyzed while carrying out the study. The analysis of these data revealed that the incidence of thyroid cancer (TC) shows a steady upward trend (Fig. 1).

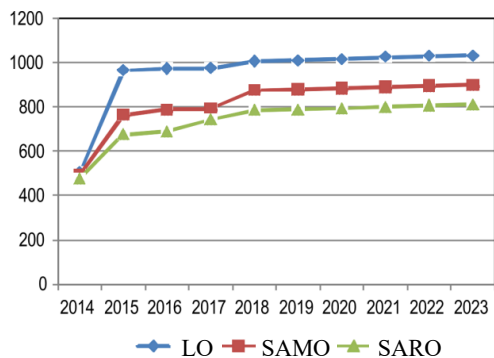


Fig. 1. Statistical data on TC incidence in the Leningrad, Saratov, and Samara Regions from 2014 to 2023: LO – Leningrad Region; SAMO – Samara Region; SARO – Saratov Region

Over the past decades, the number of people affected by TC in the Russian Federation has increased significantly. The number of patients rose by almost 45 %: from 8,900 in 2014 to 11,500 in 2023 [11–13]. In certain regions, the growth in TC incidence was particularly noticeable. For example, in the Leningrad Region, the number of cases increased by 3.5 % from 2018 to 2019. In the Samara Region, the increase was 10.8 %, and in the Saratov Region – 5.9 %. De-

spite this, it was the Leningrad Region that showed the highest level of TC incidence.

Thyroid cancer may occur for various reasons [14–18], both external that is, related to the environment and internal. External factors that can contribute to the development of TC most often include:

1. Ionizing radiation: exposure from external sources or accumulation of radioactive substances inside the body [19].

2. Iodine deficiency or excess: iodine is an essential element for proper thyroid function; its deficiency or excess can lead to certain disorders, especially affecting the endocrine system as a whole [20–21].

3. Poor diet: deficiency of essential nutrients and consumption of harmful foods may effect thyroid health [22] unfavorably.

4. Occupational hazards: exposure to chemicals that may damage the thyroid gland [23].

Internal factors contributing to the development of TC include mutations in the BRAF, PTEN, APC, DICER1, MNG, NRAS, KRAS, and TERT genes; hormonal imbalances; and hereditary syndromes such as Gardner's syndrome, Cowden syndrome, and multiple endocrine neoplasia types 2A and 2B [24–27].

Overall, the success of TC treatment depends on early detection, appropriate selection of surgical intervention extent, and the implementation of additional therapy when needed. Postoperative follow-up includes regular examinations to reveal any recurrence and to administer necessary treatment.

Undoubtedly, close cooperation between primary care physicians and endocrinologists, surgeons, and oncologists is crucial. Such collaboration can enhance prevention, early diag-

nosis, and postoperative management, helping to prevent complications and recurrences. It is also very important to provide patients` training in order to raise their awareness about TC and its prevention.

### CONCLUSIONS

The conducted study revealed a number of important trends and patterns in the dynamics of thyroid cancer prevalence in the Russian Federation. The obtained results can be used to develop more effective measures for the prevention and early diagnosis of TC<sup>1</sup>. In order to promptly detect potential changes and develop effective preventive and therapeutic strategies, it is necessary to continue monitoring the incidence of thyroid cancer throughout the entire territory of the Russian Federation.

### REFERENCES

1. Clinical guidelines. Differentiated thyroid cancer. Coding according to the International Statistical Classification of Diseases and Related Health Problems: C 73. Age group: adults. Moscow 2020 (in Russian).
2. Rummyantsev P.O., Ilyin A.A., Rummyantseva U.V., Saenko V.A. Thyroid cancer: modern approaches to diagnosis and treatment. Moscow: GEOTAR-Media 2009; 448 (in Russian).
3. Balabolkin M.I., Klebanova E.M., Kreminskaya V.M. Fundamental and clinical thyroidology. Moscow: Medicine 2007; 816 (in Russian).
4. Deng Y., Li H., Wang M, et al. Global burden of thyroid cancer from 1990 to 2017. *JAMA Netw Open.* 2020; 3 (6): e208759. DOI: 10.1001/jamanetworkopen.2020.8759
5. Berstein L.M. Thyroid cancer: epidemiology, endocrinology, factors and mechanisms of carcinogenesis. *Practical Oncology* 2007; 8 (1): 1–8 (in Russian).
6. Barchuk A.S. Recurrences of differentiated thyroid cancer. *Practical Oncology* 2007; 8 (1): 35 (in Russian).
7. International experience in the study of thyroid diseases (based on the materials of the journal “Thyroid International”). Moscow: RCT Sovero Press 2004; 296 (in Russian).
8. Amin M.B., Greene F.L., Edge S.B., et al. The Eighth Edition AJCC Cancer Staging Manual: Continuing to build a bridge from a population-based to a more “personalized” approach to cancer staging. *CA Cancer J Clin.* 2017; 67 (2): 93–99. DOI: 10.3322/caac.21388
9. Kane S.M., Mulbern M.S., Poursbabi-di L.K., et al. Micronutrients, iodine status and concentrations of thyroid hormones: a systematic review. *Nutr Rev.* 2018; 76 (6): 418–431. DOI: 10.1093/nutrit/nuy008
10. Egorov P.I., Tsfasman A.3. Radioactive iodine in the diagnosis and treatment of thyroid diseases. Moscow 1962; 247 (in Russian).
11. Reshetov I.V., Romanchishen A.F., Gostimsky A.V. Thyroid cancer. Moscow, 2020; 55 (in Russian).

