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Prystash Yu.Ya.**Trends in the incidence of malignant tumors in Ukraine in 2014–2019 on the example of lung and breast cancer**State Non-Profit Enterprise «Danylo Halytsky Lviv
National Medical University»,
Lviv, UkraineЛукавецький Н.О., Володько Н.А., Гіпп І.Г.,
Присташ Ю.Я.**Тенденції захворюваності на злоякісні пухлини в Україні в 2014–2019 рр. на прикладі раку легень та грудної залози**Державне некомерційне підприємство «Львівський
національний медичний університет імені Данила
Галицького», м. Львів, Українаlukavetsky@ukr.net**Introduction**

The recent geopolitical and epidemiological events in Ukraine have had a profound impact on the nation's demographic, security, and economic landscape. The onset of armed conflict in 2014, the COVID-19 pandemic in 2020–2021, and the full-scale Russian invasion in 2022 have collectively triggered large-scale disruptions across Ukrainian society.

Despite these challenges, the Ukrainian healthcare system has demonstrated notable resilience, maintaining functionality – including the continuity of oncological care. However, previously observed patterns and trends in cancer incidence and distribution, which had been gradually established over the years, have been significantly disrupted by these unprecedented societal shocks. These developments represent some of the most substantial challenges to public health in Europe since the World War II.

In this context, it is essential to reassess available epidemiological data to better understand the magnitude of change in cancer incidence and distribution, particularly in relation to lung and breast malignancies. This analysis aims to evaluate current trends, regional variability, and implications for oncology service delivery and treatment capacity in Ukraine.

The aim of this study is to investigate the trends in the incidence of malignant neoplasms (MNs) in Ukraine during the period from 2014 to 2019, with a specific focus on lung cancer in men and breast cancer in women. The selection of these particular cancer types is based on their leading positions in the national incidence structure among the male and female populations, respectively.

Object, materials and research methods

To assess the investigated indicators, data from the Ukrainian National Cancer Registry (UNCR) for

the years 2014–2019 were used [1–6]. Due to the complete lack of such data for the Autonomous Republic of Crimea, this territory was temporarily excluded from our study.

The following indicators were determined in the study:

Number of malignant neoplasm (MN) cases (C00–C96 according to ICD-10 codes), (males and females);

Number of lung cancer cases in males (C33–C34 according to ICD-10 codes);

Number of breast cancer cases (C50 according to ICD-10 codes);

Age structure of MN incidence, % (males and females);

Sex and age-specific indicators of incidence (lung cancer in males and breast cancer in females) – number of disease cases; age-specific incidence rate (in 5-year age groups) per 100,000 population.

All indicators were calculated based on UNCR data separately for the years 2014, 2015, 2016, 2017, 2018, and 2019, using the updated data clarified during the following year.

The study applied methods of structural-logical and medical-statistical analysis.

Research results

Trends in Cancer Incidence. In 2019, a total of 138,509 cancer cases were registered in Ukraine, reflecting an increase in incidence of 2.37% compared to 2014 (135,307 cases). When analyzing the structure of malignant neoplasms (MNs), it is noted that among men, the incidence grew by nearly 1% (65,415 cases in 2014 compared to 66,021 in 2019). In contrast, the number of cases in women increased by 3.7%, from 69,892 cases in 2014 to 72,488 in 2019.

The number of lung cancer cases in men decreased from 10,866 (2014) to 10,126 (2019), representing a decline of 6.8%. At the same time, the proportion of lung cancer cases (among the top 10 most common cancer types) in the overall cancer incidence structure

