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THE IMPACT OF THE COVID-19 PANDEMIC AND THE WAR ON THE EARLY DETECTION OF THYROID CANCER IN UKRAINE (BASED ON AN ANALYSIS OF TEN YEARS OF DATA)

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Abstract

Introduction. The problem of thyroid cancer requires increased attention to prevention and early detection of pathology.
Aim. To analyze indicators of timely detection of thyroid cancer in Ukraine over the last decade.
Materials and methods. According to data from the National Cancer Registry of Ukraine for 2014-2024, national, regional, and gender indices were analyzed: incidence rate, % detection of thyroid cancer during preventive examinations, distribution of newly detected cases by stages, and one-year fatality rate.
Results. Despite the visually detectable nature of thyroid cancer, between 2015 and 2024, 20-25% of cases were detected at stages III-IV. The incidence of thyroid cancer among women is 3.5-4.5 times higher than among men, and as of 2019, their standardized indicators were practically the same as the global ones, amounting to 10.5 per 100,000 women and 2.8 per 100,000 men. During the lockdown in 2020-2021, the incidence of thyroid cancer and its detection during preventive examinations decreased significantly. The full-scale war was accompanied by a further decline in the detection of thyroid cancer during medical check-ups and an increase in its detection at stages III-IV in southern and eastern Ukraine. Both before and during the lockdown and war, the best situation in terms of early detection of thyroid cancer was observed in Kyiv, where the people had the best access to medical care. It was found that the lower incidence of thyroid cancer in men was accompanied by higher one-year fatality rates, along with a lower percentage of cases detected during preventive examinations in the pre-war period. There are negative correlations between detecting thyroid cancer during medical check-ups and the diagnosis at stages III-IV (rxy= –0.82) and one-year fatality rate (–0.54), as well as positive correlations between the early detection of thyroid cancer and one-year survival rate (0.59).
Conclusions. The COVID-19 pandemic and the full-scale war with russia have negatively affected the timeliness of detection and survival rates for thyroid cancer. This points to the need for adequate strategies to improve the accessibility of preventive services for the population, especially in the face of global threats.

Keywords: **thyroid cancer, prevention, early detection, management, public health, healthcare system, accessibility of medical services, global threats**

INTRODUCTION

Over the past decades, the incidence of thyroid cancer has increased significantly worldwide and in Ukraine [1-2]. According to GLOBOCAN estimates for incidence and mortality rates, published by Lancet in 2022, age-standardized incidence rates in 2020 were 10.1 per 100,000 women and 3.1 per 100,000 men [2].

The diagnostics and treatment of thyroid cancer are long-term and costly and therefore make a significant burden on healthcare systems [3] and require management efforts aimed at prevention and early detection, particularly in countries with limited resources [4].

Most researchers attribute the increase in the incidence of thyroid cancer to both improved

diagnostics [5] and a true increase in the pathology due to the negative impact of environmental factors, primarily iodine deficiency and radiation contamination [6-7].

For Ukraine, thyroid cancer is an important issue, as a significant part of its territory was exposed to radiation after the Chernobyl accident [6]. According to research conducted by the V.P. Komisarenko Institute of Endocrinology and Metabolism of the National Academy of Medical Sciences of Ukraine, it has been established that virtually the entire territory of Ukraine, and not just its western regions as previously thought, is an iodine-deficient zone to one degree or another [7].

It is well known that the accessibility of medical care has a significant impact on incidence rate. In this regard, it should be noted that most healthcare systems in 2019-2021 faced the adverse impact of the COVID-19 pandemic on the timely detection of cancers [8]. In addition, since 2022, Ukraine has been living in the realities of a full-scale war with russia, accompanied by an increase in demographic and socio-economic problems, which leads to a decrease in the accessibility of healthcare and therefore negatively affects the population health [9].

