

ANALYSIS OF ENDOMETRIAL CANCER INCIDENCE AMONG THE FEMALE POPULATION OF SUMY REGION IN THE PRE-WAR PERIOD AND UNDER MARTIAL LAW¹Sumy State University (Sumy, Ukraine)²Sumy Clinical Oncology Center (Sumy, Ukraine)n.gyryavenko@med.sumdu.edu.ua

Endometrial cancer (EC) is one of the most common gynecological malignancies in Ukraine. Since February 2022, the Sumy region has experienced security and logistical changes that may affect cancer diagnosis. The aim was to assess EC incidence among women in the Sumy region during the pre-war (2017–2021) and war (2022–2024) periods and the proportion of advanced (III–IV) stages. A retrospective population-based study used open data from the National Cancer Registry of Ukraine bulletins No. 19–26. Newly registered cases, incidence rates, stage distribution, and oncological care indicators were analyzed. Proportions were compared using Pearson's χ^2 or Fisher's exact test; $p < 0.05$ was significant. Registered cases decreased from 216–253 annually in 2017–2019 to 178 in 2020 and 144 in 2022, then increased to 229 in 2023 and 225 in 2024. Stage III–IV cases increased from 8.7% in 2017 to 19.2% in 2022, then decreased to 11.4% in 2023 and 13.1% in 2024. No significant difference was found between pre-war and war periods (12.4% vs. 13.9%; $p > 0.05$). One-year mortality was highest in 2022 (10.8%). The wartime period was associated with reduced EC detection and more advanced cases in 2022, with indicators approaching pre-war levels in 2023–2024.

Key words: endometrial cancer, morbidity, martial law, stage of disease, cancer registry.

Connection of the publication with planned research work.

The work was carried out within the framework of the research work "Liquid biopsy of the endometrium: development of an innovative approach to in vitro diagnostics of oncopathology" (state registration number 0126U000779).

Introduction.

Malignant neoplasms (MN) of the uterine corpus (C54 according to ICD-10), the vast majority of which are endometrial cancer (EC), occupy one of the leading places in the structure of oncological morbidity in women. According to GLOBOCAN 2022 estimates, more than 420,000 new cases are registered worldwide every year. In highly developed countries, the increase in the incidence of EC is associated primarily with the spread of obesity and metabolic disorders, as well as changes in the age structure of the population [1–3].

The specificity of this nosology is that it has an early and clinically pronounced symptom – abnormal uterine bleeding, in particular in postmenopause. That is why, under normal health care system conditions, up to 75–85% of cases are detected at stages I–II, and the five-year survival rate at stage I exceeds 90% [2, 4]. This makes EC an important indicator of access to medical care and the timeliness of diagnosis, as the delay between symptom onset, seeking medical care, and confirmation of diagnosis can affect the stage at which the disease is detected.

Over the past decade, the Ukrainian oncology service has experienced two consecutive systemic shocks. The first was the COVID-19 pandemic, during which most countries recorded a significant decrease in newly diagnosed oncological cases due to restrictions on planned care and reduced patient referrals. Studies show that a delay in diagnosis can lead to an increase in cancer mortality in the following years [5–7]. The second and much more powerful was the full-scale armed attack by the Russian Federation on February 24, 2022. The international oncology community immediately pointed out the risk of excess cancer mortality in Ukraine due to delays

in diagnosis and treatment, damage to infrastructure, and large-scale population displacement [8–10]. At the same time, generalized nationwide estimates hide significant regional heterogeneity. Sumy region is a border region that, from the first days of the invasion, suffered the occupation of part of its territory, and later, systematic shelling of the border strip, evacuation of the population from individual communities, and disruption of the regional oncology center's transport accessibility. Regional studies that would trace the impact of these factors on a specific nosology for the entire available period of martial law remain isolated and, with regard to EC in the Sumy region, are practically absent. This determines the relevance of this work.

The aim of the study.

To assess the dynamics of the incidence of malignant endometrial neoplasms among the female population of the Sumy region in the pre-war (2017–2021) and war (2022–2024) periods. To test the hypothesis that martial law conditions led to a decrease in the number of registered cases with a simultaneous increase in the proportion of advanced (III–IV) stages, which would indicate later patient referral and disruption of the diagnostic route.

Object and research methods.

A retrospective population study was conducted using publicly available statistical data. Only publicly available data were used. Since access to personalized medical information was not required, patient-informed consent was not required.

Data sources. The primary source was the bulletins of the National Cancer Registry of Ukraine (NKRU) No. 19–26 (issues "Cancer in Ukraine" for 2016–2017, 2017–2018, 2018–2019, 2019–2020, 2020–2021, 2021–2022, 2022–2023 and 2023–2024), section "C54 uterine corpus neoplasms", tables 3 and 4 (operational information by region) and table 2 (revised indicators) [11–14]. Data on the female population of the region up to 2022 are based on official estimates from the State Statistics Service of Ukraine [15].

