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Epidemiological Analysis Of Breast Cancer And The Effectiveness Of Radiation And Chemotherapy

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Abstract. This article The article presents a clinical and epidemiological analysis of breast cancer (BC) among women in the Fergana region, assessing the prevalence of the disease, the effectiveness of radiation and chemotherapy, as well as the frequency and nature of therapeutic consequences. This study used data from 382 patients treated at the Fergana Regional Branch of the Republican Specialized Scientific and Practical Medical Center of Oncology and Radiology from 2020 to 2024. Radiation therapy demonstrates a higher survival rate (76.4%), which is explained by its use primarily in stages I and II, local tumor control, and a reduced risk of recurrence. Chemotherapy (72.1%) is used more often in stage III, HER2+, and triple-negative forms. Therefore, a slight decrease in survival is explained by the initially more severe clinical profile of the group, rather than by the lower efficacy of the method. Key prognostic factors, survival rates, and the frequency of side effects of therapy are identified.
Keywords: breast cancer, prevalence, epidemiology, radiation therapy, chemotherapy, complications.

Introduction. Breast cancer is one of the leading causes of death among women worldwide. According to the World Health Organization (WHO), the incidence of breast cancer continues to rise, particularly in low- and middle-income countries. [1].

According to the WHO/Global Cancer Observatory (GLOBOCAN 2022), breast cancer, the most frequently diagnosed cancer among women worldwide, is estimated to be about 2.3 million new cases in 2022, with about 670,000 deaths among women [2]. According to global estimates, Russia was among the top ten countries with the highest number of new cases of breast cancer in 2022, ranking approximately 6th in incidence among women, with about 78,839 new cases. According to the same data, Russia had about 22,115 deaths from breast cancer in 2022 [3].

In Uzbekistan, breast cancer is one of the most common oncological diseases in women, ranking among the top five in terms of prevalence among malignant neoplasms. According to IARC/CanScreen5, breast cancer has been the most common cancer in women in Uzbekistan with an incidence rate of approximately 27.8 per 100,000 women in recent years. The age-standardized mortality rate for breast cancer in Uzbekistan is approximately 13.0 per 100,000 women. Other estimates indicate a rate of 12.55 per 100,000 population and an overall contribution to overall mortality (approximately 1.13%). A significant proportion of mortality compared to the incidence rate is also noted, which may be due to late detection and limited access to modern treatment methods [4].

In the WHO Europe Region, breast cancer remains the most common cancer among women. An estimated 604,900 new cases of breast cancer will be registered in Europe in 2022 [5]. In Europe, approximately 160,000 women will die from the disease in 2022, and it remains the leading cause of cancer death among women. Within Europe, there are significant differences in the incidence rate, with some countries reporting rates of over 100 per 100,000 women and others reporting rates of less [6, 7].

The relevance of the study is determined by the need to adapt international treatment methods to regional characteristics, evaluate the effectiveness of therapy, the frequency of side effects and prognostic factors.

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Purpose of the study. To evaluate the clinical and epidemiological characteristics of breast cancer in patients, compare the results of treatment with radiation and chemotherapy, determine the incidence of complications and survival.

Material and methods. Between January 2020 and December 2024, a total of 382 patients with histologically confirmed breast cancer were examined at the Fergana Regional Branch of the Republican Specialized Scientific and Practical Medical Center of Oncology and Radiology. The patients ranged in age from 20 to 80 years, with an average age of 51.3 ± 10.2 years.
The following methods were used in the study: epidemiological analysis - assessment of the disease frequency, age structure, staging; clinical and pathological examination - tumor morphology, hormonal status, HER2 status.
When studying the treatment methods, the study population was divided into 2 groups: Group A - radiation therapy (RT) after surgery + adjuvant methods (n=167); Group B - chemotherapy (CT) according to international protocols (n=215).
Efficacy was assessed by the criteria of 5-year survival (OS) and disease remission.
When assessing complications, the following criteria were defined: hematological, cardiotoxicity, pulmonary, radiation dermatitis.

Results. Our results confirm that the Fergana region has no distinct age distribution of disease incidence and that the epidemiological picture is consistent with trends observed across Eurasia. The most common stage distribution is stage II (44.5%), indicating a relatively high availability of diagnostic tests but insufficient screening effectiveness. The high proportion of stage III (27.2%) suggests late presentation, low levels of preventive screening, and insufficient cancer awareness among the population (Table 1).