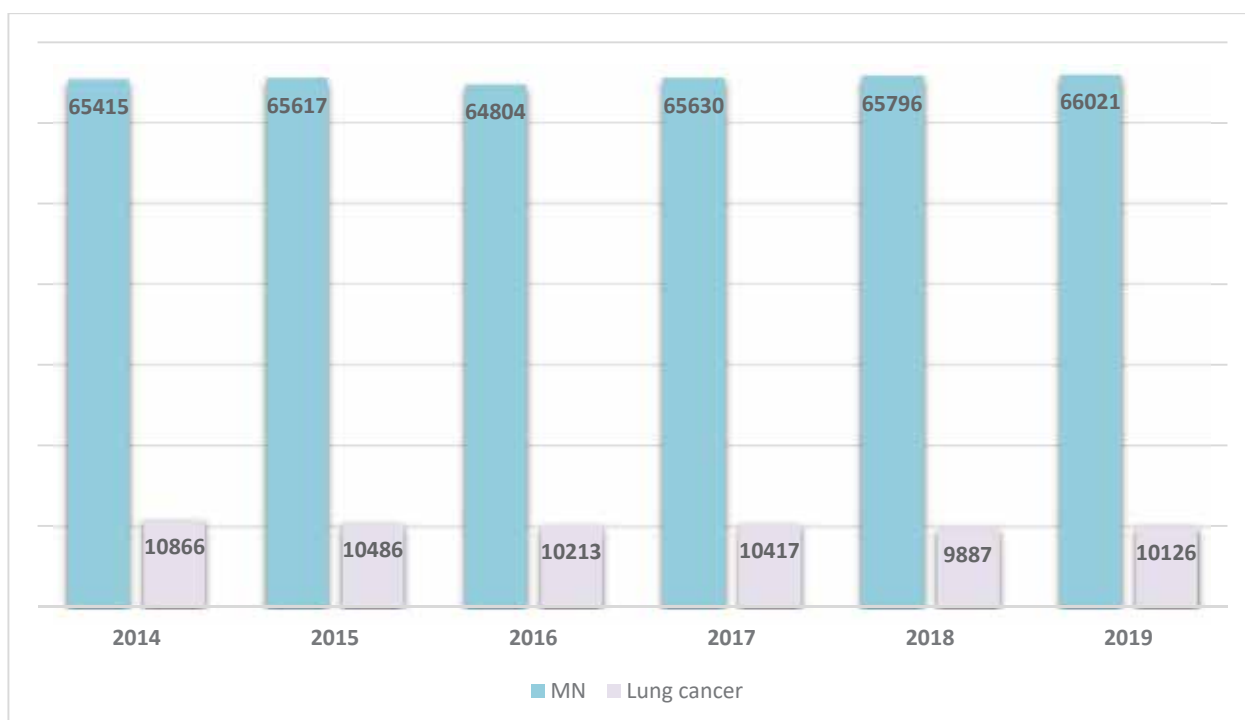


Fig. 1. Incidence of MN in the general population and lung cancer in men

in Ukraine slightly decreased from 16.6% in 2014 to 15.3% in 2019.

The analysis of breast cancer incidence over the studied period revealed a reverse trend, with the number of breast cancer cases in women increasing

from 13,641 in 2014 to 14,720 in 2019, reflecting a rise of 7.9%.

At the same time, the proportion of breast cancer cases in the overall structure of cancer incidence among women in Ukraine (among the top 10 most common