AIM

To analyze the indicators of timely detection of thyroid cancer in Ukraine over the last decade, in the pre-pandemic years 2014-2019, after the national lockdown due to the COVID-19 pandemic (2020-2021), and after the start of full-scale war with russia (2022-2024).

MATERIALS AND METHODS

According to the annual reports of the National Cancer Registry of Ukraine for 2014-2024 [10], which contain online data for the current year and additional data for the previous year, a cross-sectional study was conducted. The following indicators were analyzed: incidence rate, % detection of thyroid cancer during preventive examinations, distribution of newly detected cases by stages, and one-year fatality rate. The indicators were analyzed for the whole of Ukraine, by gender, and summarized for certain regions: West (Volyn, Zakarpattia, Ivano-Frankivsk, Lviv, Rivne, Ternopil, Khmelnytskyi, and Chernivtsi regions), East (Dnipropetrovsk, Zaporizhzhia, Kharkiv regions), Center (Vinnytsia, Zhytomyr, Kyiv, Kirovohrad, Poltava, Sumy, Cherkasy, Chernihiv regions), South (Mykolaiv, Odesa, Kherson regions) and Kyiv city. Since the annexation of the Autonomous Republic of Crimea and parts of the Donetsk and Luhansk regions in 2014 no data has been received. Therefore, these regions were not included in the study. Since the start of the full-scale invasion by russia, due to the lack of accurate data on the population of Ukraine, the National Cancer Registry has not published data on incidence rate and death rate.

A database was created on the Microsoft Excel platform to process and present the obtained materials. Indicators for certain regions of Ukraine were calculated as the mean of indicators for territories belonging to a specific region. To test hypotheses about the relationship between the percentage of new cases of thyroid cancer detected during preventive examinations, incidence rates and indicators of late detection, we used Pearson's paired correlation-regression analysis [11] using the STATISTICA.10 program.

RESULTS

It has been established that the age-standardized incidence rates of women with thyroid cancer in Ukraine in 2019 (before the 2020 lockdown and the 2022 war) were 10.5 per 100,000 of the corresponding population, and 2.8 for men.

Moreover, the incidence rates of thyroid cancer among women remained 3.5-4.5 times higher than among men throughout the entire observation period (Table 1).

Table 1

Crude Incidence Rates of Thyroid Cancer (per 100,000 Population), Adjusted Rates 2014-2023

Region	population	2014	2015	2016	2017	2018	2019	2020	2021	2022-2023
Ukraine	women	12,6	13,4	13,2	12,8	13,9	14,2	11,0	12,7	NDA
Ukraine	men	3,6	3,2	3,0	3,5	3,8	3,8	3,0	3,3	NDA
Ukraine	all population	8,4	8,7	8,5	8,4	9,2	9,3	7,3	8,3	NDA
West	all population	4,2	4,7	5,0	5,1	5,0	5,7	4,4	6,8	NDA
East	all population	6,6	7,8	8,0	7,8	8,6	8,7	7,5	8,1	NDA
Center	all population	11,2	11,9	10,9	11,7	11,5	10,9	8,4	8,1	NDA
South	all population	8,7	7,8	7,8	7,0	9,5	10,4	8,3	9,8	NDA
Kyiv	all population	19,2	17,3	15,7	14,2	17,8	17,9	12,5	13,8	NDA

NB: NDA – no data available.

From 2014 to 2019, the incidence rates of thyroid cancer gradually increased, in 2020 it decreased significantly (–22.5% in women and –21.1% in men), in 2021 the incidence rates increased slightly, but did not reach the 2019 level.

An increase in the incidence of thyroid cancer in the pre-pandemic period was observed in all regions of the country, except for the Center and Kyiv, where its levels remained consistently high throughout the observation

period, with the highest rates in the capital. The lowest incidence rates of thyroid cancer were in the West.

Most new cases of thyroid cancer were detected at early stages of the I-II. However, almost every fourth to fifth Ukrainian patient with thyroid cancer (20.6-24.5%) was admitted to healthcare facilities at late stages III-IV (Table 2).

