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EPIDEMIOLOGICAL ANALYSIS OF BREAST CANCER IN WOMEN OF CHILDBEARING AGE IN THE KARAGANDA REGION

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ABSTRACT

Relevance: *The article examines the epidemiological features of breast cancer among women of childbearing age (15-49 years). Over the past decade, the incidence of breast cancer in women of reproductive age has been steadily increasing. Awareness of prevention is the first and most important step in reducing mortality from breast cancer. Breast cancer, especially among women of childbearing age, is a major public health problem worldwide and is currently the most common cancer among women.*

The study aimed to *analyze the level and structure of breast cancer incidence among women of childbearing age in the Karaganda region (Kazakhstan) in 2013-2023.*

Methods: *A retrospective epidemiological analysis of the long-term dynamics of cardiovascular disease incidence among women of reproductive age in the Karaganda region for 2013-2023 was conducted. Statistical data on cardiovascular disease incidence in the Karaganda region for 2013-2023 are provided in terms of age, mortality and mortality rates. The data are taken from the statistical collections "Health of the population of the Republic of Kazakhstan and the activities of health care organizations for 2013-2023."*

Results: *Between 2013 and 2023, breast cancer incidence rates in the Karaganda region fluctuated, with ups and downs. Every year, breast cancer incidence among urban residents was higher than among rural residents. In recent years, the incidence of stage IV breast cancer has decreased signifi-cantly. The region's mortality rate decreased steadily between 2013 and 2023. The correlation coefficient ($r = 0.93$) indicates a very strong positive linear connection between the number of reported breast cancer cases and the patients' age.*

Conclusion: *The average annual rate increase in breast cancer incidence remains stable. In general, breast cancer incidence in urban areas is around 1.3-1.6 times higher than in rural areas. As the proportion of early diagnosis increases, the mortality from breast cancer decreases considerably. Early diagnosis is crucial for improving survival and reducing mortality from this disease, as evidenced by a significant decline in this indicator $t = 3.12$, $p < 0.01$.*

Keywords: *breast cancer, incidence, mortality, fertile age, screening.*

Introduction: Breast cancer (BC), including in women of reproductive age, is a pressing health problem worldwide and is currently the most common cancer among women [1]. Studies of the socioeconomic significance of BC have shown that it is not only one of the leading causes of mortality among women but also causes significant economic losses.

In 2023, the World Health Organization launched a global initiative aimed at reducing the incidence of breast cancer by 2.5% annually through prevention, timely diagnosis, and effective treatment [2]. In Kazakhstan, in 2023, breast cancer ranked first in the structure of oncological diseases and third in mortality. According to data for 2023, breast cancer accounts for 13.2% of all cancer cases in the country [3-4]. Increased awareness of breast cancer, increased public attention, and significant advances in breast research have had a positive impact on the detection and implementation of breast cancer screening [4].

As of 2024, approximately 5,000 patients are diagnosed with breast cancer in Kazakhstan annually, and up to 1,200 women die from it. Breast cancer is the second most common type of cancer among women. About 1,800 new cases are registered annually, and about 600 women die from it [3].

Despite the seriousness of the problem, it should be noted that there is a lack of systematic studies examining the prevalence of cancer among women of reproductive age. This is reflected in the limited available data, which hinders a full understanding of the problem's scale and the development of effective prevention and treatment strategies.

The study aimed to analyze the level and structure of breast cancer incidence among women of childbearing age in the Karaganda region (Kazakhstan) in 2013-2023.

Materials and methods: Statistical data on the incidence of breast cancer in women of childbearing age (ICD code C50.0-C50.9) in the Karaganda region for 2013-2023 were obtained from the Republican Statistical Digest No. 3 of the Karaganda City Multidisciplinary Hospital. The article "Kazakhstan and the Activities of Healthcare Organizations in 2013-2023" [5-15] was also used.

Statistical analysis of the data was performed using Statistica 13.3. Morbidity and mortality rates were calculated per 100,000 population. Student's t-test and Pearson's correlation coefficient (r) were used.

A descriptive epidemiological surveillance method was used. A retrospective epidemiological analysis (analysis of long-term incidence dynamics for 2013–2023) was conducted.