Observation periods. The pre-war period is defined as 2017–2021, the martial law period as 2022–2024. It should be emphasized separately that, as of the time of preparing the work, the latest available issue is the NKRU bulletin No. 26 (“Cancer in Ukraine, 2023–2024”), which contains revised data for 2023 and operational data for 2024. Data for 2025 have not yet been published at the time of writing, since the verification and publication cycle of the NKRU bulletin is approximately 1.5 years. Therefore, the war period is analyzed as three years (2022–2024), not four.

Table 1 – Incidence of malignant neoplasms of the uterine corpus (C54) in Sumy region, 2017–2024

Year	New cases, abs.	Deceased, abs.	Per 100,000 population	Per 100,000 female population	Ukraine, per 100,000 female population
2017	253	65	23.0	42.3	33.3
2018	216	63	19.8	36.5	33.8
2019	248	51	23.0	42.5	34.1
2020	178	50	16.7	30.9	29.4
2021	201	46	19.1	35.3	31.8
2022	144 (157)*	45	n/a	n/a	n/a
2023	229 (238)*	36	n/a	n/a	n/a
2024	225	52	n/a	n/a	n/a

Notes: * – in brackets is the revised number of cases according to the next bulletin of the National Commission for the Elimination of Racial Discrimination; n/a – the indicator was not calculated by the National Commission for the Elimination of Racial Discrimination due to the lack of reliable data on the population of the region. Source: National Commission for the Elimination of Racial Discrimination Bulletins No. 19–26.

Indicators analyzed. The study analyzed the absolute number of first-time registered cases and deaths from EC: the intensive incidence rate per 100,000 female population, as well as the distribution of newly detected patients by disease stage (I, II, III, IV, stage not established), with subsequent grouping into early (I–II) and advanced (III–IV) stages. The quality of oncological care indicators was separately evaluated, in particular, the proportion of morphologically verified diagnoses, the proportion of patients detected during preventive examinations, coverage of special treatment, and one-year mortality.

Limitations. First, in bulletins No. 19 and No. 20, stages I and II are listed together (I–II), so a detailed breakdown of I vs. II is only available from 2019, although this does not affect the main analysis (I–II vs. III–IV). Sec-

ond, the stage-level percentage distributions published by the NKRU total 92–96%, not 100%, so the absolute numbers do not cover all registered cases. Given this, the periods were compared using the I–II:III–IV ratio among cases with a documented stage. Third, starting with operational data for 2022 (bulletin No. 24), the NKRU stopped publishing intensive indicators by region because the State Statistics Service of Ukraine did not publish population data. The latest published table of regional indicators refers to revised data for 2021, for 2022–2024, the intensive indicator is given in the form

of scenario calculations, and not as a published indicator (according to the formula: incidence = number of new cases / female population × 100,000), and is not an officially published indicator. Fourth, the C54 rubric covers all malignant neoplasms of the uterine body, although endometrial cancer makes up the vast majority, but not all 100%.

Statistical processing. Comparison of qualitative indicators between groups was carried out using the Pearson χ^2 test; when expected frequencies were small, Fisher’s exact test was used. To assess the differences between periods, the odds ratio (OR) with a 95% confidence interval (CI) was calculated. Differences were considered statistically significant at $p < 0.05$. Statistical analysis was performed using computer programs, and the results were presented as tables and graphs.

Research results and their discussion.

Dynamics of the absolute number of cases and the intensive index. The main characteristics of the incidence of malignant neoplasms of the uterine body in Sumy region for 2017–2024 are given in **table 1** and **figure 1**.

In the pre-war period, the dynamics were not monotonous. In 2017–2019, the absolute number of cases fluctuated between 216 and 253 per year (on average, 239), and the intensive indicator – between 36.5 and 42.5 per 100 thousand female population, consistently exceeding the average Ukrainian level (33.3–34.1). That is, the Sumy region throughout the entire pre-war period belonged to the regions with an increased incidence of this nosology.

The first sharp drop occurred in 2020, the year of the COVID-19 pandemic: 178 cases were registered, which

is 70 cases, or 28.2%, less than in 2019. The intensive indicator decreased from 42.5 to 30.9 per 100 thousand (–27.3%). For comparison, in Ukraine as a whole, the decrease was almost half as large (from 34.1 to 29.4 per 100,000 (–13.8%)). Thus, the “Covid drop” in the Sumy region was significantly deeper than the national one. In 2021, there was a partial, but incomplete recovery – 201 cases (35.3 per 100 thousand), that is, the 2019 level was not reached.

