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## BREAST CANCER IN UKRAINE DURING THE LAST DECADE

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Breast cancer occupies the second place in the structure of morbidity and the fourth place in the structure of mortality among all cancer types. To study the epidemiology of breast cancer, we used data from the National Cancer Registry of Ukraine and the Global Cancer Observatory. From 2014 to 2019, morbidity and mortality rates in Ukraine and the Sumy region were stable. Since 2020, there has been a significant deviation in incidence rates and a rapid decrease in mortality from breast cancer. The most significant decrease in incidence was observed in 2020 and 2022. In 2023, this trend continued. In comparison with Ukraine, the morbidity in the USA is more than twice as high, but the mortality rates are almost the same. In China, the incidence of breast cancer is lower than in Ukraine, but it tends to increase. The decrease in morbidity and mortality in Ukraine cannot be considered an improvement in the epidemiological situation. It is almost impossible to establish accurate data during the war.

Key words: breast cancer, morbidity, mortality, Ukraine, Sumy region.

# О.І. Винниченко, Р.Ю. Лахтарина, Ю.В. Москаленко РАК МОЛОЧНОЇ ЗАЛОЗИ В УКРАЇНІ ПРОТЯГОМ ОСТАННЬОГО ДЕСЯТИЛІТТЯ

Рак молочної залози займає друге місце в структурі захворюваності та четверте місце в структурі смертності серед усіх злоякісних новоутворень. Для вивчення епідеміології раку молочної залози ми використовували дані національного канцер-реєстру України та Global Cancer Observatory. З 2014 по 2019 рік показники захворюваності та смертності в Україні та Сумській області перебували на стабільному рівні. З 2020 року спостерігається зачне коливання показники захворюваності та стрімке зменшення смертності від раку молочної залози. Найбільш значне зниження захворюваності спостерігалося в 2020 та у 2022 роках. У 2023 році дана тенденція зберігалася. У порівнянні з Україною захворюваність в США більш ніж вдвічі вища, проте показники смертності практично однакові. В Китаї захворюваність на рак молочної залози нижча, ніж в Україні, проте має тенденцію до зростання. Зниження захворюваності та смертності в Україні не можна вважати покращенням епідеміологічної ситуації. Точні показники під час війни встановити практично неможливо.

Ключові слова: рак молочної залози, захворюваність, смертність, Україна, Сумська область.

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In 2022, there will be 2,308,897 cases and 665,684 deaths from female breast cancer worldwide. Breast cancer occupies the second place in the structure of morbidity (11.6%) and the fourth place in the structure of mortality (6.9%) among all cancer types. Overall, one in four cancer cases and one in six deaths are related to breast cancer [12]. Australia, North America, and Northern Europe have the highest incidence rates. Developed countries have a significantly higher incidence rate than developing countries (54.1 versus 30.8 per 100,000 population). However, the mortality rate in developed countries is lower (11.3 versus 15.3 per 100,000 population) [2].

Women in developed countries have more risk factors that negatively impact the reproductive system [11]. Reduced physical activity, obesity, early menarche, late menopause, childfree or first pregnancy after 30 years old, rejection of breastfeeding, using oral contraceptives, and hormone replacement therapy during menopause cause a higher incidence of breast cancer in high-income countries [5, 15].

Significant factors contributing to the steady increase in the incidence of breast cancer in developed countries between 1982 and 2002 were the widespread use of mammography and hormone replacement therapy during menopause. As a screening method, mammography examines a large part of the population and provides an adequate cancer diagnosis. At the same time, hormone therapy during menopause harmed women and increased the risk of breast cancer. Since 2003, a sharp restriction on the use of hormones began, which led to a decrease in the incidence of postmenopausal women [3]. In developing countries, the incidence and mortality from breast cancer continue to increase. First of all, this applies to the countries of South America, Asia, and Africa. However, a similar trend is observed in some high-income countries (for example, the Republic of Korea and Japan) [4]. Mortality from breast cancer has significant geographic variability and is primarily reflected in the healthcare system and the quality of life of the population [9].

Ukraine belongs to the developing countries with a high level of morbidity and mortality from breast cancer. The COVID-19 pandemic and the war in Ukraine in 2022 can be considered as factors that potentially affect morbidity and mortality rates.

**The purpose** of the study was to assess the dynamics of morbidity and mortality from breast cancer in women in the Sumy region and Ukraine for the period from 2014 to 2023 and to compare the dynamics of indicators of Ukraine, the USA, and China.