Results: A retrospective epidemiological analysis of newly diagnosed cancer incidence in the Karaganda region is presented in Figure 1. In the Karaganda region, an uneven incidence rate, with fluctuations, was recorded from 2013 to 2023. The highest rates were recorded between 2016 and 2018. In the Karaganda region, there were 280.3-290.3 cases per 100,000 population. In particular, in 2018, the highest incidence rate was recorded in the Karaganda region (290.3 cases) per 100,000 population. Between 2018 and 2022, a significant decrease was observed in the Karaganda region, from 278.5 cases per 100,000 population to 245.1. This phenomenon may be related to the reduction in the number of routine screenings and medical examinations during the COVID-19 pandemic.

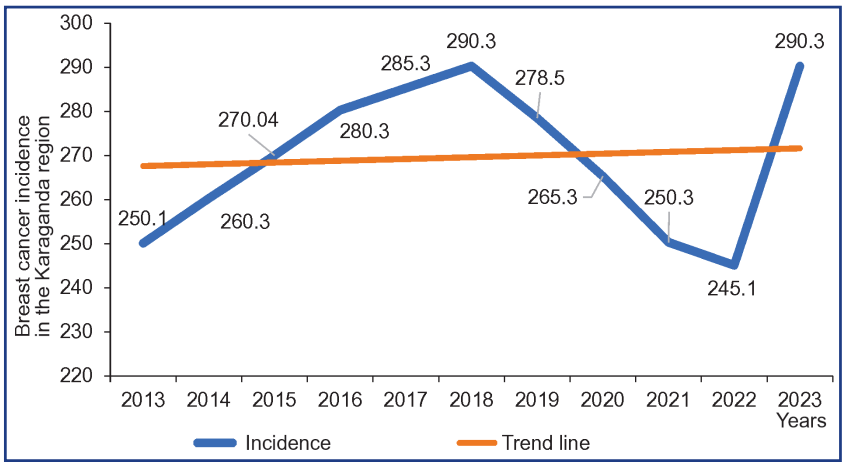

Figure 1 – Long-term dynamics of cancer incidence in the Karaganda region for the period 2013-2023 (per 100,000 population)

The lowest level was recorded in 2022, at 245. The average incidence rate in the analyzed years is 250.08. per 100,000 population. In 2023, a comparative analysis of incidence compared to 2013 revealed a 1.47-fold increase. In 2023, the highest incidence rate was reported in the Karaganda region, with 290 cases per 100,000 population. This figure is comparable to the peak in 2018. This increase could be due to the resumption of preventive examinations and timely diagnostic procedures in recent years.

Generally, the incidence rate in the Karaganda region remained consistently high throughout the review period. The average annual growth rate was stable at T^{sn}_{pr}=0.94%. The projected incidence rate in 2024 was 280.71 per 100,000 population. If the trend that developed in the previous period continued, the incidence rate could range from 278.9 to 281.86

An analysis of cancer incidence in urban and rural populations in 2013-2023 revealed that breast cancer was more common among urbanites (Figure 2). Figure 2 shows the annual breast cancer incidence in urban and rural populations of childbearing age in the Karaganda region for 2013-2023 (per 100,000 inhabitants). The average incidence in urban areas was 1.19 times higher than in rural areas, amounting to 260.6 and 219.3 cases per 100,000 inhabitants, respectively.

The incidence rate among urbanites was consistently higher every year compared to rural residents.

The lowest and highest rates were observed among urbanites, at 220 per 100,000 residents in 2013 and 275 in 2023, respectively. Among the rural population, the rates were 180 in 2013 and 210 in 2019 and 2023. The overall incidence in urban areas was about 1.3-1.6 times higher than in rural areas. A slight increase in breast cancer mortality was observed in both groups in 2018-2020, and screening and early detection efforts will likely be intensified during this period.

Table 1 presents an analysis of breast cancer incidence in the Karaganda region from 2013 to 2023, categorized by disease stage.

The incidence rates for stages I and II from 2013 to 2019 are presented separately. These stages have been combined since 2020. Notably, the incidence rates for stages I and II were higher per 100,000 population compared to stages III and IV. Between 2013 and 2023, there was an improvement in early detection of breast cancer (at stages I and II), likely due to screening programs and higher medical awareness among women. The decrease in the incidence of stages III and IV could indicate improved treatment efficacy.