The second and deepest drop occurred in 2022. Accord-

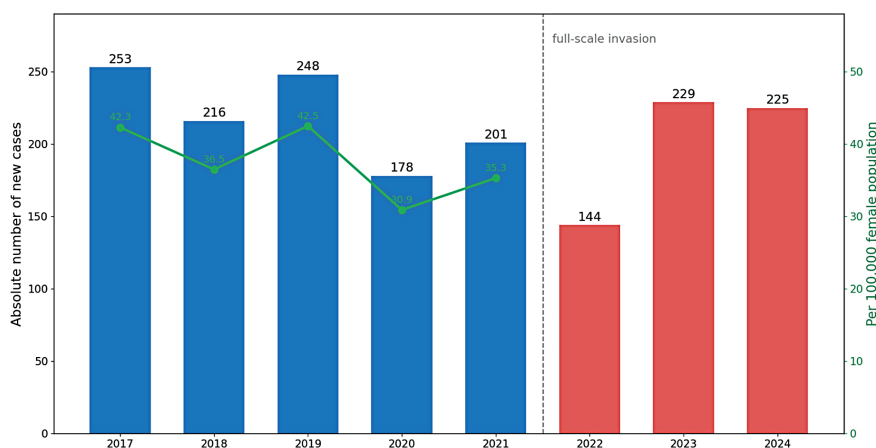


Figure 1 – Absolute number of new cases of C54 and intensive incidence rate per 100 thousand female population, Sumy region, 2017–2024.

ing to the operational data of the National Commission for the Elimination of Racial Discrimination in the region, only 144 cases were registered – 28.4% fewer than in 2021 and 34.3% fewer than the average pre-war level (219.2 cases per year). This is the lowest figure for the entire observation period. A revision of the register later raised this figure to 157 cases, indicating an incomplete initial registration in the year of the invasion, but even the revised value remains the lowest in the series.

What happened next is fundamentally important. In 2023, the number of registered cases increased to 229 (revised to 238), and in 2024, it was 225. That is, in the second year of martial law, registration did not simply resume, but returned to the average pre-war level (219.2). The average annual number of cases for 2022–2024 was 199.3, compared to 219.2 in 2017–2021, i.e., a decrease of 9.1%. This decrease is almost entirely due to one anomalous year, 2022.

The above comparison of absolute numbers has a fundamental limitation that warrants discussion separately. The absolute number of cases depends on the size of the risk group, and the female population of the Sumy region changed during the war due to internal displacement, evacuation from border communities, women's departure abroad, and reduced accessibility of certain territories. The calculation, inverse to the published NKRU indicators, gives the following estimates of the female population of the region: 598.1 thousand people in 2017, 591.8 thousand in 2018, 583.5 thousand in 2019, 576.1 thousand in 2020, and 569.4 thousand in 2021, i.e., a reduction of 4.8% over the five pre-war years, mainly due to natural decline. After 2021, official regional population estimates were not published, so the NKRU stopped calculating intensive indicators at the oblast level. To assess how much this factor could change the conclusions, we performed a scenario calculation (figure 2, table 2). Even in the most conservative scenario, which assumes that the female population of the region remained at the 2021 level, the intensive indicator in 2023 would be 40.2, and in 2024, 39.5 per 100 thousand, i.e., it would exceed the average pre-war level (37.5). Under a more realistic assumption of a 10–20% reduction in the female population, the corresponding values increase to 44.7–50.3 in 2023 and 43.9–49.4 in 2024. This means that the decrease in the absolute number of cases in 2022 cannot be explained solely by demographic losses: in 2023–2024, under the same demographic assumptions, the intensive incidence exceeded

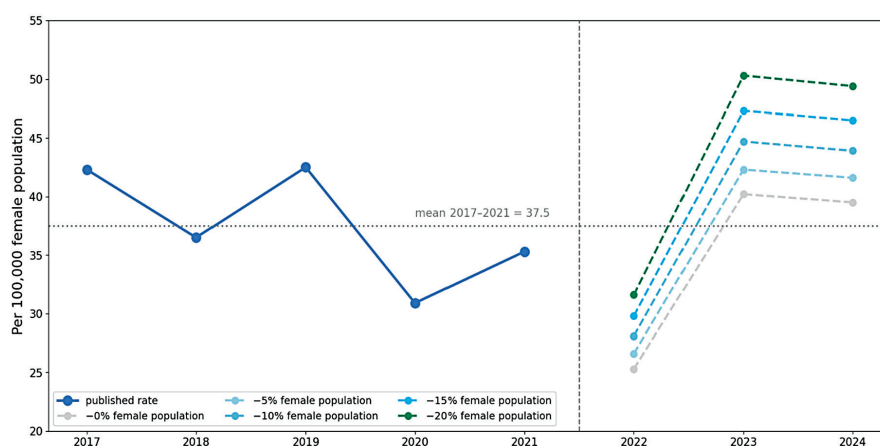


Figure 2 – Scenario assessment of the intensive incidence rate of C54 in 2022–2024 under different assumptions regarding the reduction of the female population of the Sumy region.

Table 2 – Scenario assessment of the intensive incidence rate of C54 in 2022–2024, depending on the assumption of a reduction in the female population of the Sumy region (per 100,000 female population)

Scenario of female population decline relative to 2021	2022	2023	2024
0% (569,4 thousand)	25.3	40.2	39.5
–5% (541,0 thousand)	26.6	42.3	41.6
–10% (512,5 thousand)	28.1	44.7	43.9
–15% (484,0 thousand)	29.8	47.3	46.5
–20% (455,5 thousand)	31.6	50.3	49.4

Notes: The average intensive rate for 2017–2021 was 37.5 per 100,000 female population. The calculation was made based on the NKRU's operational data on the absolute number of cases using the formula: incidence = number of new cases / female population × 100,000.

the pre-war level, a typical picture of “overshooting” of cases not detected in 2022.