Late detection rates for thyroid cancer remained consistently high in western Ukraine, while the lowest rates were observed in Kyiv. Since 2022, a significant increase in this indicator has been observed in the East and South.

The fatality rate within one year of diagnosis showed a generally downward trend in Ukraine (Table 3). Its lowest levels were in Kyiv, and the highest were in western and eastern Ukraine.

As can be seen in Fig. 1, the one-year survival rate for men is worse than for women, although the difference is gradually decreasing.

Table 2

Detected Cases of Thyroid Cancer in Stages III-IV (%), Online Data 2015-2024

Region	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Ukraine	22,1	23,4	24,5	23,7	23,5	22,8	20,2	24,0	22,6	20,6
West	32,5	31,3	31,8	33,5	24,7	27,4	23,3	27,8	27,4	29,1
East	27,3	24,8	28,8	28,5	25,8	27,5	23,6	38,1	30,4	28,5
Center	22,7	25,5	26,0	21,9	25,7	21,2	18,7	22,5	18,2	17,8
South	16,7	23,8	28,9	28,8	29,2	28,0	27,3	28,7	32,7	34,5
Kyiv	14,9	13,7	15,8	16,0	13,5	12,8	12,8	15,9	14,4	16,5

Table 3

Percentage of Patients Who Lived Less than One Year Since the Diagnosis of Thyroid Cancer in the Previous Year, Online Data 2015-2024

Region	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Ukraine	5,2	3,9	4,3	4,5	3,4	3,9	4,0	2,8	3,3	2,5
West	10,1	6,5	6,8	7,5	5,5	5,9	7,9	4,7	3,9	3,8
East	5,9	7,4	5,1	5,6	6,5	5,9	3,1	3,7	3,9	4,2
Center	4,7	2,6	4,2	4,4	2,9	4,3	4,0	2,2	4,4	2,3
South	4,7	3,7	4,3	5,0	1,6	1,9	3,2	3,1	1,9	1,2
Kyiv	2,1	1,3	1,4	1,5	0,4	1,0	2,5	1,6	2,7	1,1

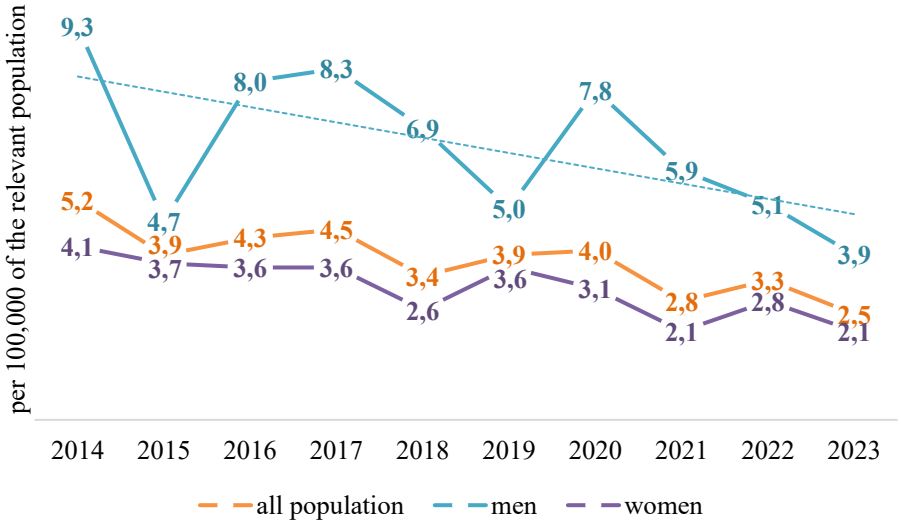

Figure 1. Percentage of patients who lived less than one year since the diagnosis of thyroid cancer in the previous year, by gender, adjusted rates 2014-2023.