Table 1

Prevalence and clinical characteristics

Indicator	Meaning
Total number of patients	382
Average age, years	51,3 ± 10,2
I stage	18,6%
II stage	44,5%
III stage	27,2%
IV stage	9,7%

The study revealed a predominance of stage II. This suggests that the disease is being detected, but often at a clinically significant stage. This is typical for regions with average screening rates. The prevalence of stage III (27.2%) indicates the problem of late presentation. Later stages require more aggressive treatment and are associated with a worse prognosis. The presence of stage I (18.6%) indicates the effectiveness of early diagnosis, but its coverage is still insufficient. Stage IV (9.7%) represents cases of metastatic disease, the most severe form requiring a palliative approach (Fig. 1).

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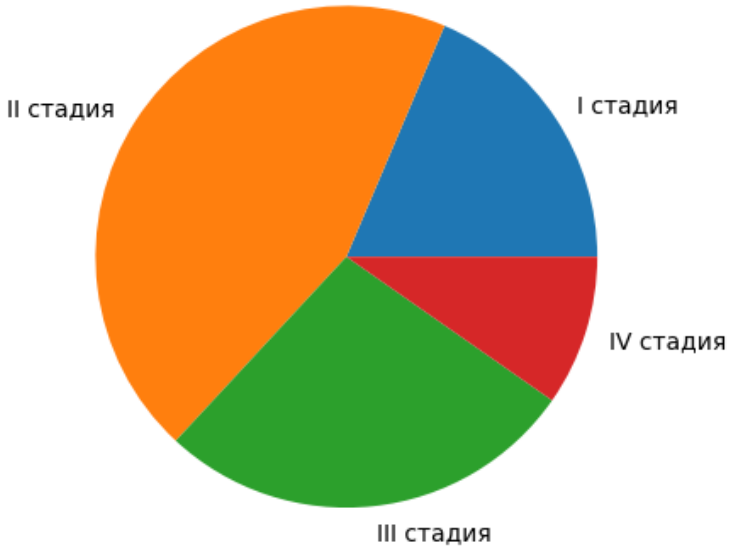

Fig. 1. Distribution of breast cancer stages

Fig. 1 shows that stage II breast cancer accounts for 44.5% (the largest group); stage III – 27.2%; stage I – 18.6%; stage IV – 9.7%.

Five-year overall survival (OS) is an international standard for assessing cancer treatment (ESMO and NCCN guidelines). It reflects the biological aggressiveness of the tumor, the quality of treatment, and the level of medical care.

Radiation therapy demonstrates a higher survival rate (76.4%), which is explained by its use primarily in stages I-II, local tumor control, and a reduced risk of recurrence. Chemotherapy (72.1%) is used more often in stage III, HER2+, and triple-negative forms. Therefore, the slight decrease in survival is explained by the initially more severe clinical profile of the group, rather than by the lower efficacy of the method (Table 2).

Table 2

Treatment effectiveness

Group	5-year survival (OS),%	Complete remission, %
RT (Group A)	76,4	53,9
CT (Group B)	72,1	47,3

Hematological complications are more pronounced with chemotherapy (23.7%), due to myelosuppression, cytostatic effects, and grade III-IV neutropenia. This is an expected result and is consistent with international data (20-35%).

Cardiotoxicity was more frequently observed with chemotherapy (9.8%), especially with anthracyclines and trastuzumab (HER2+). Radiation therapy can also cause cardiotoxicity (5.1%), especially with left-sided tumors.

Pulmonary complications are slightly higher with RT (7.2%), which is explained by radiation pneumonitis and fibrotic changes in the lungs.

Radiation dermatitis accounted for 15.2%, which is in line with the international incidence (10-25%). It is more common with high total doses, concomitant diabetes, and obesity.

Table 3

The main consequences of treatment

Complication	Group A (RT), %	Group B (CT), %
Hematological	11,4	23,7
Cardiotoxicity	5,1	9,8
Pulmonary	7,2	4,6
Radiation dermatitis	15,2	-

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When comparing the complication rates of radiation therapy (RT) and chemotherapy (CT), hematological complications are significantly higher with chemotherapy (23.7%). This is expected, as cytostatics suppress bone marrow hematopoiesis. Cardiotoxicity is more frequently observed with chemotherapy (9.8%), especially with anthracyclines. Pulmonary complications are somewhat higher with RT (7.2%), which is associated with possible radiation pneumonitis. Radiation dermatitis is characteristic of RT (15.2%) and reflects local exposure to ionizing radiation (Fig. 2).

