medicinska revija
medical review

UDK: 618.19-006.6-036.2(497.11)

Čapo N. et al. ■ MD-Medical Data 2024;16(2) 079-085

Originalni članci /
Original articles

ASSESSMENT OF THE EFFECTIVENESS OF EARLY BREAST CANCER DETECTION IN THE MAČVA DISTRICT: A COMPARATIVE STUDY OF ORGANIZED AND OPPORTUNISTIC SCREENING MODELS

PROCENA EFIKASNOSTI RANOG OTKRIVANJA RAKA DOJKE U MAČVANSKOM OKRUGU: UPOREDNA STUDIJA ORGANIZOVANOG I OPORTUNISTIČKOG SKRINING MODELA

Correspondence to:
Nataša Čapo
doktor medicine
e-mail: hiniceva.ns@gmail.com
Tel. +381 64 9192448

Nataša Čapo[1,2], Jelena Đekić Malbaša[1,3], Tihomir Dugandžija[1,4], Željka Ninković[5], Ljubica Nikolić Pajić[1,6], Marijana Srećković[1,5,6]

[1] University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia
[2] Pasteur Institute Novi Sad, Novi Sad, Serbia
[3] Institute for Pulmonary Diseases of Vojvodina, Sremska Kamenica,
[4] Oncology Institute of Vojvodina, Sremska Kamenica, Serbia
[5] Institute of Public Health of Sabac, Šabac, Serbia
[6] Academy of Professional Studies Šabac, Šabac, Serbia

Key words
breast neoplasms, global health, health education

Ključne reči
neoplazme dojke, globalno zdravlje, zdravstvena edukacija

Abstract

Introduction: Breast cancer (BC) presents a considerable global health challenge with elevated mortality rates and an increasing incidence. Our study aims to assess the effectiveness of organized and opportunistic BC screening (BCS) in the Mačva District (MD) and compare the results and shortcomings of these two early detection models. **Material and Methods:** The research involves a retrospective analysis of age-standardized incidence (ASIRs) and mortality rates (ASMRs) of BC in the MD, as well as an evaluation of the effectiveness of health education and conducted BCS. **Results:** The ASIR of BC in Central Serbia (CS) (62.5±6.3) was significantly higher than in the MD (55.2±7.6), with p=0.02. The linear trend model showed a decrease in ASIR in both CS (0.1% annually) and the MD (0.5% annually). Although there was no significant difference in ASMR between CS and MD, both regions experienced a decline in ASMR. The coverage of organized BCS in Šabac and Loznica was 35%, with nine new cases of BC detected out of 215 cases in these cities combined. The ASIR in Loznica decreased (from 54.2/100,000 to 51.3/100,000), while it increased in Šabac (from 64.8/100,000 to 70.4/100,000). The ASIR for BC in Šabac was significantly higher than in the MD (p=0.001). **Conclusion:** The coverage of BCS was significantly lower than the required 75%, and a decrease in the ASIR for BC was observed in the MD. Coordination of all relevant institutions is needed to implement health education and preventive examinations and provide accessible healthcare to improve efficiency in the fight against BC.

INTRODUCTION:

Breast cancer (BC) represents the most widespread form of cancer among women worldwide, with high mortality rates. Globally, BC is the leading cause of morbidity (23.8% of all malignant tumors) and the fifth leading cause of death, after lung, colorectal, liver, and stomach cancers (15.4% of all cancer deaths) in 2022. [1] BC is a global health challenge, with 2.3 million new cases and 666,103 deaths in 2022. By 2045, new cases are expected to increase by more than 46.5%, exceeding 4 million annually, while mortality will rise by over 59.1%. [2] In Serbia, the BC incidence rate 2015 was 54.3 per 100,000, and the mortality rate was 19.7 per 100,000. [3]

Late detection of BC is a significant factor contributing to high mortality rates and increasing mortality trends. Positive evidence of BC screening effectiveness has existed for nearly four decades. A systematic review from 2020, encompassing 60 European studies, confirmed that organized screening programs reduce BC mortality, with reductions ranging from 12% to 58%. [4] A meta-analysis of 27 validated studies showed that BC screening invitations are associated with a 22% reduction in BC mortality. [5] Regular screening can also improve other clinical outcomes, such as less invasive surgeries and shorter hospital stays. [6]

Global efforts need to prioritize implementing effective screening programs, particularly in transitioning countries, to lessen the increasing impact of this disease. In order to alleviate the increasing impact of this illness, it is crucial for worldwide initiatives to prioritize establishing successful screening initiatives, particularly in countries undergoing transition.