**Materials and methods**. Data from the national cancer registry of Ukraine were used to study the incidence and mortality of breast cancer. The epidemiology of breast cancer in the United States and China was studied using the Global Cancer Observatory registry for 2012 [14], 2018 [1], 2020 [10], and 2022 [2]. Age-standardized incidence and mortality rates (world standard) per 100,000 population were used to compare the indices of different countries. Calculation of mean values (M) and standard deviation (STD) and data visualization were performed in the Stata V.18.0 software environment (StataCorp, Texas, USA; https://www.stata.com; 2024). Special treatment was considered palliative, radical, or adjuvant antitumor therapy, which was performed within a year after the diagnosis.

**Results of the study and their discussion.** From 2014 to 2023, the mean morbidity in Ukraine was  $41.9\pm3.24$  per 100,000 population, mortality –  $13.5\pm2.39$  per 100,000 population. Morbidity and mortality rates in the Sumy region during the same period were the same ( $41.5\pm3.29$  per 100,000 population and  $13.7\pm2.94$  per 100,000 population, respectively).



Fig. 1. Age-standartized incidence (A) and mortality (B) rates from female breast cancer in Ukraine and the Sumy region for the period from 2014 to 2023.

From 2014 to 2019, the deviation of indices was within 10 %. The exception was in 2017, when mortality in the Sumy region exceeded the average Ukrainian rate by 20.9 %. However, from 2020 to 2023, there is a significant deviation in the incidence rate and a sharp decrease in the mortality rate from breast cancer both among women in Ukraine and in the Sumy region. Compared with 2019, in 2020, the incidence decreased by 17.8 % in the Sumy region and 11.2 % in Ukraine. However, in 2021, the incidence rates were similar to those in 2014–2019. In 2022, incidence and mortality from breast cancer reached their lowest values. Compared to 2019, mortality in Ukraine decreased by 9.3 % in 2020 and 30.7 % in 2022. In 2023, the trend towards stabilization of mortality rates is maintained (Fig. 1).

Most often, breast cancer is diagnosed in the early stages. In Ukraine, at the time of diagnosis, 73.0 $\pm$ 3.93 % of patients have I–II stages, 15.3 $\pm$ 1.91 % – III, and 9.0 $\pm$ 1.69 % – IV stage of the disease. On average, the stage of the disease remains unknown in 2.3 $\pm$ 0.52 % of patients (Fig. 2).



Fig. 2. Staging of breast cancer in Ukraine in newly diagnosed patients.



Fig. 3. Staging of breast cancer in Sumy region in newly diagnosed patients.

In the Sumy region, staging looks even more optimistic. The early stages of breast cancer are diagnosed 14.9 % more often than the mean in Ukraine. At the time of diagnosis,  $83.9\pm5.14$  % of Sumy region patients have I–II stages,  $5.9\pm2.42$  % – III, and  $4.0\pm1.12$  % – IV stage of the disease. On average, the stage of the disease remains unknown in  $5.8\pm2.43$  % of patients. Since 2020, the number of patients with an unknown stage of the disease has increased in Sumy region (Fig. 3).

Levels of coverage by special treatment in Ukraine and Sumy region are similar. Thus,  $81.0\pm1.37$  % of Ukrainian patients and  $81.8\pm3.61$  % received radical, palliative or adjuvant treatment.

To correctly assess the epidemiological situation, we compared morbidity and mortality rates in Ukraine, the USA, and China in 2012, 2018, 2020, and 2022. The highest incidence of breast cancer is observed in the USA (on average,  $90.2\pm4.31$  per 100,000 population). In Ukraine and China, the incidence is much lower ( $42.2\pm5.19$  and  $36.8\pm6.94$  per 100,000 population, respectively). Incidence in the USA is consistently high, with a rate deviation within 10 %. In China, there is a trend of increasing morbidity. Compared to 2012, in 2022, the number of breast cancer cases in Chinese women increased by 38.8 %, and in Ukrainian women – decreased by 23.7 % (Fig. 4).

Mortality rates in Ukraine and the USA are almost the same (on average,  $13.4\pm3.01$  and  $13.1\pm1.17$  per 100,000 population, respectively). However, it should be considered that the incidence in the USA is more than two times higher than in Ukraine. In China, the mortality rate is the lowest ( $7.5\pm1.75$  per 100,000 population) (Fig. 4).