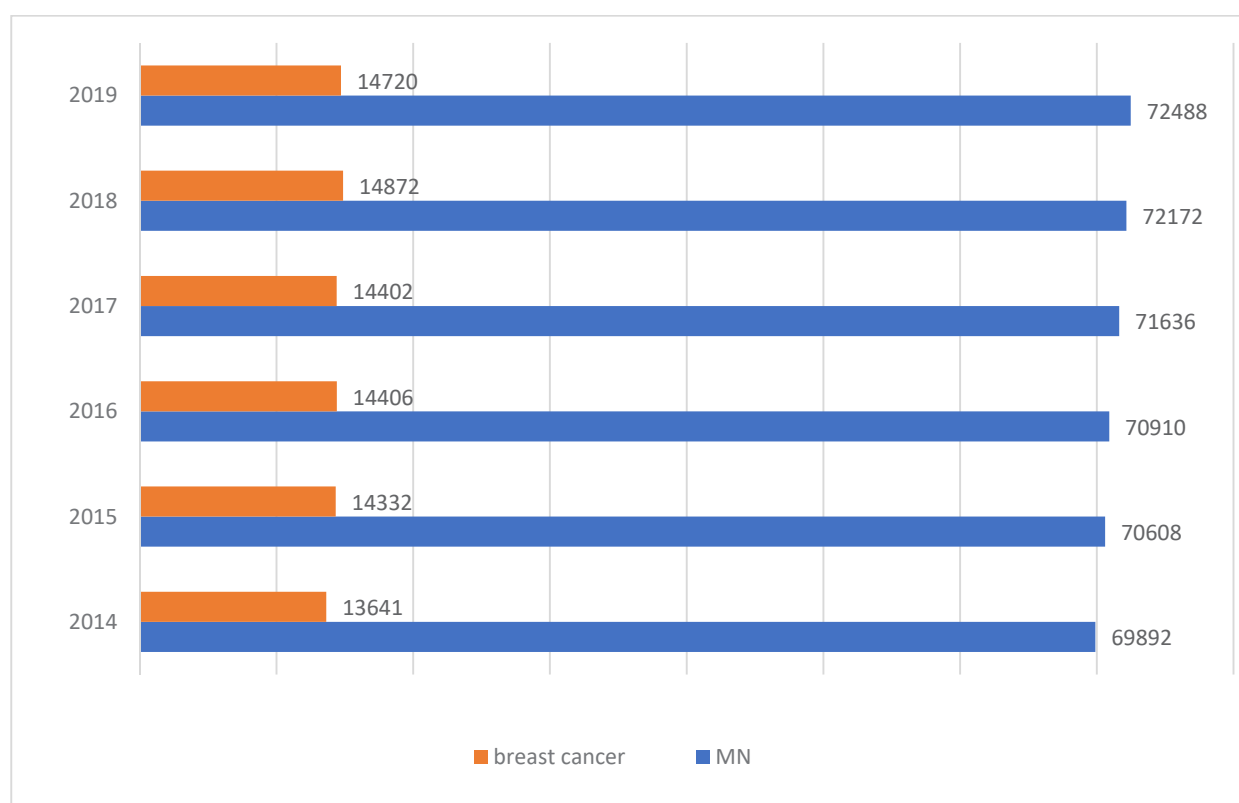


Fig. 2. Incidence of MN in the general population and breast cancer in women

Table 1

Age Structure of Cancer Incidence, %

	2014	2015	2016	2017	2018	2019
Men (Age)						
0-17	0,90	0,90	0,90	0,80	0,80	0,80
18-29	1,20	1,20	1,10	1,10	1,10	0,90
0-29 (total)	2,10	2,10	2,00	1,90	1,90	1,70
30-54	18,40	18,30	17,80	17,00	16,60	16,40
55-64	30,10	30,10	30,40	29,90	30,10	29,60
30-64 (total)	48,50	48,40	48,20	46,90	46,70	46,00
65-75	28,90	28,70	29,20	29,90	31,30	33,00
75+	20,40	20,70	20,60	21,30	20,10	19,30
65 ≤ (total)	49,30	49,40	49,80	51,20	51,40	52,30
Women (Age)						
0-17	0,70	0,70	0,60	0,60	0,60	0,60
18-29	1,80	1,70	1,50	1,60	1,50	1,40
0-29 (total)	2,50	2,40	2,10	2,20	2,10	2,00
30-54	25,20	25,50	24,90	24,30	24,20	23,90
55-64	26,00	26,20	26,00	25,90	26,00	26,10
30-64 (total)	51,20	51,70	50,90	50,20	50,20	50,00
65-75	24,30	24,20	24,60	25,10	26,20	27,20
75+	22,10	21,60	22,30	22,50	21,50	20,80
65 ≤ (total)	46,40	45,80	46,90	47,60	47,70	48,00

cancer types) slightly increased from 19.5% in 2014 to 20.3% in 2019.

Age Structure of Cancer Incidence. An analysis of the age structure of cancer incidence over the studied period reveals an increasing proportion of older individuals (aged 65 and above) among patients. This trend has been consistent and is observed in both men and women.

It is noteworthy that in 2019, more than 50% of cancer cases in men were recorded in the older age group.

Analysis of Age Groups by Nosologies. Since the proportion of cancer cases in individuals under 30 years of age does not exceed 2%, we begin the detailed analysis of nosologies starting from the age of 30 years.

During the period of our observation, the highest lung cancer incidence rate in men occurred in the age group 70–74 years, except for 2015, when the peak incidence was observed in the 65–69 age group. By comparing age categories over the years, we found a significant increase in lung cancer cases in the 80–84 age group – from 192.8 (per 100,000 population) in 2014 to 255.6 in 2019. In contrast, the incidence rate in the 85+ age group decreased from 136.6 to 76.9 (per 100,000 population).