Structure by stages. The distribution of newly diagnosed patients by stages is shown in table 3 and figure 3.

In 2017–2022, the proportion of EC cases detected at stages III–IV generally increased, although the rate varied by year: from 8.7% in 2017 to 19.2% in 2022. The highest rate was recorded in 2022. The difference between 2017 and 2022 was statistically significant ($\chi^2=7.56$; $p=0.006$). When comparing the periods 2017–2019 and 2020–2022, the proportion of cases at stages III–IV was higher in the second period ($p=0.013$). In 2023–2024, the proportion of cases at stages III–IV decreased to 11.4% and 13.1%, respectively. At the same

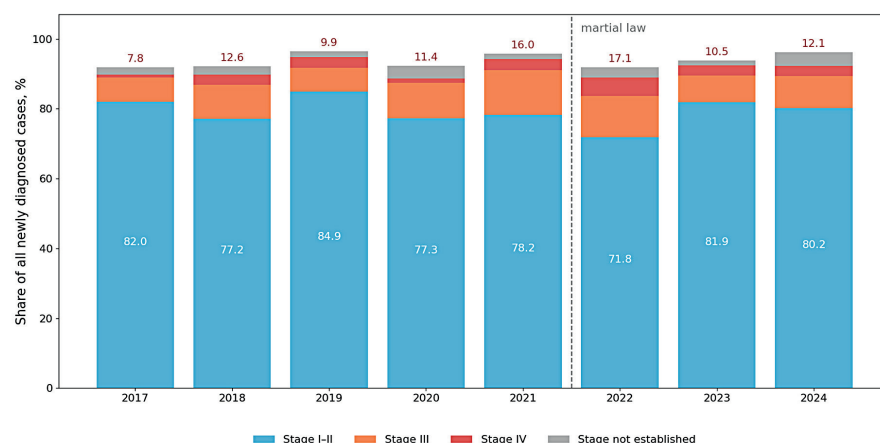


Figure 3 – Distribution of newly diagnosed patients with C54 by stages, Sumy region, 2017–2024.

Table 3 – Distribution of newly diagnosed patients with C54 by stage, Sumy region, 2017–2024, % of all newly diagnosed

Year	I	II	I–II	III	IV	III–IV	Stage not determined	Proportion of stage III–IV cases among cases with a known stage, %
2017	–	–	82.0	6.9	0.9	7.8	2.1	8.7
2018	–	–	77.2	9.7	2.9	12.6	2.4	14.0
2019	74.6	10.3	84.9	6.9	3.0	9.9	1.7	10.4
2020	67.7	9.6	77.3	10.2	1.2	11.4	3.6	12.9
2021	67.6	10.6	78.2	12.8	3.2	16.0	1.6	17.0
2022	63.7	8.1	71.8	11.9	5.2	17.1	3.0	19.2
2023	71.4	10.5	81.9	7.6	2.9	10.5	1.4	11.4
2024	71.5	8.7	80.2	9.2	2.9	12.1	3.9	13.1

Notes: In the NKRU bulletins No. 19 and No. 20, stages I and II are presented together. The published percentage distributions total 92–96%, so the last column shows the normalized proportion of stages III–IV among cases with documented stage.

time, in the general comparison of the pre-war and war periods, no statistically significant difference was found: 12.4% in 2017–2021 versus 13.9% in 2022–2024 ($\chi^2=0.62$; $p=0.431$) (table 4).

Comparison with national data (figure 4) helps to interpret these fluctuations. In Ukraine as a whole, the share of common stages increased smoothly and monotonically - from 12.3% in 2017 to 16.7% in 2023. Sumy region started from a significantly lower level (8.7% versus 12.3% in 2017), that is, it had a better stage structure, but in 2021–2022 it exceeded the national indicator (17.0 and 19.2% versus 15.6 and 16.3%), and in 2023–2024 it again fell below it (11.4 and 13.1% versus 16.7 and 14.7%). Thus, the region exhibited a brief but distinct “war anomaly” against the backdrop of a slow national deterioration.

Quality indicators of oncological care. The described picture is indirectly confirmed by indicators of diagnostic quality (table 5). The proportion of morphologically

Table 4 – Comparison of the structure by stages between the pre-war period and the martial law period, Sumy region

Period	Total number of registered cases, abs.	I–II стадія, abs.	III–IV стадія, abs.	Stage not determined, abs.	Proportion of stage III–IV cases among cases with a known stage, %
2017–2021 (pre-war period)	1096	880	124	23	12,4
2022–2024 (martial law period)	598	471	76	16	13,9

Notes: Absolute numbers by stage are reconstructed from percentage distributions published by the National Cancer Institute. Their sum is less than the total number of registered cases for reasons stated in the “Object and Methods” section.