<sup>1</sup> Certificate of State Registration of a Computer Program № 2024689824 dated 11.12.2024. Application dated 28.11.2024. Polidanov M. A., Petrunkin R. P., Kudashkin V. N., Volkov K. A., Kravchenya A. R., Rafeeva P. D., Trukhina M. K., Kapralov S. V., Amirov E. V., Maslyakov V. V. A system for predicting recurrence after surgical intervention for thyroid cancer.

12. *Kaprin A.D., Starinsky V.V.* Malignant neoplasms in Russia in 2015 (morbidity and mortality). Moscow 2017; 33: 151 (in Russian).
  13. *Merabishvili V.M.* Oncologic statistics (traditional methods, new information technologies). Part 2. Saint Petersburg: KOSTA 2015; 248 (in Russian).
  14. *Belcevic D.G., Vanushko V.E., Rumyantsev P.O. et al.* Russian clinical guidelines for the diagnosis and treatment of highly co-differentiated thyroid cancer in adults. *Endocrine Surgery* 2017; 1 (11): 6–27 (in Russian).
  15. *Mallick W.K., Harmer K., Mazzaferri E.L., Kendall-Taylor P.* Thyroid treatment tactics. *Interdisciplinary Concepts* 2022; 15: 175–203 (in Russian).
  16. *Makarov I.V., Pismenny I.V., Pismenny V.I., Galkin R.A., Ruzanova A.A.* Features of diagnosis and treatment of malignant neoplasms of the thyroid gland. *Perm Medical Journal* 2022; 39 (5): 41–47 (in Russian).
  17. *Yoon J.H., Lee H.S., Kim E.K., et al.* Malignancy risk stratification of thyroid nodules: comparison between the thyroid imaging reporting and data system and the 2014 American thyroid association management guidelines. *Radiology*. 2016; 278 (3): 917–924. DOI: 10.1148/radiol.2015150056
  18. Formation of oncologic risk groups using digital technologies: methodical recommendations for doctors, residents and students. Ed. by A.F. Lazarev. Barnaul 2020; 68 (in Russian).
  19. *McLeod D.S., Watters K.F., Carpenter A.D. et al.* Thyrotropin and thyroid cancer diagnosis: a systematic review and dose-response meta-analysis. *J Clin Endocrinol Metab* 2012; 97: 2682–2692.
  20. *Choi J.S., Kim E.K., Moon H.J. et al.* Higher body mass index may be a predictor of extrathyroidal extension in patients with papillary thyroid microcarcinoma. *Endocrine* 2015; 48 (1): 264–271.
  21. *Paches A.I.* Tumors of the head and neck. 4th ed. Moscow: Medicine 2000; 379–407 (in Russian).
  22. *Thomas G.* Radiation and thyroid cancer—an overview. *Radiat Prot Dosimetry* 2018; 182 (1): 53–57. DOI: 10.1093/rpd/ncy146
  23. *Sergiyko S.V., Lukyanov S.A., Titov S.E., Veryaskina Yu.C. i dr.* Modern trends, paradigms and misconceptions in the diagnosis and treatment of nodular neoplasms of the thyroid gland. *Tavrisheskiy Mediko-Biologicheskiy Vestnik* 2021; 24 (2): 150–155 (in Russian).
  24. *Bonavita J.A., Mayo J., Babb J., et al.* Pattern recognition of benign nodules at ultrasound of the thyroid: which nodules can be left alone? *AJR Am J Roentgenol.* 2009; 193: 207–213.
  25. *Brzbezovsky V.J.* Tumors of the thyroid gland. Tumors of the head and neck. 5th ed., supplement. and revision. Moscow: Practical Medicine 2013; 339–359 (in Russian).
  26. *Allelein S., Eblers M., Morneau C., et al.* Measurement of Basal Serum Calcitonin for the Diagnosis of Medullary Thyroid Cancer. *Hormone and Metabolic Research* 2017; 50 (1): 23–28.
  27. *Alexander E.K., Cooper D.* The importance, and important limitations, of ultrasound imaging for evaluating thyroid nodules. *JAMA Intern Med* 2013; 173: 1796–1797.
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**Limitation of the study.** The study complies with the Declaration of Helsinki and was

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