A downward trend in long-term dynamics of mortality from breast cancer in the Karaganda region was revealed

(Figure 3), with a 2.9-fold decrease in mortality, from 15.7 to 5.4 per 100,000 population. The peak mortality rate of 15.7 was recorded in 2013. The projected mortality rate in 2024 was 4.94 cases per 100,000 population.

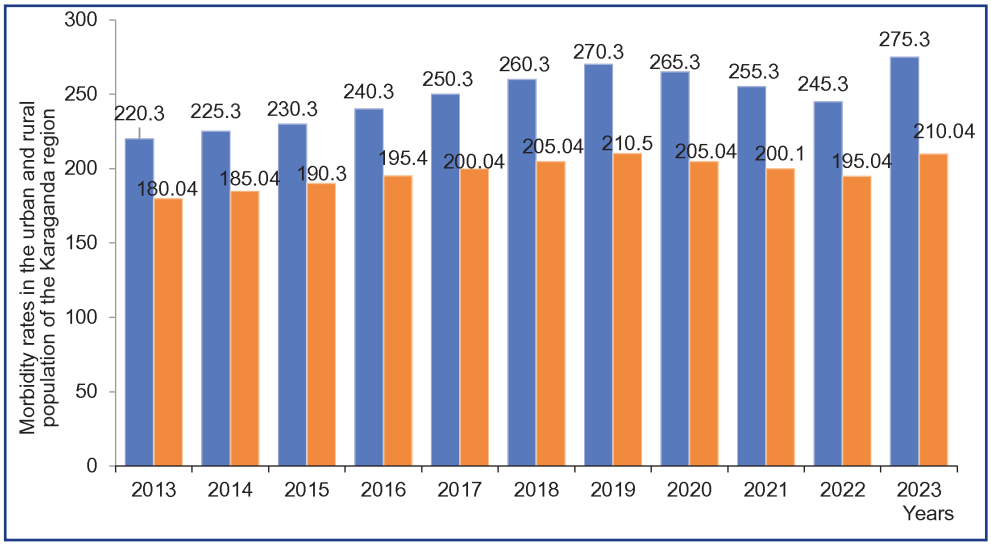

Figure 2 – Long-term dynamics of breast cancer incidence among the urban and rural population of childbearing age in the Karaganda region for the period 2013–2023 (per 100,000 inhabitants)

Table 1 – Prevalence of breast cancer by disease stage in the Karaganda region, 2013-2023

Year	Breast cancer (by stage)			
	Stage I	Stage II	Stage III	Stage IV
2013	38.7	41.2	12.8	7.4
2014	44.7	37.7	12.1	5.4
2015	40.7	40.5	12.3	6.3
2016	46.2	39.9	8.8	5.2
2017	46.9	38.8	6.7	4.7
2018	41.8	40.9	11.5	5.8
2019	31.8	45.4	15.2	7.4
2020	78.0		15.8	6.0
2021	78.8		14.0	7.1
2022	82.8		11.6	5.6
2023	73.3		21.8	4.7

A positive correlation with the total number of detections indicates improved diagnostic and screening coverage. However, a clear decline in early detections (7.2%) is observed, confirming the impact of the pandemic in 2020. The increase in the share of early detection is a positive sign, as it increases the chances of successful treatment and reduces mortality.

Statistical analysis revealed a very high correlation between the frequency of screening tests and the rate of early detection ($r = 0.98$). This provides important evidence of the direct link between early diagnosis and screening. Furthermore, a strong positive correlation was observed between the frequency of general preventive examinations and the rate of detected cases ($r = 0.993$). This confirms the high effectiveness of preventive examinations.

The study also included a statistical analysis of mortality rates. A significant reduction in mortality rates has been noted due to improved early diagnosis. The statistical significance of this reduction ($t = 3.12$, $p < 0.01$) indicates that early diagnosis is a key factor in improving survival and reducing mortality.