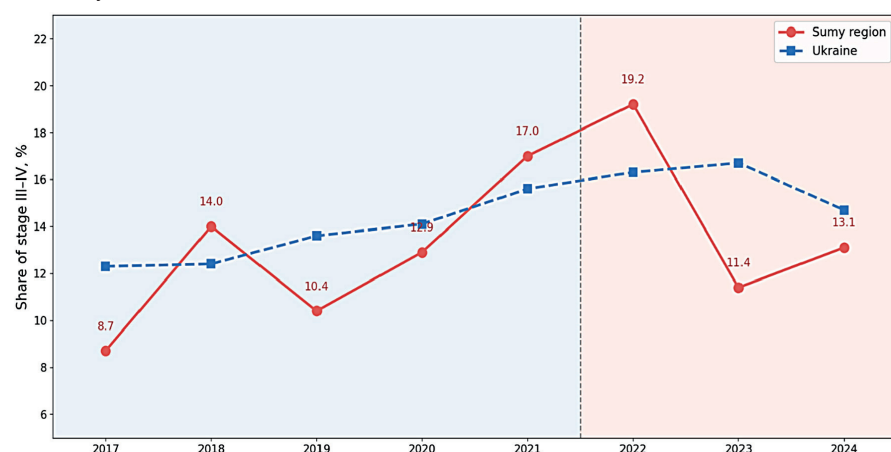


Figure 4 – Proportion of stage III–IV cases among cases with a known stage, %: Sumy region compared to Ukraine, 2017–2024.

verified diagnoses remained high throughout the period (95.1–98.6%), with a minimum of 95.1% in 2022. Coverage of primary patients with special treatment was stable (87.0–90.4%) and, even in 2022, was 88.9%, indicating the preservation of the operational capacity of the regional oncological service. Instead, one-year mortality, which is the most sensitive marker of neglect, in the cohort of patients identified in 2022 reached 10.8% – the highest level for the studied period 2017–2023 (only in the 2016 cohort it was higher – 13.2%) and 1.6 times higher than in the 2021 cohort (6.6%). In the 2023 cohort, this indicator decreased to 7.8%.

Particular caution is required by the detection rate during preventive examinations, which in the region increased from 42.5% in 2017 to 79.5% in 2023, while the average Ukrainian level over the same period decreased from 41.5% in 2017 to 22.9–24.5% in 2023–2024. Such a gap of more than threefold is difficult to explain by the actual expansion of preventive examinations under martial law. More likely, it reflects the regional peculiarities of accounting and coding of the detection channel. Therefore, this indicator should not be interpreted as evidence of improved early detection.

The results obtained allow us to give a differentiated answer to the key research question. Thus, the war led to a sharp decrease in the number of registered cases of EC in the Sumy region, and this decrease was accompanied by the highest proportion of advanced stages and the highest one-year mortality for the entire period. This is consistent with international estimates, according to which armed conflict causes delays in diagnosis, interruption of treatment, and an increase in the proportion of advanced forms [8, 9, 10], and every four weeks of treatment delay increases the risk of death by approximately 6–8% [6].

However, this effect turned out to be much less long-lasting than could be expected. Already in 2023, both the number of registered cases and the stage structure returned to pre-war values, and scenario calculations of the intensive indicator indicate that in 2023–2024, the actual detection rate exceeded the pre-war level. The most likely explanation is a partial catch-up of cases missed in 2022: in 2023, some women whose symptoms appeared in the first year of the

invasion were included in the registry. This also explains why the peak of one-year mortality was recorded in the 2022 cohort.

Equally important, the shift towards advanced stages was not caused by the war. It began at least in 2020: the proportion of stages III–IV increased from 9.9% in 2019 to 12.9% in 2020 and 17.0% in 2021, i.e., even before the full-scale invasion. Thus, the full-scale war exacerbated the already existing trend set by the COVID-19 pandemic and its associated restrictions on access to planned care, rather than creating it. This is consistent with research on the pandemic's delayed effects on cancer services [5, 7]. In practical terms, this means that interpreting the “war” effect without accounting for the “Covid” baseline leads to its overestimation.

The study has a number of limitations. First, the analysis was conducted using aggregated data from the cancer registry, so it was not possible to account for patient age, tumor histological characteristics, or diagnosis dates at the individual level. Second, for 2022–2024, there were no reliable data on the size of the female population, so the calculated incidence rates are approximate and cannot be directly equated to official statistical indicators. Third, the analysis of the distribution by stage was conducted only among cases with a documented stage, since the published data did not cover 100% of registered cases in all years. Fourth, data for 2025 were not available at the time of the study, which prevented assessment of the further dynamics of the indicators. In addition, under martial law, incomplete registration of individual cases cannot be ruled out entirely, especially in areas where access to medical care was limited.

Conclusions.