The first recommendations for cancer prevention in Serbia were made in 2005 as a National Guide for primary healthcare physicians, recommending biennial mammographic screenings for women aged 50-69, with individual decisions for women aged 40-49 and those at increased BC risk. (Majstorović et al., 2014) [7] 2012, the National BC Screening Program was launched in 10 Serbian municipalities. By the end of 2016, a quarter of municipalities were covered. The program involves decentralized screenings with biennial mammograms for women aged 50-69. (Official Gazette, 2013) [8] In March 2014, the Organized BC Screening began in the Mačva District, involving two General Hospitals (Šabac and Loznica), two Health Centers (Šabac and Loznica), and the Šabac Public Health Institute. By the end of 2016, the Screening Office reported 41.7% coverage, with 38.5% response and 16.0% mammogram completion. (Screening Office, 2016) [9] Screening coverage in Serbia is deficient, with recent studies indicating that 59.3% of women have never had a mammogram. [10] Total BC costs in Vojvodina in 2019 were estimated at 15 million euros, with direct costs of 5 million euros and indirect costs of 10 million euros. The most significant portion of direct costs was hospital treatment (76%), while the most considerable portion of indirect costs was productivity losses due to early retirement (50%). [11]

The objectives of our study were to analyse the age-standardized incidence rates (ASIRs) and age-standardized mortality rates (ASMRs) of BC among women in the Mačva District and in Central Serbia from 2006 to 2016 and to compare a two-year cycle (2015-2016) of opportunistic and organized breast cancer screening (BCS) in the Mačva District based on process and outcome indicators in order to determine the advantages and shortcomings of different early detection models for BC.

MATERIAL AND METHODS

The conducted research is a combined retrospective study consisting of two parts. Data from the Institute of Public Health (IPH) of Šabac and the Institute „Dr. Milan Jovanović Batut" were used in the first part of the study. These data include information from the Cancer Registry for the municipalities of Šabac, Loznica, Bogatić, and Koceljeva, as well as the Mačva District and Central Serbia in the period from 2006 to 2016. The ASIRs and ASMRs were calculated according to Segi and Doll. [12, 13]

In the second part of the study, we used the Health Education Protocol from the IPH of Sabac (2006-2016) and annual reports on the implementation of BCS in the period from 2015 to 2016. The study addresses two types of BCS: opportunistic and organized. Organized BCS was conducted in the cities of Šabac and Loznica, while opportunistic BCS was conducted in the municipalities of Bogatić and Koceljeva; for the results of opportunistic BCS, data from the Health Centers (HC) of Koceljeva and Bogatić for the two-year period (2015-2016) were used. For analyses of opportunistic BCS, data from the Health Centers (HC) of Koceljeva and Bogatić, for the two-year period (2015-2016) were used. The data used in this study were obtained from screening reports. Data on opportunistic BCS were derived from patient health records and protocols of the Women's Health Services at HC Koceljeva and HC Bogatić, and data from the IPH of Sabac on registered BC cases for the municipalities of Koceljeva and Bogatić. Women who participated in the organized BCS in the Mačva District were from the cities of Šabac and Loznica, aged 50-69 years, and were invited for mammographic examinations during 2015-2016. Women with previously diagnosed BC were excluded from the screening. The organized BCS involved the General Hospital (GH) Šabac, GH Loznica, HC Šabac, and HC Loznica.