Discussion: Cancer remains one of the most significant health issues in modern medicine. Cancer diseases spread rapidly worldwide. According to the literature, breast cancer is more common in women living in urban areas than in rural areas. This is attributed to increased access to diagnostic capabilities, screening, and medical care. Late or inadequate diagnosis in rural areas, as well as low public awareness, can negatively impact early detection. Low registration rates in rural areas may be due not to a low true incidence but to limited diagnostic capabilities. This situation underscores the importance of developing targeted prevention programs in rural areas to reduce regional disparities among women of reproductive age [16-17].

Between 2013 and 2023, an improvement in the detection of early-stage breast cancer (stages I and II) was noted, which may be due to the availability of screening pro-

grams and increased medical awareness among women. An increase in the incidence of stage III and a decrease in stage IV cases during this period may indicate increased treatment effectiveness. In recent years, the integration of mass screening, mammography, ultrasound, and public education on self-examination methods into the medical examination of women over 40 years of age has provided a valuable opportunity for early disease detection [18-19].

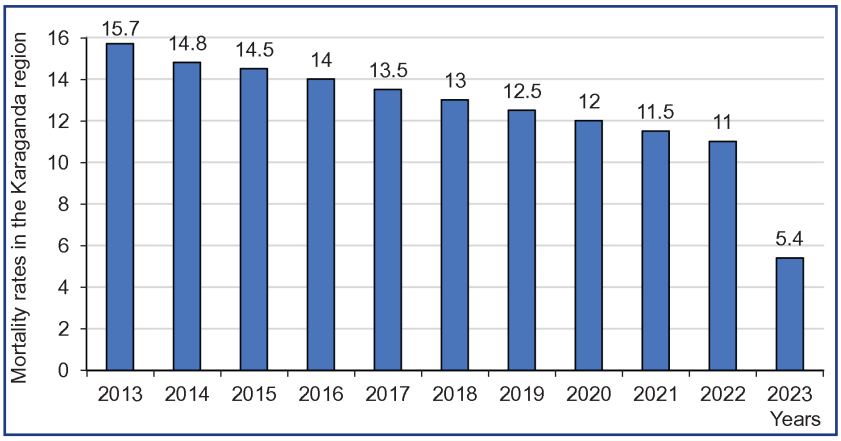

Figure 3 – Long-term dynamics of mortality from breast cancer in the Karaganda region for the period 2013-2023 (per 100,000 inhabitants)

Regular examinations and screening programs are the most effective tools for early detection of breast cancer, which in turn allows for timely initiation of treatment, prevention of disease complications, and reduction of mortality [20].

Several factors increase the risk of developing breast cancer [21-22]. Some risk factors are independent of a woman's lifestyle, such as age or genetic predisposition, but other factors, including reproductive behavior, hormonal use, and lifestyle, may also influence them. A systematic literature review [23] of 197 citations in PubMed, Web of Science, and Scopus summarized the influence of lifestyle factors on the risk of breast cancer; for example, smoking and alcohol consumption increase the odds ratio by 7% and 10%, respectively, while regular physical activity reduces the risk by 10%. The same study summarized the influence of reproductive behavioral factors (infertility, late pregnancy, breastfeeding, oral contraceptive use) and hormones (estrogen, progesterone, estrogen/progesterone, hormone therapy), as well as diet and radiation therapy. It is important to note that there are also secondary risk factors, such as night shift work, which influence the risk of developing cancer through changes in women's hormonal status [22, 24]. Furthermore, the influence of risk factors may vary depending on the genetic and ethnic characteristics of women [25-26].

The study demonstrates that the introduction of modern diagnostic and treatment methods has a significant impact on reducing cancer mortality. The findings confirm the importance of implementing innovative technologies and improving organizational processes in the healthcare system. Further research aimed at analyzing additional variables will help clarify the impact of various factors on mortality dynamics and facilitate the development of effective strategies to improve the quality of medical care.

Further research in this area includes conducting in-depth quantitative analysis using regression modeling and correlation analysis to identify key factors contributing to the development of the disease. This will not only enhance our understanding of epidemiological patterns but also enable the development of effective measures to reduce the incidence of the disease.

Conclusion: The incidence rate in the Karaganda region remains consistently high throughout the period under review. The average annual growth rate is estimated to be stable at T^{sn}_{pr} = 0.94%. The projected incidence rate in 2024 is 280.71 per 100,000 population, and if the trend established in the previous period continues, the incidence rate is expected to range from 278.9 to 281.86.