In the Sumy region, in the pre-war period (2017–2021), the incidence of malignant neoplasms of the uterine body consistently exceeded the average Ukrainian level, at 36.5–42.5 per 100,000 female population versus 29.4–34.1 per 100,000 female population. In 2020, against the backdrop of the COVID-19 pandemic, the indicator decreased by 28.2%. In 2022, after the start of a full-scale invasion, the number of registered cases decreased to 144, which is 34.3% below the average pre-war level. In 2023–2024, the number of registered

Table 5 – Quality indicators of oncological care for C54, Sumy region, 2017–2024, %

Year	Morphologically verified	Detected during preventive examinations	Received specialized treatment	Did not survive one year among those diagnosed in the current year *
2017	98.0	42.5	89.3	8.0
2018	98.6	43.2	88.3	6.3
2019	97.2	45.7	87.5	6.8
2020	96.6	52.7	88.6	8.4
2021	97.0	63.3	90.4	6.6
2022	95.1	67.4	88.9	10.8
2023	97.8	79.5	89.0	7.8
2024	96.4	75.8	87.0	n/a

Note: * – in the NKRU bulletins, the one-year mortality for year N is given for the cohort of patients identified in year N–1. In the table, the values are assigned to the year of cohort identification. n/a – data not yet published.

cases recovered to 229 and 225, respectively, approaching pre-war values. During 2017–2022, the proportion of cases detected at stages III–IV increased from 8.7% in 2017 to a peak of 19.2% in 2022. In 2023–2024, this figure decreased to 11.4% and 13.1%, respectively. At the same time, when comparing the pre-war and war periods, no statistically significant difference was found (12.4% vs. 13.9%; $p = 0.431$). Thus, the deterioration of the stage structure began in 2020–2021, that is, before the start of the full-scale war, which may indicate the impact of the COVID-19 pandemic and the associated restrictions on access to medical care. The war probably exacerbated the already existing unfavorable trend, but was not its sole cause. At the same time, the lack of reliable data on the female population in the Sumy region after 2021 limits the ability to accurately determine the level of morbidity during the war period. Therefore, the assessment of morbidity dynamics in 2022–2024 should be carried out taking into account this limitation and be based primarily on the absolute number of registered cases and stage-structure indicators.

Prospects for further research.

Further research should focus on analyzing data for 2025–2026 after their publication by the National Cancer Registry, which will allow us to verify the stability of the described recovery. Separate studies are required to assess the duration of the interval “symptom onset – morphological verification” at the level of primary medical documentation of the regional oncology center and to analyze the stage structure in the context of border communities of the region, as well as to assess the survival of the 2020–2022 cohorts as a direct indicator of the clinical consequences of delayed diagnosis.

References

- Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin.* 2024;74(3):229–263.
- Crosbie EJ, Kitson SJ, McAlpine JN, Mukhopadhyay A, Powell ME, Singh N. Endometrial cancer. *Lancet.* 2022;399(10333):1412–1428.
- Lortet-Tieulent J, Ferlay J, Bray F, Jemal A. International patterns and trends in endometrial cancer incidence, 1978–2013. *J Natl Cancer Inst.* 2018;110(4):354–361.
- Concin N, Matias-Guiu X, Vergote I, Cibula D, Mirza MR, Marnitz S, et al. ESGO/ESTRO/ESP guidelines for the management of patients with endometrial carcinoma. *Int J Gynecol Cancer.* 2021;31(1):12–39.
- Riera R, Bagattini AM, Pacheco RL, Pachito DV, Roitberg F, Ilbawi A. Delays and disruptions in cancer health care due to COVID-19 pandemic: systematic review. *JCO Glob Oncol.* 2021;7:311–323.
- Hanna TP, King WD, Thibodeau S, Jalink M, Paulin GA, Harvey-Jones E, et al. Mortality due to cancer treatment delay: systematic review and meta-analysis. *BMJ.* 2020;371:m4087.
- Maringe C, Spicer J, Morris M, Purushotham A, Nolte E, Sullivan R, et al. The impact of the COVID-19 pandemic on cancer deaths due to delays in diagnosis in England, UK: a national, population-based, modelling study. *Lancet Oncol.* 2020;21(8):1023–1034.
- Caglevic C, Rolfo C, Gil-Bazo I, Cardona A, Sapunar J, Hirsch FR, et al. The armed conflict and the impact on patients with cancer in Ukraine: urgent considerations. *JCO Glob Oncol.* 2022;8:e2200123.
- Talbot A, Connor SG, Austin K, Hannon T, Gabbay E, Clay TD. The impact of the 2022 Ukraine/Russian conflict on cancer clinical trials. *J Int Med Res.* 2022;50(12):3000605221143284.