Fig. 4. Breast cancer incidence (A) and mortality (B) rates among women in Ukraine, the United States, and China.

We established that the morbidity and mortality rates of breast cancer in women of Ukraine and the Sumy region from 2014 to 2019 were at a stable level. However, since 2020, there has been a significant deviation in morbidity rates in Ukraine and Sumy region and a rapid decrease in mortality. In our opinion, there can be several explanations for these phenomena. The decrease in the number of registered cases of breast cancer in 2020 was primarily due to the COVID-19 pandemic. Quarantine restrictions led to patients from remote cities and villages not reaching cancer centers and receiving diagnostic services. Due to the fear of infection and death, some patients avoided visiting medical facilities. As a result, a 17.8 % decrease in morbidity was recorded in Ukraine in 2020. Already in 2021, the incidence returned to the level of 2014–2019. But mortality continued to decrease. This was probably due to the revocation of quarantine restrictions.

In 2022, the lowest rates of morbidity and mortality from breast cancer in the last ten years were recorded. The main reason for this phenomenon was high population migration and decreased visits to oncology centers concerning the war in Ukraine. Several regions of Ukraine, particularly the Sumy region, were under occupation. In such conditions, it was impossible to provide high-quality diagnostic services, which led to an artificial decrease in the incidence of breast cancer. In 2023, this trend continued.

The decrease in morbidity and mortality in Ukraine in 2022 and 2023 cannot be considered an improvement in the epidemiological situation. We believe it is impossible to establish accurate data during the war. Several regions of Ukraine are still occupied.

Our results regarding the country's epidemiological situation fully coincide with the conclusions of other authors [7]. The war in Ukraine led to an increase in the burden on cancer centers in many European countries. For example, many patients received temporary protection in Poland, Germany, Romania, Hungary, the Czech Republic, Ireland, and other countries [6].

Tolia et al. [13] a insist on the negative impact of COVID-19 and the war in Ukraine on the healthcare system, particularly on the quality of oncology care. Insufficient financing of the industry, destruction of medical centers, pollution of the environment with carcinogenic substances due to hostilities, blocking of roads, interruptions in the work of the energy sector, stress, depression, migration of medical workers, lack of clinical trials are the factors that directly or indirectly affect morbidity and mortality rates in Ukraine.

### Conclusions

1. From 2014 to 2023, the mean morbidity rate in Ukraine was  $41.9\pm3.24$  per 100,000, with a mortality rate of  $13.5\pm2.39$  per 100,000 population. Morbidity and mortality rates in the Sumy region during the same period were the same ( $41.5\pm3.29$  and  $13.7\pm2.94$  per 100,000 population, respectively).

2. From 2014 to 2019, indices were stable. From 2020 to 2023, there is a significant deviation in the incidence rates and a rapid decrease in the mortality rates from breast cancer both among women in Ukraine and in the Sumy region. Compared with 2019, in 2020, the incidence decreased by 17.8 % in the Sumy region and 11.2 % in Ukraine. In 2022, the incidence of breast cancer reached its lowest value (36.4 per 100,000 population).

3. Compared to 2019, mortality in Ukraine decreased by 9.3 % in 2020 and 30.7 % in 2022. In 2023, the trend towards stabilization of mortality rates is maintained.

4. At the time of diagnosis,  $83.9\pm5.14$  % of female patients in Sumy region and  $73.0\pm3.93$  % of female patients in Ukraine have stage I or II of the disease.

5. The highest incidence of breast cancer is observed in the USA (on average,  $90.2\pm4.31$  per 100,000 population). In Ukraine and China, the incidence is much lower ( $42.2\pm5.19$  and  $36.8\pm6.94$  per 100,000 population, respectively). Incidence in the USA is consistently high. Compared to 2012, in 2022, the number of breast cancer cases among Chinese women increased by 38.8%, and among Ukrainian women decreased by 23.7%.

6. Mortality rates in Ukraine and the USA are almost the same (on average,  $13.4\pm3.01$  and  $13.1\pm1.17$  per 100,000 population, respectively). However, the incidence in the USA is more than two times higher than in Ukraine. The decrease in morbidity and mortality in Ukraine in 2022 and 2023 cannot be considered an improvement in the epidemiological situation. Accurate data during the war is almost impossible to establish.

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