Over the years of observation, the percentage of thyroid cancer detection during preventive medical examinations has decreased significantly (Table 4): in Ukraine as a whole, from 56.4% in 2015 to 32.2-33.4% after 2022 (on-line data).

The indicator remained consistently high in the capital (around 90%). Between 2015 and 2019, the indicator was lowest in eastern and western Ukraine, in 2021, it practically evened out in all regions, but after 2022, it showed high rates of decline, especially in the East (–62.6% in 2024 compared to 2015), the South (–68.1%), and Central Ukraine (–54.5%).

Table 4

Detection of Thyroid Cancer During Preventive Medical Examinations (%), Online Data 2015-2024

Region	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Ukraine	56,4	50,6	51,7	52,0	49,6	45,2	42,6	33,4	32,2	32,7
West	38,2	41,5	38,4	38,6	35,2	30,5	28,6	24,9	26,3	26,7
East	33,9	33,2	39,5	38,8	34,2	34,9	32,4	8,6	7,1	12,7
Center	54,3	50,3	50,3	52,0	49,2	41,4	35,6	23,3	25,0	24,7
South	66,3	45,9	40,8	41,8	41,2	34,6	32,6	24,7	20,2	21,2
Kyiv	86,0	86,3	86,8	86,2	86,7	88,8	89,6	84,4	88,1	90,7

According to updated data for 2014-2023 (Fig. 2), these indicators turned out to be even lower, with a significant decline observed first during the COVID-19 pandemic and then after the start of full-scale war. During 2014-2021, the percentage of cases of thyroid cancer detected during preventive medical check-ups was usually slightly higher among women than among men. However, in 2022-2023, it became a bit higher among men than among women.

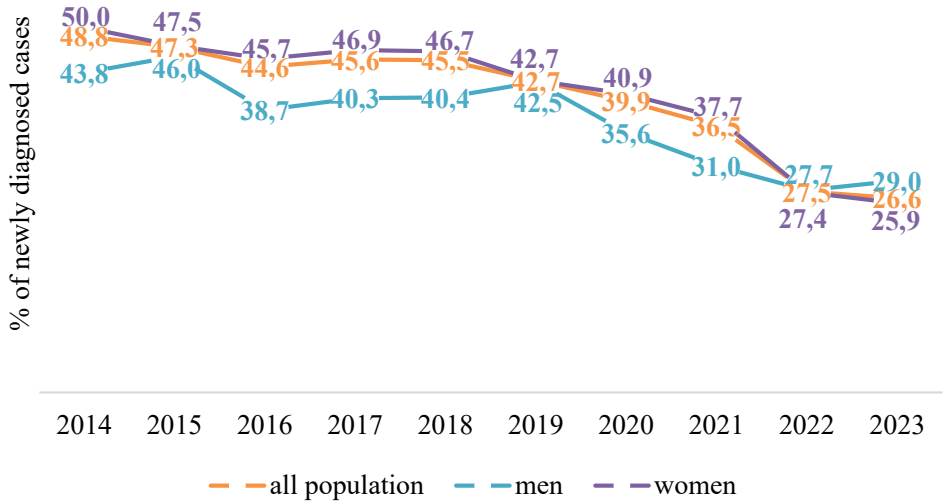

Figure 2. Percentage of patients diagnosed with thyroid cancer during preventive medical examinations, by gender, adjusted rates 2014-2023.

It has been proven (Table 5) that there is a direct strong correlation between the percentage of detected cases of thyroid cancer during preventive examinations and the incidence rate (rxy = 0.81; $p < 0.05$), an inverse strong correlation with the percentage of cases detected at stages III-IV (rxy = 0.82; $p < 0.05$), and an inverse moderate correlation with one year fatality rate (rxy = –0.54; $p < 0.05$), as well as a direct moderate correlation between the percentage of cases detected at stages III-IV and one year fatality rate (rxy = 0.59; $p < 0.05$).