The population data was sourced from the official records of the Statistical Office of the Republic of Serbia (SORS). These data were used to calculate process and outcome indicators. [14] Process and outcome indicators were used to compare the performance of opportunistic and organized BCS. The process indicators included the ratio of the number of women invited to participate in the screening to the number of women who responded to the organized screening, the percentage of women who had a mammogram, the percentage of women who were invited for additional diagnostics, and the percentage of women who did not respond to the invitation. The outcome indicator represented the number of women in whom BC was detected by mammography and confirmed by additional diagnostics and histological examination. ASIRs and ASMRs of BC in municipalities of the Mačva District (from 2006 to 2016) compared with Student's t-test for independent samples. A linear trend model was used to present yearly changes of ASIRs and ASMRs in the observed period.

RESULTS

I. Incidence and Mortality of Breast Cancer (BC) among Women in the Mačva District and Central Serbia

During the observed period, the average ASIRs of BC in the municipality of Šabac were higher than in the other municipalities of the Mačva District, (p=0.001). The average incidence rates in municipalities without screening program (Krupanj, Ljubovija, Mali Zvornik, and Vladimirci) were lower than in municipalities where a BCS program was implemented. The average ASIR and ASMR of BC in the Mačva District was slightly lower compared to the average ASIR and ASMR in Central Serbia (Table 1).

The number of women diagnosed with BC varies irregularly over the years in the municipalities of Bogatić and Koceljeva due to the small number of new cases and the small population, so we cannot confidently assert a trend of increasing ASIRs for BC in the population of women in these two municipalities. During the observed period, according to the linear trend model, an increase in ASIRs for BC among women in the municipality of Šabac was observed, averaging 0.7% annually, which was not the case in other municipalities of the Mačva District (Graph 1). In the population of women in other observed municipalities, of the Mačva District and Central Serbia, a decrease in ASIRs was recorded, except in the municipality of Koceljeva (we cannot confirm with great significance due to variation in ASIRs over the years). According to the linear trend model, ASIRs in municipalities without screening (Krupanj, Ljubovija, Mali Zvornik, and Vladimirci) were lower compared to municipalities where screening was conducted and showed less variation. In the municipality of Loznica (2.7% annually), the Mačva District (0.5% annually), and Central Serbia (1% annually), ASIRs were declining.

Table 1.1. *Age-Standardized Incidence Rates (ASIR) of Breast Cancer per 100,000 Women in the Municipalities of the Mačva District from 2006 to 2016*

Year	Municipalities of the Mačva District							
	Šabac*	Loznica*	Bogatić*	Koceljeva*	Krupanj	Ljubovija	Mali Zvornik	Vladimirci
2006	59.7	52.3	54.9	27.4	62.5	29.2	29.2	13.3
2007	63.6	67.6	83.1	31.0	36.6	88.9	88.9	64.1
2008	69.5	60.1	45.9	53.7	30.7	39.9	39.9	46.4
2009	78.8	51.1	58.1	71.0	59.1	25.7	25.7	28.9
2010	53.0	59.3	50.4	0.0	58.2	27.7	27.7	50.2
2011	70.4	58.6	55.3	9.6	48.3	40.5	40.5	10.7
2012	56.0	45.1	32.0	70.6	0	40.3	40.3	38.7
2013	60.8	43.3	67.7	50.6	22.6	32.7	32.7	11
2014	71.8	50.8	21.5	26.3	32.4	60.6	60.6	41.1
2015	74.3	50.5	35.1	78.3	63.5	48.8	48.8	45.4
2016	66.9	52.0	70.0	84.2	59.1	40.3	40.3	50.2
Average ASIR	65.9	53.7	52.2	45.7	43.0	34.5	43.1	36.4

(*)Municipalities where BCS (opportunistic or organized) was conducted; ASIR- Age-Standardized Incidence Rates

Table 1.2*. Age-Standardized Incidence Rates (ASIR) and Age-Standardized Mortality Rates (ASMR) of Breast Cancer in the Mačva District and in the Central Serbia from 2006 to 2016*