In women, peak breast cancer incidence rates (per 100,000 population) were recorded in the 65–69 age group from 2014 to 2018. In 2019, the highest value of this indicator was observed in the 70–74 age group. A comparison of 2014 and 2019 revealed a significant

increase in breast cancer incidence in women in the 70–74 and 80–84 age categories – from 143.0 to 195.5 (per 100,000 population) and from 95.5 to 146.4 (per 100,000 population), respectively.

Discussion of research results

It is important to note that starting from 2014, the calculation of standard statistical indicators in oncology became very complicated due to the war and occupation of parts of the territory in Ukraine. We cannot reliably extrapolate the available data to the entire territory, as there was significant internal migration during this time. According to the State Statistics Service of Ukraine, the population as of January 1, 2014, was 45,426.2 thousand people [7]. However, previous data (excluding the temporarily occupied territory of the Autonomous Republic of Crimea and Sevastopol) indicate that the population as of January 1, 2015, was already 42,928.9 thousand people [8]. As of February 1, 2020, the population, excluding the temporarily occupied territories of the Autonomous Republic of Crimea and Sevastopol (population estimates were based on available administrative data regarding the state registration of births, deaths, and changes in the place of residence), was 41,879,904 people [9].

Thus, according to official data, the population of Ukraine in the controlled territory decreased by 3,546,296 people, or ~7.8% from 2014. Of these,