Table 5

Correlation Matrix of Early Detection Indicators for Thyroid Cancer (Rxy)

Indexes	Detected at stages III-IV, %	Lived less than a year since the diagnosis in the previous year, %	Diagnosed during preventive medical examinations, %	Incidence rate, per 100 000 of population
Detected at stages III-IV, %	1,000000	0,588483	-0,821584	-0,744049
Lived less than a year since the diagnosis in the previous year, %	0,588483	1,000000	-0,540876	-0,778523
Diagnosed during preventive medical examinations, %	-0,821584	-0,540876	1,000000	0,810762
Incidence rate, per 100 000 of population	-0,744049	-0,778523	0,810762	1,000000

NB. Marked correlations are significant at $p < 0.05$.

DISCUSSION

Our study found that in Ukraine, as in the rest of the world [1-2], the incidence rates of thyroid cancer among women are 3.5-4.5 times higher than among men, and as of 2019, the standardized rates were practically the same as the global ones [2]. During the 2020-2021 quarantine, the incidence of thyroid cancer decreased significantly, as did its detection during preventive check-ups. Other researchers have observed similar trends regarding the negative impact of the COVID-19 pandemic on the detection of cancers [8, 12], explaining them mainly by the limited access of the population to preventive services [12]. In Ukraine, the situation with access to medical care worsened even further after russia's full-scale aggression in 2022 [9], which, as shown in our study, was followed by the largest decrease in the detection of thyroid cancer during preventive examinations and an increase in its diagnosis at stages III-IV in southern and eastern Ukraine. At the same time, even before the lockdown and the war, the highest rates of incidence and detection of thyroid cancer during preventive examinations, as well as the lowest rates of detection at stages III-IV and one-year fatality rates, were observed in Kyiv, where all types of medical care, including specialized expert-level care, are most accessible. The opposite situation was observed in the western regions of Ukraine, which have always been associated with the highest iodine deficiency [7]. All these facts emphasize the leading role of accessibility and appropriate preventive technologies in the early detection of thyroid cancer. Although the impact of the Chernobyl accident should not be dismissed [6]. After all, in central Ukraine, where radiation contamination was most severe, the highest incidence rates of thyroid cancer have been consistently recorded throughout the last decade.

Another confirmation of the hypothesis about the impact of the availability of preventive technologies on the timely detection of thyroid cancer was the gender differences in the indicators. This is because the lower incidence rates of thyroid cancer in men were accompanied by higher one-year fatality rates than in women throughout the entire observation period. This occurred even though, thanks to modern treatment technologies, survival rates for cancers have improved worldwide in recent decades [13]. Our study also showed that before the war, the percentage of cases of thyroid cancer detected during preventive examinations was significantly lower among men than among women, which coincides with data from other researchers regarding lower healthcare-seeking activity among men, their poorer compliance with timely screening and visits to physicians [14]. And only after the start of full-scale war, because of more extensive medical check-ups of men to determine their readiness for military service, the levels of these indicators became slightly higher among men than among women.

The data obtained in the study may explain why, despite the visibly apparent form of thyroid cancer, 20-25% of its cases are detected at late stages III-IV, which make a significant burden on the healthcare system [3]. Moreover, proven inverse correlations between the detection of thyroid cancer during preventive medical check-ups and the frequency of diagnosis at advanced stages and one-year fatality rates, as well as a direct correlation between late detection of thyroid cancer and one-year fatality rates, indicate an unfavorable prognosis for the future and the need for adequate management strategies at the national, regional, and community levels.

Limitations of the study. The study is descriptive and cross-sectional, and therefore its results can only be used to generate hypotheses about the relationship between the studied indicators and the availability and adherence to preventive technologies in healthcare facilities. Testing of these hypotheses should be carried out in a future analytical epidemiological study.

CONCLUSIONS

It has been established that the COVID-19 pandemic and full-scale war with the russian federation were accompanied by a decrease in the detection of thyroid cancer during preventive examinations, and, accordingly, a decrease in incidence rates and a forecast of an increase in neglected forms and a deterioration in survival rates.