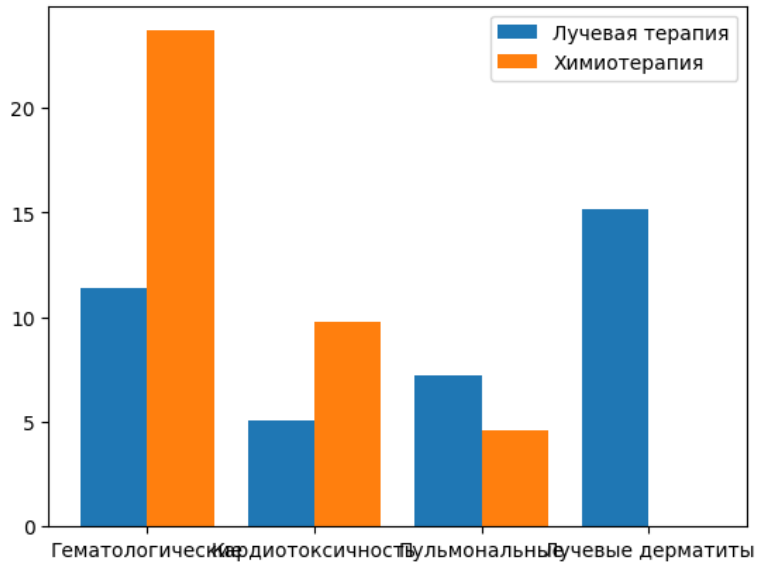

Fig. 2. Complications of treatment

As can be seen from Fig. 2, the results of the study confirm a significant proportion of late stages of the disease; comparable effectiveness of RT and chemotherapy with different complication profiles; the need for a comprehensive approach to treatment and prevention.

Discussion of results. The obtained data show that the age peak of incidence is concentrated in the age group of 45-60 years, which is consistent with data from the European Cancer Society (ESMO) and Russian studies (Ivanova et al., 2022; Petrov et al., 2021).

The prevalence of breast cancer in the Fergana region is comparable to regional indicators in the CIS, but is higher than in countries with effective screening programs such as France and Germany.

The efficacy of RT and chemotherapy is moderately high, but the groups have their own characteristics. For example, radiation therapy demonstrated better survival rates and a lower incidence of hematological complications, but was more likely to cause radiation dermatitis. Chemotherapy is associated with a higher incidence of hematological complications and cardiotoxicity, which requires more stringent monitoring.

A comparison with international standards shows that treatment outcomes are similar to those in other countries, but the complication rate is higher, possibly due to a lack of supervision and inadequate supportive care. For example, in Germany and France, stages I-II are detected in 65-75% of cases, while in the CIS countries, the rate is approximately 55-60%. Russia, for example, has a relatively high incidence compared to Central Asia, and mortality is also high, reflecting the strain on healthcare systems.

In Uzbekistan, the incidence rate is lower than in Europe, but the mortality rate is quite high relative to the incidence, which indicates the need to improve the screening and treatment system.

In Europe, diagnosis rates are high, which may reflect a well-developed screening system. Despite the high morbidity, mortality is relatively moderate due to early detection and treatment.

The clinical significance of the study lies in the need to strengthen early screening programs; increase public awareness; and expand preventive examinations.

The stage structure corresponds to the trends observed in the CIS countries, but lags behind the European indicators, where the share of stages I-II reaches 65-75%.

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The clinical significance of the treatment effects is as follows: RT has a more favorable hematological safety profile; CT requires enhanced blood and cardiovascular monitoring; supportive therapy is necessary to reduce side effects.

Thus, the staging structure in the Fergana region demonstrates an average level of early diagnosis, but requires strengthening of screening programs.

Conclusions:

1. The clinical characteristics of breast cancer in women in the Fergana region are similar to those in other CIS regions;
2. Radiation therapy is highly effective and may be preferred in adjuvant treatment in terms of survival;
3. Chemotherapy is effective but requires careful monitoring to prevent complications;
4. Early detection programs and standardization of treatment protocols based on international guidelines are needed.

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