Year	ASIR* Mačva District	ASMR* Mačva District	ASIR* Central Serbia	ASMR* Central Serbia
2006	50.0	14.6	59.4	19.1
2007	73.2	21.1	60.2	20
2008	57.7	21.1	61.1	20.3
2009	60.1	17.7	71.5	20.3
2010	49.7	22.5	67.8	21.4
2011	54.9	16.4	69.7	19.8
2012	47.7	16.4	68.3	20.2
2013	44.8	19.6	50.5	19.2
2014	50.9	18.5	53.6	19.3
2015	59.7	18.6	61.0	19.8
2016	58.7	16.5	64.7	20.1
Average	55.2	18.5	62.5	20.0

ASIR*- Age-Standardized Incidence Rates; ASMR*-Age-Standardized Mortality Rates

ASIRs were declining more rapidly compared to ASMRs for BC in the population of women in the Mačva District and Central Serbia. ASIRs of BC in Central Serbia (62.5 ± 6.3) compared to the Mačva District (55.2 ± 7.6) were statistically higher (p=0.02). The linear trend model showed a decline in ASIRs in Central Serbia (0.1% annually) and the Mačva District (0.5% annually). Although there was no statistically significant difference in ASMRs of BC between Central Serbia and the Mačva District (19.9 ± 0.6 and 18.5 ± 2.3, respectively), both regions experienced a decrease in ASMRs during the observed period.

II. Evaluation of the Effectiveness of Breast Cancer (BC) Early Detection in the Mačva District

Results of opportunistic screening in the municipalities of Bogatić and Koceljeva in the period from 2015 to 2016 showed decrease in the total number and in percentage of screening visits in Bogatić (from 35.9% to 32.8%), while the number and percentage of screening visits in Koceljeva increased in the same period (from 13.6% to 19.7%).

The total number and the percentage of women underwent mammography increased in both municipalities, in Bogatić from 10.2% to 18.3%, and in Koceljeva from 13.5% to 19.5%.

The total number of BC cases in Bogatić and in Koceljeva detected in screening during observed two years was 3 and 5 respectively. Results showed increase in number and percentage of BC cases detected in screening in Bogatić (from 0.2% in 2015 to 0.5% in 2016), while in Koceljeva decrease in rates were reported (from 2.9% in 2015 to 1.3% in 2016) (Table 2).

The number of newly diagnosed cases through opportunistic screening over the two-year observation period was

three newly diagnosed breast malignancies out of a total of 25 newly diagnosed in the same period in the municipality of Bogatić (Tables 2).

Table 2. *The Opportunistic Breast Cancer Screening in the Municipalities of Bogatić and Koceljeva*

Opportunistic Breast Cancer Screening (BCS) by the Municipality	*Bogatić*		*Koceljeva*	
Year	2015	2016	2015	2016
Number of Women 50 to 69 Years of age	1287	1287	771	771
Number (%) of BCS Visits	463 (35.9)	422 (32.8)	105 (13.6)	152 (19.7)
Number (%) of Women Underwent Mammography	131 (10.2)	235 (18.3)	104 (13.5)	150 (19.5)
Number (%) of BC Cases detected in BCS	1 (0.2)	2 (0.5)	3 (2.9)	2 (1.3)
% of Incidental BC from the Total Number of Women aged from 50 to 69	0.07	0.2	0.4	0.3

Table 3. *Organized Breast Cancer Screening in the Municipalities of Šabac and Loznica*

Organized Breast Cancer Screening by the Municipality	Šabac		Loznica	
Year	2015	2016	2015	2016
Number of Women 50 to 69 Years of age	8000	8000	4000	4000
Number of BCS Invitations	4965	6991	3569	3899
Number (%) of BCS Response Rate	2021 (40.7)	2693 (38.5)	1574 (44.1)	1563 (40.1)
Number (%) of Women Who Underwent	1840 (23.0)	2486 (31.1)	1560 (39.0)	1546 (38.6)
Number (%) of BC Cases	4 (0.2)	3 (0.1)	1 (0.1)	1 (0.1)

Table 4. Age-Standardized Incidence Rates (ASIR) and Age-Standardized Mortality Rates (ASMR) of Breast Cancer in the Municipalities of the Mačva District from 2015 to 2016