10. World Health Organization Regional Office for Europe. Ukraine crisis: public health situation analysis. Copenhagen: WHO Regional Office for Europe; 2022.
11. National Cancer Registry of Ukraine. Cancer in Ukraine, 2017–2018. Bulletin of the National Cancer Registry of Ukraine No. 20. Kyiv: National Cancer Institute; 2019.
12. National Cancer Registry of Ukraine. Cancer in Ukraine, 2020–2021. Bulletin of the National Cancer Registry of Ukraine No. 23. Kyiv: National Cancer Institute; 2022.
13. National Cancer Registry of Ukraine. Cancer in Ukraine, 2022–2023. Bulletin of the National Cancer Registry of Ukraine No. 25. Kyiv: National Cancer Institute; 2024.
14. National Cancer Registry of Ukraine. Cancer in Ukraine, 2023–2024. Bulletin of the National Cancer Registry of Ukraine No. 26. Kyiv: National Cancer Institute; 2025.
15. State Statistics Service of Ukraine. Population of Ukraine as of January 1, 2022. Kyiv: State Statistics Service of Ukraine; 2022.

АНАЛІЗ ЗАХВОРЮВАНOSTІ НА РАК ЕНДОМЕТРІУ СЕРЕД ЖІНОЧОГО НАСЕЛЕННЯ СУМСЬКОЇ ОБЛАСТІ У ДОВОЄННИЙ ПЕРІОД ТА В УМОВАХ ВОЄННОГО СТАНУ

Гирявенко Н. І., Циндренко Н. Л., Сумцов Д. Г., Москаленко Р. А.

Резюме. Рак ендометрію (РЕ) належить до найпоширеніших онкогінекологічних захворювань в Україні. Сумська область є прикордонним регіоном, який з лютого 2022 р. перебуває під постійним впливом безпекових, демографічних і логістичних чинників, що потенційно змінюють доступність та своєчасність онкологічної діагностики.

Мета – оцінити динаміку захворюваності на РЕ серед жіночого населення Сумської області у довоєнний (2017–2021 рр.) та воєнний (2022–2024 рр.) періоди, а також з'ясувати, чи супроводжувався період воєнного стану зростанням частки поширених (III–IV) стадій.

Ретроспективне популяційне дослідження на основі відкритих даних бюлетенів Національного канцер-реєстру України № 19–26. Аналізували абсолютну кількість уперше зареєстрованих випадків РЕ, інтенсивний показник на 100 тис. жіночого населення, розподіл за стадіями (I, II, III, IV, стадія не встановлена) та показники якості онкологічної допомоги. Порівняння відносних величин між групами проводили за допомогою критерію χ^2 Пірсона. За наявності малих очікуваних частот застосовували точний критерій Фішера. Статистично значущими вважали відмінності при $p < 0,05$.

Кількість зареєстрованих випадків у 2017–2019 рр. коливалась у межах 216–253 на рік. У 2020 р. відбулося зниження до 178 випадків (-28,2% відносно 2019 р.), у 2022 р. – до 144 випадків (-28,4% відносно 2021 р. та -34,3% відносно середнього довоєнного рівня), з подальшим відновленням до 229 і 225 випадків у 2023 та 2024 рр. Частка пацієнток із III–IV стадіями РЕ впродовж досліджуваного періоду мала тенденцію до зростання та досягла максимального значення у 2022 році – 19,2%, порівняно з 8,7% у 2017 році. У наступні роки цей показник знизився до 11,4% у 2023 році та 13,1% у 2024 році. Водночас при порівнянні довоєнного та воєнного періодів статистично значущих відмінностей у частці випадків III–IV стадій не встановлено (12,4% та 13,9% відповідно, $p > 0,05$). Найвищий рівень однорічної летальності також спостерігався серед пацієнток, у яких захворювання було діагностовано у 2022 році, і становив 10,8%.

Вплив воєнного стану на виявлення РЕ у Сумській області мав характер різкого, але короткочасного провалу 2022 року з максимальною за весь період часткою поширених стадій. У 2023–2024 рр. показники повернулися до довоєнного рівня. Зсув у бік пізніх стадій розпочався ще у 2020–2021 рр., тобто був закладений пандемією COVID-19.

Ключові слова: рак ендометрію, захворюваність, воєнний стан, стадія захворювання, канцер-реєстр.

ANALYSIS OF ENDOMETRIAL CANCER INCIDENCE AMONG THE FEMALE POPULATION OF SUMY REGION IN THE PRE-WAR PERIOD AND UNDER MARTIAL LAW

Hyriavenko N. I., Tsyndrenko N. L., Sumtsov D. G., Moskalenko R. A.

Abstract. Endometrial cancer (EC) is one of the most common oncogynecological diseases in Ukraine. The Sumy region is a border region that, since February 2022, has been under the constant influence of security, demographic, and logistical factors that may affect the availability and timeliness of oncological diagnostics.

The aim is to assess the dynamics of the incidence of EC among the female population of Sumy region in the pre-war (2017–2021) and war (2022–2024) periods, as well as to find out whether the martial law period was accompanied by an increase in the proportion of advanced (III–IV) stages.

Retrospective population-based study based on open data from bulletins of the National Cancer Registry of Ukraine No. 19–26. The absolute number of first-time registered cases of EC, the incidence rate per 100,000 female population, the distribution by stage (I, II, III, IV, stage not established), and indicators of the quality of oncological care were analyzed. The comparison of relative values between groups was performed using the Pearson χ^2 test. When expected frequencies were small, Fisher's exact test was used. Differences were considered statistically significant at $p < 0.05$.