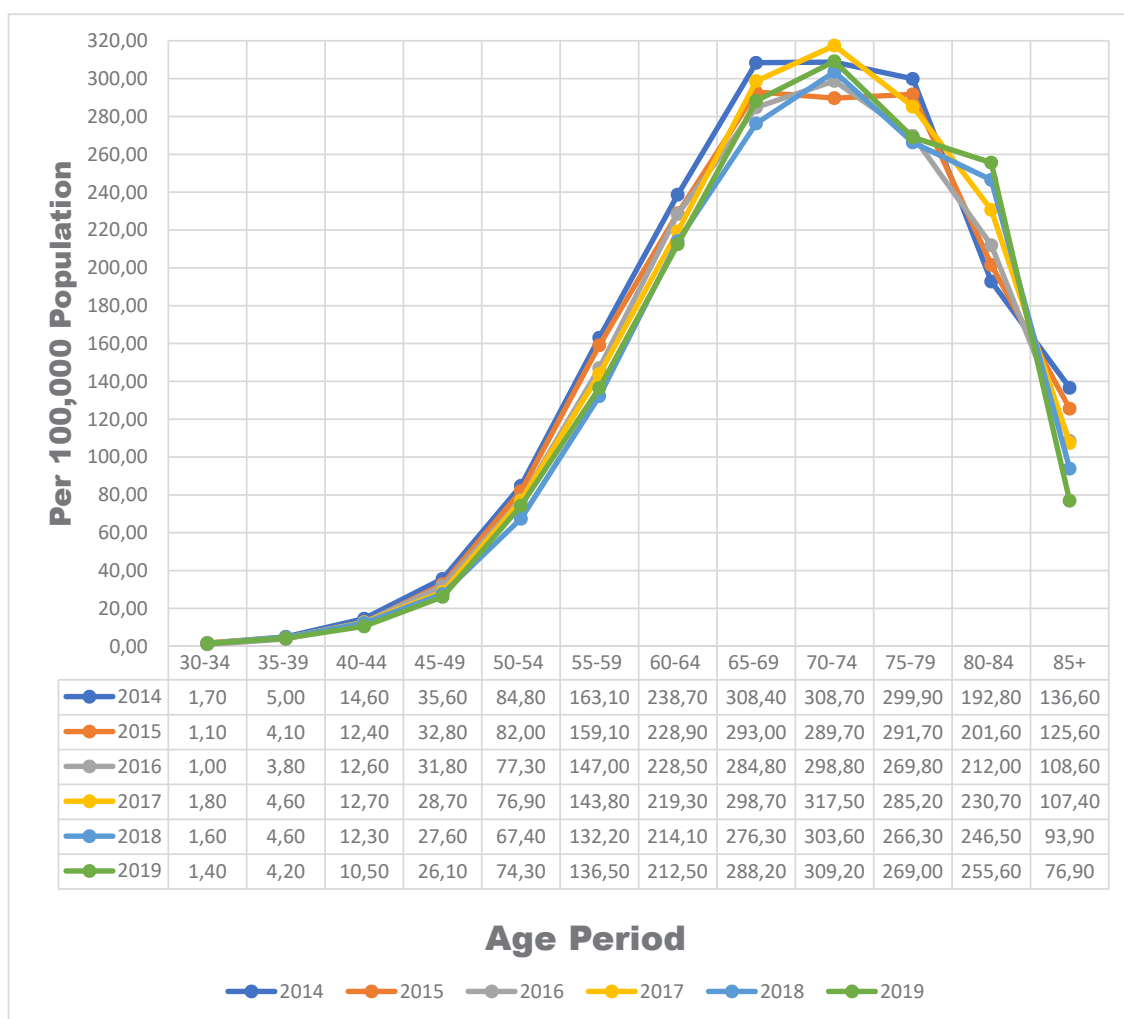


Fig. 3. Gender-Age Specific Incidence Rates of Lung Cancer (Men)

2,497.3 thousand people were lost during the first year of the war. Meanwhile, the number of registered cancer cases increased by ~2.4%. According to the National Cancer Registry's revised data, 138,509 cancer cases were registered in Ukraine in 2019, which is 3,202 more than in 2014. Given the ongoing population decline in Ukraine, which had been observed even before the war, this increase in cancer cases stands out as a notable trend.

It is worth mentioning that the proportion of specific cancer forms in the overall structure of oncology has changed. Lung cancer in men and breast cancer in women continue to occupy leading positions [10]. However, our analysis demonstrates a tendency towards a decrease in lung cancer incidence in men and an increase in breast cancer incidence in women. These results partly align with global data but require further research within the context of Ukraine. Prostate cancer and colorectal cancer in many countries (especially economically developed ones) have surpassed lung cancer in men. In particular, many developed countries have seen a decline in lung cancer incidence and mortality in men, contrasted with rising incidence in women [11].

Lung cancer incidence in men in Europe has been decreasing since the early 1990s, often linked to the level of economic development. Generally, lung cancer incidence rates in men are highest in Central and Eastern Europe, while Western European countries show somewhat lower rates with a tendency for decline. Exceptions include Norway, Finland, Spain, and France, where lung cancer rates remain stable [12].

Analysis of global data shows an increasing divergence in cancer incidence and breast cancer rates between countries with different levels of development. Specifically, a detailed analysis of subgroups of breast cancer patients by age confirmed a temporary increase in breast cancer incidence among women aged 50–69 years, followed by a decline among those over 70 years in countries with high economic development [13].

The age aspect of cancer prevalence is one of its defining factors. Given the continuous and steady increase in the proportion of elderly people in the population of almost all countries, an increase in cancer incidence can be expected accordingly. According to the World Health Organization, by 2030, one in six people worldwide will be 60 years or older, and between 2015 and 2050,