Year	*2015*		*2016*	
The Municipalities	Number of New Breast cancer Cases (ASIR)*	Number of deaths (ASMR)*	Number of New Breast cancer Cases (ASIR)*	Number of death, (ASMR)*
Šabac	75 (74,3)	28 (25)	66 (66,9)	28 (25)
Loznica	36 (50,5)	16 (21)	37 (52)	11 (14,3)
Koceljeva	10 (78,3)	1 (8,1)	10 (84,2)	4 (33)
Bogatić	8 (35,1)	6 (21,7)	17 (70)	3 (11)

ASIR- Age-Standardized Incidence Rates; ASMR-Age-Standardized Mortality Rates per 100,000 population

In the same timeframe the total number of newly diagnosed BC cases through opportunistic screening in Koceljeva was 5 out of a total of 20 newly diagnosed, while the age-standardized incidence rates were significantly increased in both years compared to the previous period (average rates for 2015-2016 were 81.3/100,000, while for the previous period, the average rates were 37.8/100,000) (Table 2 and Table 4).

Results of organized Screening in the Municipality of Šabac and Loznica shown that **t**he number of BCS invitations increased in 2016 compared to 2015 in bout municipalities, while the BCS response rate in the same years decreased in Šabac (from 40.7% to 38.5%) and in Loznica (from 44.1% to 40.1%). The average percentage of women who underwent mammography in two years was lower in Šabac (around 27%) compared to Loznica (39%), although observed percentage increased in Šabac from 23% in 2015 to 31.1% in 2016, while in Loznica was unchanged in the same period (39%). The total number and the average percentage of BC detected in screening in two years was higher in Šabac compared to Loznica (0.2% vs 0.1%) (Table 3).

The total number of newly diagnosed cases through opportunistic screening over the two-year observation period was seven newly diagnosed breast malignancies out of a total of 141 newly diagnosed in the same period in the municipality of Šabac, while the age-standardized incidence rates were slightly increasing in both years compared to the previous period (average rates for 2015-2016 were 70.6/100,000, while for the previous period, the average rates were 64.8/100,000) (Table 3 and Table 4).

The number of detected BC in Loznica was the same in both years under investigation (Table 3). The total number of newly diagnosed cases through opportunistic screening over the two-year observation period was two out of a total of 73 newly diagnosed BC in the same period in the municipality of Loznica, while the age-standardized incidence rates were slightly decreasing in both years compared to the previous period (average rates for 2015-2016 were 51.3/100,000, while for the previous period, the average rates were 54.2/100,000) (Table 3 and Table 4).

Further analysis involved presenting the number of new cases, ASIR, number of deaths, and ASMR for each examined municipality separately (Table 4). The number of new cases and ASIR decreased in the two-year period in the municipality of Šabac (from 74.3 to 66.9 per 100,000), while mortality remained the same (25.0 per 100,000). ASIR slightly increased (from 50.5 to 52.0 per 100,000 population) while ASMR decreased during the two-

year monitoring period in Loznica (from 21 to 14.3 per 100,000 population). ASIR and ASMR increased in the municipality of Koceljeva. In the municipality of Bogatić, ASIR for BC doubled in 2016 compared to 2015, but ASMR decreased (Table 4).

ASIR for BC in the period before the introduction of screening (2006-2014) decreased in Loznica (from 54.2/100,000 to 51.3/100,000), while some increase was observed in Šabac (from 64.8/100,000 to 70.4/100,000). ASIR for BC in the Šabac municipality were statistically significantly higher than in the Mačva district (p=0.001), while such differences were not recorded in the Loznica municipality (Table 1).

Upon review of the Health Education Protocol of the IPH of Sabac (period: 2006-2016), there were no data on conducted health education sessions on BC prevention in the Mačva district. In practice, health institutions or other organizations in the local community often fail to report to the IPH of Sabac regarding conducted health education sessions, resulting in a lack of such information in official documents.