The data obtained in the study on the ten-year dynamics of general, regional, and gender incidence rates and timely detection of thyroid cancer allow us to hypothesize that the accessibility of and adherence to preventive service standards have a primary impact on them and require appropriate management measures at the national, regional, and community levels, particularly in the conditions of global threats.

Perspectives for further research will consist of testing the hypotheses put forward during an analytical epidemiological study.

COMPLIANCE WITH ETHICAL REQUIREMENTS

The design and program of the study were reviewed and approved by the Ethics Commission of the State Institution «V. P. Komisarenko Institute of Endocrinology and Metabolism of the National Academy of Medical Sciences of Ukraine», which verified its compliance with the principles of the Declaration of Helsinki (Protocol No. 52-KE of 22.10.2024).

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The study has no external sources of funding. The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

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Резюме

ВПЛИВ ПАНДЕМІЇ COVID-19 ТА ВІЙНИ НА ВЧАСНІСТЬ ВИЯВЛЕННЯ РАКУ ЩИТОПОДІБНОЇ ЗАЛОЗИ В УКРАЇНІ (ЗА ДАНИМИ АНАЛІЗУ ДЕСЯТИРІЧНОЇ ДИНАМІКИ ПОКАЗНИКІВ)

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Вступ. Проблема раку щитоподібної залози (РЩЗ) потребує посиленої уваги до профілактики та раннього виявлення патології.
Мета. Проаналізувати індикатори вчасності виявлення РЩЗ в Україні за останнє десятиріччя.
Матеріали та методи. За даними Національного канцер-реєстру України за 2014-2024 рр. проаналізували національні, регіональні та гендерні показники: захворюваності, % виявлення РЩЗ під час профілактичних оглядів, розподілу вперше виявлених випадків по стадіях, летальності до року.
Результати. Попри візуальність РЩЗ, впродовж 2015-2024 рр. 20-25% його випадків виявлялись на пізніх III-IV стадіях. Захворюваність жінок на РЩЗ у 3,5-4,5 разів вища, ніж чоловіків, і станом на 2019 рік їх стандартизовані показники практично не відрізнялись від загальносвітових та становили 10,5 на 100 тисяч жінок та 2,8 – у чоловіків. Під час локдауну 2020-2021 рр. суттєво знизилась захворюваність на РЩЗ та його виявлення під час профілактичних оглядів. Повномасштабна війна супроводжувалась подальшим зниженням виявлення РЩЗ під час профілактичних медичних оглядів та зростанням його виявлення на III-IV стадії на Півдні та Сході України. Показано, що як до локдауну та війни, так і під час них найліпша ситуація щодо вчасного виявлення РЩЗ спостерігалась в м. Києві, де найоптимальніший доступ населення до всіх видів медичної допомоги. З'ясовано, що нижча захворюваність на РЩЗ чоловіків супроводжувалась вищою летальністю до року на тлі нижчого відсотка виявлених випадків під час профілактичних оглядів у довоєнний період. Доведені зворотні кореляційні взаємозв'язки між виявленням РЩЗ на профілактичних медичних оглядах з частотою діагностування на III-IV стадіях (rxy = -0,82) та летальністю до року (–0,54), а також прямий взаємозв'язок між вчасністю виявлення РЩЗ та річною виживаністю (0,59).
Висновки. Пандемія COVID-19 та повномасштабна війна з російською федерацією негативно вплинули на вчасність виявлення та виживаність при РЩЗ. Це, на тлі встановлених особливостей десятирічної динаміки регіональних та гендерних показників, виявлених кореляційних взаємозв'язків, вказує на потребу адекватних управлінських рішень із поліпшення доступності для населення профілактичних послуг в умовах загроз глобального характеру.

Ключові слова: **рак щитоподібної залози, профілактика, раннє виявлення, менеджмент, громадське здоров'я, система охорони здоров'я, доступність медичних послуг, глобальні загрози**

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