Generally, the incidence rate in urban areas is approximately 1.3 to 1.6 times higher than in rural areas. The incidence of diseases detected for the first time in life in the region and the city was 1.19 times higher than in rural areas, amounting to 260.6 and 219.3, respectively.

In the Karaganda region, a gradual decline in mortality was observed between 2013 and 2023. The mortality rate in the Karaganda region has decreased from 15.7 to 5.4 per 100,000 people. The number of registered cases has increased by 2.9 times. The maximum mortality rate was 15.7 in 2013. The projected mortality rate in 2024 is 4.94 cases per 100,000 population.

Between 2013 and 2023, an improvement in early detection of breast cancer (stages I and II) was noted, which may be due to the availability of screening programs and increased medical awareness among women. Furthermore, a decrease in the incidence of stage IV breast cancer has been observed in recent years. The relatively uniform incidence of cancer and the decrease in stage IV breast cancer incidence and mortality are due to several social, medical, and organizational factors. The increase in stage

III breast cancer cases and the decrease in stage IV breast cancer cases during this period may indicate improved treatment effectiveness.

Statistical analysis revealed a very high correlation between the frequency of screening tests and the rate of early detection (r=0.98). A strong positive correlation was also observed between the frequency of general preventive examinations and the number of cases detected (r=0.993). This confirms the high effectiveness of preventive examinations.

In conclusion, it should be noted that the increase in early breast cancer diagnosis rates over the past decade demonstrates the effectiveness of screening programs and awareness-raising activities in the healthcare system. These data are important from both a scientific and practical perspective, as early cancer detection is a crucial factor in improving treatment effectiveness and quality of life.

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АНДАТПА

ҚАРАҒАНДЫ ОБЛЫСЫ БОЙЫНША ФЕРТИЛЬДІ ЖАСТАҒЫ ӘЙЕЛДЕРДІҢ СҮТ БЕЗІ ҚАТЕРЛІ ІСІГІН ЭПИДЕМИОЛОГИЯЛЫҚ ТАЛДАУ

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Өзектілігі: *Бұл мақалада фертильді жастағы (15-49 жас) әйелдер арасындағы сүт безі қатерлі ісігі (СБҚІ)-нің эпидемиологиялық ерекшеліктері зерттеледі. Соңғы онжылдықта репродуктивті жастағы әйелдер арасында СБҚІ-нің жиілігі біртіндеп өсіп келе жатқаны байқалды. Алдын алу туралы ақпараттандырылу – бұл СБҚІ-нен болатын өлімді азайтудың алғашқы және маңызды қадамы. СБҚІ, оның ішінде фертильді жастағы әйелдер арасында және бүкіл әлемде денсаулық сақтаудың өзекті мәселесін тудырады және қазіргі уақытта әйелдер арасында ең көп тараған ісік түрі болып табылады.*

Зерттеу мақсаты *– 2013-2023 жылдарға Қазақстан Республикасының Қарағанды облысында фертильді жастағы әйелдердің сүт безі қатерлі ісігінің аурушаңдығы мен құрылымын зерттеу.*

Әдістері: *Қарағанды облысы бойынша 2013-2023 жылдарға арналған репродуктивті жастағы әйелдердің жүрек-қан тамырлары ауруларының ұзақ мерзімді динамикасына ретроспективті эпидемиологиялық талдау жүргізілді. Қарағанды облысы бойынша 2013-2023 жылдарға арналған жүрек-қан тамырлары ауруларының статистикалық деректері жас, өлім және өлім-жітім көрсеткіштері бойынша берілген. Мәліметтер «Қазақстан Республикасы халқының денсаулығы және денсаулық сақтау ұйымдарының 2013-2023 жылдарға арналған қызметі» статистикалық жинақтарынан алынды.*