DISCUSSION

Our study results showed that ASIR was decreasing, which is different in other countries implementing organized screening. It is expected that screening will detect more changes in the early stages, leading to an increase in newly diagnosed cases and, thus, increase incidence. [15, 16] Organized BCS was conducted in the cities of Šabac and Loznica, but the coverage was low (35%), as well as the number of new diagnoses through screening compared to the total number of cases (9 out of 214). In the municipalities of Bogatić and Koceljeva, opportunistic screening was conducted. In Koceljeva, as much as 25% of newly diagnosed malignant changes were through the screening program (5 out of 20), while this number was significantly lower in Bogatić (3 out of 25). Incidence and mortality rates varied during the observation period and in the observed municipalities regardless of screening because the screening program coverage was significantly lower than recommended 75%. According to recently published research conducted in Serbia, 39.5% of women have undergone mammography at least once, 59.3% have never, and 28.1% have undergone screening in the past three years. [10]

Socio-economic status, as well as organizational barriers and problems, can significantly limit participation, especially in less prosperous environments. [10]

Implementing adequate BCS programs is the most effective way to reduce BC mortality. Although the Republic of Serbia has initiated an organized BCS program for early detection of BC by mammography, free of charge for all women aged 50 to 69, incidence rates are declining while mortality remains high. Positive evidence of the effectiveness of BCS comes from studies from 2020, including a review of 60 European studies, [4] which showed a reduction in mortality ranging from 12% to 58% among participants in organized BCS programs. A meta-analysis of 27 studies confirmed that BCS invitations are associated with a 22% reduction in BC mortality, [5] while regular BCS exams can improve other clinical outcomes, according to Fancellu et al. research (2019). [6]

Data on implemented opportunistic BCS show that BCS visits decreased annually in the Bogatić and Koceljeva municipalities during the observed two-year period. Additionally, in the Bogatić municipality, there was an increase in the number of detected malignant changes in the BC diagnosed through opportunistic BCS. In the Koceljeva municipality, there is a decrease in the proportion of BC cases relative to the number of women 50-69 years of age. The application of opportunistic BCS represents an alternative way of early detection of BC changes. However, the European Commission on Cancer has proven that better results in the early detection of BC are achieved through organized invitations of women for BCS examinations. [17]

In the Koceljeva and Bogatić municipalities, opportunistic BCS is conducted as the only form of BCS due to the lack of adequate equipment and health care personnel, staff needed for organized BCS. The difference in the proportion of mammograms relative to women's consent to participate in BCS is observed between these two municipalities, with a higher rate in Koceljeva. Research results in Serbia identify factors influencing women's attendance at BC screening, including motivation and barriers. Some of these factors include the role of physicians, knowledge about mammography, and self-assessment of BC risk. [18]

The results of organized BCS in Šabac during the observed two-year period indicate specific trends. It is noticeable that the number of invited women continuously increased during this period. However, despite the increase in invitations, the percentage of women willing to participate in mammography screenings decreased annually. This trend can be interpreted as insufficient efforts to motivate women to respond to invitations for BCS. Data for organized BCS in the cities of Šabac and Loznica show that these trends do not differ significantly from those in other cities and municipalities in Serbia. [18] The coverage of the target population with mammography screenings is a crucial process indicator of screening success, reflecting the extent to which women from the target population undergo mammography screening. In Šabac, the percentage of women who underwent mammography screenings is about 30%, while in Loznica, this percentage is slightly higher, around 39%. However, these percentages are still below the recommended coverage of 75%, indicating that additional efforts are needed to increase the number of women undergoing mammography screening and thereby improve the efficiency of the BC screening program. Organized BCS has not achieved a participation rate of 75% in all EU member states. In Slovenia, an organized BCS program aimed at achieving coverage at the national level of 75% of women aged 50-69 showed excellent results, so the coverage of women with mammography screenings of 75% was achieved after the third invitation. [17]

During the observed period, an increase in the number of breast mammography screenings is noted in the city of Šabac. However, a significant point is that this increase is not aligned with the growth in the number of invited patients to participate in BCS. In other words, although more women were invited to BCS mammography, the number of mammography screenings did not proportionally increase. It seems that there may be insufficient motivation or aware-

ness among the women invited for regular breast examinations, which aligns with research findings from Serbia. [10, 18]

In Loznica, the number of mammography screenings remains relatively stable yearly. However, there is a concerning trend of decline in the percentage of women agreeing to mammography screenings and in the percentage of invited women to BCS. This suggests that despite the constant number of screenings, a decreasing number of women choose to participate in BCS, which may be due to insufficient information, fear, or other factors influencing participation decisions. [10, 18]

In both cities, these data indicate the need for additional efforts to raise awareness and motivation among women about the importance of regular mammography screening for breast cancer prevention.