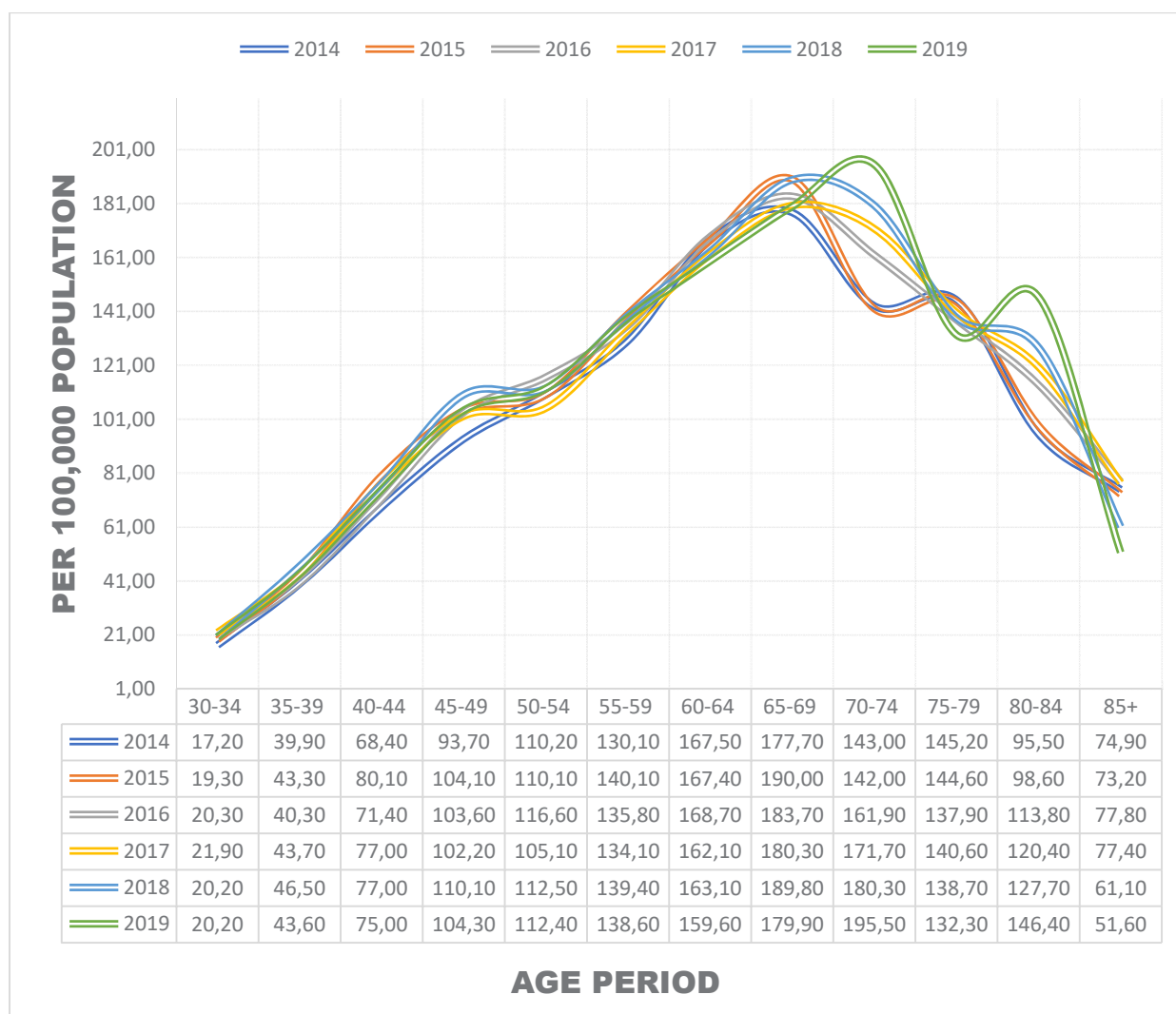


Fig. 4. Gender-Age Specific Incidence Rates of Breast Cancer (Women)

the proportion of the global population over 60 years will nearly double, from 12% to 22% [14]. These demographic changes drive the consistent trend of increasing cancer incidence among the elderly. It has been established that cancer incidence among the global population over 65 years has increased 11-fold compared to younger age groups [15–19]. Our study results confirm this trend of rising cancer incidence among the elderly in Ukraine as well.

Prospects for further research

Our study will continue, covering subsequent periods that reflect the socio-economic, historical, and thus epidemiological changes in Ukraine.

Conclusions

Despite the decrease in the population of Ukraine, the incidence of oncological diseases in the country is increasing.

The increase in cancer incidence is manifested by diverse trends in the structure of oncological diseases, namely a slight decrease in the proportion of lung cancer among all types of cancers in men and an increase in breast cancer in women.

It should be noted that the increase in cancer incidence is accompanied by a rising share of older patients, both men and women. This consistent trend is observed across all types of cancer, including lung cancer in men and breast cancer in women.

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Purpose: to investigate the trends in the incidence of malignant neoplasms in Ukraine during the period from 2014 to 2019, specifically lung cancer in men and breast cancer in women, assess the impact of demographic and socio-economic changes on incidence, and identify changes in the structure of cancer diseases.

Materials and methods. The study utilized data from the National Cancer Registry of Ukraine and official statistics on oncological diseases in Ukraine. Age categories and the dynamics of lung cancer and breast cancer incidence in men and women were examined. Statistical methods were used for data analysis, including comparison of indicators over different years.