The number of registered cases in 2017–2019 ranged from 216 to 253 per year. In 2020, there was a decrease to 178 cases (-28.2% compared to 2019), in 2022, to 144 cases (-28.4% compared to 2021 and -34.3% compared to the average pre-war level), with a subsequent recovery to 229 and 225 cases in 2023 and 2024. The proportion of patients with stages III–IV of EC during the study period tended to increase, reaching a maximum of 19.2% in 2022, compared with 8.7% in 2017. In subsequent years, this figure decreased to 11.4% in 2023 and 13.1% in 2024. At the same time, when comparing the pre-war and war periods, no statistically significant differences in the proportion of cases of stages III–IV were found (12.4% and 13.9%, respectively, $p > 0.05$). The highest level of one-year mortality was also observed among patients in whom the disease was diagnosed in 2022, and was 10.8%.

The impact of martial law on the detection of EC in the Sumy region was in the nature of a sharp but short-term failure in 2022, with the maximum share of advanced stages for the entire period. In 2023–2024, the indicators returned to the pre-war level. The shift towards late stages began in 2020–2021, that is, it was laid by the COVID-19 pandemic.

Key words: endometrial cancer, morbidity, martial law, stage of disease, cancer registry.

ORCID and contributionship:

Hyriavenko N. I.: <https://orcid.org/0000-0002-9805-014X> ^{ABD}

Tsyndrenko N. L.: <https://orcid.org/0000-0001-6763-476X> ^{CBD}

Sumtsov D. G.: <https://orcid.org/0000-0001-5143-6902> ^{ABE}

Moskalenko R. A.: <https://orcid.org/0000-0002-2342-0337> ^{AEF}

Conflict of interest:

The authors declare no conflict of interest.

Corresponding author

Hyriavenko Natalia Ivanivna

Sumy State University

Ukraine, 40007, Sumy, 116 Kharkivska str.

Tel.: +380997466578

E-mail: n.gyryavenko@med.sumdu.edu.ua

A – Work concept and design, B – Data collection and analysis, C – Responsibility for statistical analysis, D – Writing the article, E – Critical review, F – Final approval of the article.

This article is distributed under the terms of the **Creative Commons Attribution (CC-BY) License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited © All authors, 2026

Received 14.05.2026

Accepted 19.08.2026

Published 29.09.2026

DOI 10.29254/2077-4214-2026-3-182-253-258

УДК 616.127-005.8-085

^{1,2}Гончар О. О.

НО-ПРОДУКУЮЧІ ФЕРМЕНТИ ТА ВМІСТ КОРТИЗОЛУ В КРОВІ У ХВОРИХ НА Q-ІНФАРКТ МІОКАРДА В ДИНАМІЦІ ЛІКУВАННЯ

¹Комунальне підприємство «Полтавський обласний клінічний медичний кардіоваскулярний центр Полтавської обласної ради» (м. Полтава, Україна)

²Полтавський державний медичний університет (м. Полтава, Україна)

ol.gonchar19@gmail.com

Метою дослідження є визначення впливу темгіколурилу на активність ізоформ NO-синтази, концентрації нітритів та пероксинітритів, рівня кортизолу у сироватці крові при додаванні до стандартної схеми лікування пацієнтів з Q-інфарктом. Пацієнти були підібрані на основі критеріїв включення та виключення. Дані пацієнтів були зібрані згідно стандартної форми. Розподіл на групи проведений у відповідності до дослідження. В крові пацієнтів визначали активності наступних NO-продукуючих ферментів: індукцбельної NO-синтази (iNOS), ендотеліальної NO-синтази (eNOS) та нейрональної NO-синтази (nNOS). Активності ізоформ NO-синтази визначали за приростом концентрації L-цитруліну після інкубації 0,2 мл плазми крові у середовищі, що містить L-аргінін, НАДФН-відновлений та селективні інгібітори активності ізоформ NO-синтази (аміногуанідин та 7-нітроіндазол). Також в крові пацієнтів було визначено вміст нітритів та пероксинітритів. Вміст кортизолу в плазмі крові визначали спектрофотометрично із використанням аммонію тетраметилгідроксидпентагідрату та нітросинього тетразалію у якості кольорових агентів на кортизол. Лікування Q-інфаркту з використанням стандартних протоколів супроводжується зниженням надмірної продукції оксиду азоту від усіх досліджуваних ізоформ NO-синтази. Стандартна терапія знижує утворення токсичних форм оксиду азоту та вміст кортизолу в крові пацієнтів. Додавання темгіколурилу до стандартних протоколів лікування Q-інфаркту зберігає сумарну продукцію оксиду азоту за рахунок меншого пригнічення активності індукцбельної ізоформи NO-синтази та зберігає високі концентрації кортизолу в крові пацієнтів.

Ключові слова: Q-інфаркт, оксид азоту (NO), NO-продукуючі ферменти, кортизол, темгіколурил.