Additional analyses conducted in Šabac and Loznica have shown an increase over the years. These analyses include palpation breast examinations, breast ultrasound examinations, and targeted mammograms with compression, enlargement, or from different angles. Since mammography is not always optimal in cases of denser breast parenchyma, breast ultrasound examination becomes an important tool, and under optimal conditions, the sensitivity of this procedure ranges from 69-90%. [19]

In the observed municipalities of the Mačva district, the incidence and mortality rates varied. The number of deaths was higher in the Koceljeva municipality, while mortality declined in the Loznica and Bogatić municipalities. In the Šabac municipality, it was the same in both years of observation. A cohort study in Italy investigated the effectiveness of mammographic screening for breast cancer, comparing the incidence of advanced cancer stages between women aged 50-69 who participated in screening and those who did not. The results showed that women in the screening group had fewer positive lymph nodes (13% less), lower rates of advanced cancer stages (22% less), and lower rates of mastectomy (32% less) compared to women not covered by screening. [20]

In the fight against BC in Serbia, a country with limited resources, proactive measures of information, education, and counseling for all women, particularly 50-69 years of age participants are needed. In order to enhance BCS, it is crucial to promote physician involvement, particularly general practitioners, in advising patients on screening, offering them details about national guidelines, the significance of exams, and individual risk, as well as providing comprehensive education and support for healthcare professionals. Concurrently, organizing communication campaigns through mass media, including social networks, should aim to convey accurate information about screening, addressing specific questions and misconceptions that may influence health behavior.

CONCLUSION

The primary goal of BCS is early diagnosis, which significantly improves survival chances through timely medical intervention. Developing countries employ various strategies to enhance BCS programs. Our study has shown a decline in BC incidence and the maintenance of high mortality rates in the Mačva District despite the existing screening programs. The low BCS coverage, organized and opportunistic, underscores the need for program improvement through enhanced education and proactive information dissemination among the target population. In Serbia, addressing the challenges of BC control requires active initiatives in information, education, and BCS organization. This approach necessitates building a sustainable infrastructure for organized BCS and ensuring equal access to preventive measures and timely interventions.

Sažetak

Uvod: Rak dojke predstavlja ozbiljan globalni zdravstveni izazov sa visokom stopom smrtnosti i rastućom incidencijom. Naša studija ima za cilj proceniti efikasnost organizovanog i oportunog skrininga raka dojke u Mačvanskom okrugu i uporediti rezultate ova dva modela ranog otkrivanja karcinoma dojke. **Materijal i metode:** Istraživanje obuhvata retrospektivnu analizu standardizovanih stopa incidencije (SSI) i mortaliteta (SSM) raka dojke u Mačvanskom okrugu i u Centralnoj Srbiji u periodu 2006-2016. godina, kao i analizu sprovedenog skrininga u periodu 2015-2016. godina u Mačvanskom okrugu. Podaci su prikupljeni iz Zavoda za javno zdravlje, instituta, domova zdravlja, registara za rak i zvaničnih statističkih izvora. **Rezultati:** SSI raka dojke u Centralnoj Srbiji (62,5±6,3) su značajno više od onih u Mačvanskom okrugu (55,2±7,6), (p=0,02). Linearni model trenda pokazao je pad SSI u Centralnoj Srbiji i Mačvanskom okrugu (0,1% i 0,5 po godini, respektivno). Iako nije bilo značajne razlike u SSM između Centralne Srbije i Mačvanskog okruga, u obe regije je registrovan pad smrtnosti. Programom skrininga u Šapcu i Loznici obuhvaćeno je 35% od ukupnog broja žena uzrasta 50-69 godina. Od ukupnog broja registrovanih slučajeva raka dojke 4.2% (9/215) je detektovano skriningom. SSI u Loznici su se smanjile (od 54,2/100.000 do 51,3/100.000), dok su u Šapcu porasle (od 64,8/100.000 do 70,4/100.000). SSI za rak dojke u Šapcu su bile značajno više nego u Mačvanskom okrugu (p=0,001). **Zaključak: O**buhvat žena u skrining programu bila je značajno niža od 75%. Zabeležen je pad SSI za rak dojke u Mačvanskom okrugu. Potrebna je koordinacija svih relevantnih institucija u sprovođenju edukacije, promocije preventivnih pregleda i obezbeđivanja pristupačne zdravstvene zaštite kako bi se poboljšala efikasnost u borbi protiv raka dojke.