Results. During the studied period, there was an increase in the overall incidence of malignant neoplasms by 2.37%, with a 7.9% increase in the cases of breast cancer in women. At the same time, there was a slight decrease in lung cancer incidence in men. The proportion of older patients increased, which is a characteristic trend for all types of oncological diseases.

Conclusions. Despite a decrease in the population of Ukraine, the incidence of oncological diseases is rising. A change in the structure of diseases is observed, particularly a decrease in lung cancer incidence in men and an increase in breast cancer incidence in women. Additionally, the proportion of older patients has significantly increased, which indicates the influence of demographic changes on cancer incidence.

Key words: malignant tumors, lung cancer, breast cancer, older patients, cancer incidence in Ukraine.

Мета: аналіз тенденцій захворюваності на злоякісні новоутворення (ЗН) в Україні у період 2014–2019 рр. з акцентом на рак легенів у чоловіків та рак молочної залози у жінок. Вибір цих нозологічних форм зумовлений їхніми провідними позиціями у структурі онкозахворюваності серед чоловічого та жіночого населення відповідно. Актуальність дослідження зумовлена суттєвими демографічними, соціальними та медичними змінами в країні, спричиненими початком збройного конфлікту в 2014 р., пандемією COVID-19 у 2020–2021 рр. та повномасштабним вторгненням РФ у 2022 р. Ці події серйозно вплинули

на функціонування системи охорони здоров'я, у тому числі онкологічної служби, та могли змінити характер і динаміку поширеності онкопатології.

Матеріали та методи. У дослідженні використано дані Національного канцер-реєстру України за 2014–2019 рр. Територія Автономної Республіки Крим була виключена з аналізу через відсутність достовірних даних. Було досліджено загальну кількість випадків ЗН (згідно з МКХ-10: C00–C96), кількість випадків раку легенів у чоловіків (C33–C34) та раку молочної залози у жінок (C50). Аналізувалися вікова структура, статеві-вікові коефіцієнти захворюваності (у п'ятирічних вікових групах), а також зміни в структурі онкопатології. Для кожного року обраховано показники за оновленими даними, уточненими у наступному році. Застосовано структурно-логічний підхід та методи медико-статистичного аналізу.

Результати. У 2019 р. в Україні було зареєстровано 138 509 нових випадків раку, що на 2,37% більше, ніж у 2014 р. (135 307 випадків). Серед чоловіків кількість випадків зросла на 1% (із 65 415 до 66 021), а серед жінок – на 3,7% (із 69 892 до 72 488 випадків). Кількість випадків раку легенів серед чоловіків зменшилася на 6,8% – із 10 866 у 2014 р. до 10 126 у 2019-му. Відповідно, його частка в структурі онкопатології серед чоловіків знизилася з 16,6% до 15,3%. Водночас кількість випадків раку молочної залози у жінок зросла на 7,9% – із 13 641 до 14 720 випадків, а його частка – з 19,5% до 20,3%.

Вікова структура свідчить про зростання частки пацієнтів віком 65 років і старше. У 2019 р. понад 52% випадків серед чоловіків та 48% серед жінок припадало саме на цю вікову категорію. Найвищі показники захворюваності на рак легенів у чоловіків спостерігалися у віці 70–74 років (окрім 2015 р.). Особливо помітним є зростання захворюваності у групі 80–84 років – зі 192,8 на 100 тис населення у 2014 р. до 255,6 у 2019 р. Серед жінок пік захворюваності на рак молочної залози припадає на вік 65–69 років, а в 2019 р. – на вік 70–74 років. За цей період показники у віковій групі 70–74 зросли з 143,0 до 195,5, а у групі 80–84 – із 95,5 до 146,4 на 100 тис населення.

Висновки:

Попри зменшення чисельності населення України загальна захворюваність на рак зростає.

У структурі онкозахворюваності простежуються різноспрямовані тенденції: зменшення частки раку легенів у чоловіків та зростання частки раку ГЗ у жінок.

Спостерігається чітка тенденція до зростання частки онкопатології серед людей старших вікових груп, що відповідає глобальним демографічним трендам і вимагає адаптації системи онкологічної допомоги.

Ключові слова: злоякісні пухлини, рак легенів, рак грудної залози, хворі старшого віку, захворюваність на злоякісні новоутворення в Україні.

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