Нәтижелері: *Қарағанды облысында 2013-2023 жылдар аралығында СБҚІ-мен сырқаттанушылықтың біркелкі емес динамикасы көтеріліп, төмендеді. Қала тұрғындары арасында СБҚІ-мен сырқаттанушылық жыл сайын ауыл тұрғындарына қарағанда тұрақты түрде жоғары болды. Соңғы жылдары СБҚІ-нің IV сатысының төмендеуі байқалады. Қарағанды облысында 2013-2023 жылдары өлім-жітімнің тиісінше төмендеу үрдісі тіркелуде. Корреляция коэффициенті (r=0,93) пациенттердің орташа жасы мен сүт безі ісігінің тіркелген жағдайларының орташа саны арасындағы өте күшті оң сызықтық байланысты көрсетеді.*

Қорытынды: *Қарағанды облысында СБҚІ-мен сырқаттанушылықтың орташа жылдық өсу қарқыны тұрақты өсуде. Жалпы, қалалық жерлерде СБҚІ-нің аурушаңдығы ауылдық жерлерге қарағанда шамамен 1,3-1,6 есе жоғары. Ерте анықтау үлесінің ұлғаюымен СБҚІ-нен болатын өлім-жітім деңгейі айтарлықтай төмендейді. Бұл көрсеткіштің төмендеуі статистикалық маңызды болды (t=3,12, p<0,01), бұл ерте диагностика өмір сүруді арттыру және осы аурудан өлімді азайтудың шешуші факторы екенін көрсетеді.*

Түйінді сөздер: *сүт безі қатерлі ісігі (СБҚІ), сырқаттанушылық, өлім-жітім, фертильді жас, скрининг.*

АННОТАЦИЯ

ЭПИДЕМИОЛОГИЧЕСКИЙ АНАЛИЗ РАКА МОЛОЧНОЙ ЖЕЛЕЗЫ У ЖЕНЩИН ФЕРТИЛЬНОГО ВОЗРАСТА В КАРАГАНДИНСКОЙ ОБЛАСТИ

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Актуальность: *РВ статье рассматриваются эпидемиологические особенности рака молочной железы среди женщин фертильного возраста (15-49 лет). За последнее десятилетие заболеваемость раком молочной железы (РМЖ) среди женщин репродуктивного возраста неуклонно растет. Информированность о профилактике является первым и самым важным шагом в снижениии смертности от рака груди. РМЖ, в том числе среди женщин фертильного возраста, представляет собой серьезную проблему общественного здравоохранения во всем мире и в настоящее время является наиболее распространенным видом рака среди женщин.*

Цель исследования *– изучить уровень и структуру заболеваемости раком молочной железы среди женщин фертильного возраста в Карагандинской области Республики Казахстан за период 2013-2023 годы.*

Методы: *Проведен ретроспективный эпидемиологический анализ многолетней динамики заболеваемости сердечно-сосудистыми заболеваниями среди женщин репродуктивного возраста Карагандинской области за 2013-2023 годы. Приведены статистические данные о заболеваемости сердечно-сосудистыми заболеваниями в Карагандинской области за 2013-2023 годы в разрезе возраста, смертности и показателей летальности. Данные взяты из статистических сборников «Здоровье населения Республики Казахстан и деятельность организаций здравоохранения за 2013-2023 годы».*

Результаты: *В течение 2013-2023 гг. в Карагандинской области отмечается неравномерный уровень заболеваемости РМЖ, с периодами подъемов и спадов. Уровень заболеваемости РМЖ среди городских жителей была ежегодно стабильно выше, чем среди сельских. В последние годы наблюдалось снижение уровня заболеваемости РМЖ IV стадии. В 2013-2023 годы в области отмечалась устойчивая тенденция снижения смертности. Коэффициент корреляции (r=0,93) показывает очень сильную положительную линейную связь между числом зарегистрированных случаев РМЖ и возрастом больных.*

Заключение: *Среднегодовой темп прироста заболеваемости РМЖ остается стабильным. В целом заболеваемость РМЖ в городской местности примерно в 1,3-1,6 раза выше, чем в сельской. С увеличением доли раннего выявления уровень смертности от РМЖ существенно снижается. Снижение данного показателя было статистически значимым (t=3,12, p<0,01), что означает, что ранняя диагностика является ключевым фактором повышения выживаемости и снижения смертности от данного заболевания.*

Ключевые слова: *рак молочной железы (РМЖ), заболеваемость, смертность, фертильный возраст, скрининг.*

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