REFERENCES

1. Ferlay J, Ervik M, Lam F, Laversanne M, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2024). Global Cancer Observatory: Cancer Today (version 1.1). Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.who.int/today, accessed [5. May 2024].

2. Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, Jemal A. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2024 May-Jun;74(3):229-263.

3. Mikljuš D, Živković Perišić S, Božić Z. Malignant tumors in Republic of Serbia 2015. Belgrade: Institute of Public Health of Serbia; 2017. Available online: https://www.batut.org.rs/download/publikacije/Incidencija%20i%20mortalitet%20od%20raka%202015.pdf

4. Zielonke N, Gini A, Jansen EEL, Anttila A, Segnan N, Ponti A, Veerus P, de Koning HJ, van Ravesteyn NT, Heijnsdijk EAM; EU-TOPIA consortium. Evidence for reducing cancer-specific mortality due to screening for breast cancer in Europe: A systematic review. Eur J Cancer. 2020;127:191-206.

5. Dibden A, Offman J, Duffy SW, Gabe R. Worldwide Review and Meta-Analysis of Cohort Studies Measuring the Effect of Mammography Screening Programmes on Incidence-Based Breast Cancer Mortality. Cancers (Basel). 2020;15;12(4):976.

6. Fancellu A, Sanna V, Sedda ML, Delrio D, Cottu P, Spanu A, Giuliani G, Conti M, Piras R, Crivelli P, Porcu A. Benefits of Organized Mammographic Screening Programs in Women Aged 50 to 69 years: A Surgical Perspective. Clin Breast Cancer. 2019;19(5):e637-e642.

7. Majstorović N, Simić S, Matejić B, Cudanov M. [Assessment of required resources for implementation of national breast cancer screening program in Serbia]. Srp Arh Celok Lek. 2014;142(1-2):59-66.

8. Uredba o Nacionalnom programu ranog otkrivanja karcinoma dojke. Službeni glasnik RS br. 73/2013 od 16.08.2013. godine.

9. Kancelarija za skrining raka, Institut za javno zdravlje Srbije „Dr Milan Jovanović Batut" [Internet]. Dostupno na:http://www.skriningsrbija.rs/srl/skrining-raka-dojke/.

10. Djordjevic S, Dimitrijevic I, Boricic K, Radovanovic S, Simic Vukomanovic I, Mihaljevic O, Jovanovic S, Randjelovic N, Lackovic A, Knezevic S, Stankovic V, Sorak M, Jovanovic V. Sociodemographic Factors Associated with Breast Cancer Screening Among Women in Serbia, National Health Survey. Iran J Public Health. 2024;53(2):387-396.

11. Milovic M, Tamas T, Crnobrnja V, et al. Economic burden of breast cancer in northern Serbia. Front Public Health. 2023;15;11:1265301.

12. Segi M (1960). Cancer mortality for selected sites in 24 countries (1950–57). Sendai, Japan: Department of Public Health, Tohoku University of Medicine.

13. Doll R, Payne P, Waterhouse JAH, editors (1966). Cancer incidence in five continents, Vol. I. Geneva: Union Internationale Contre le Cancer.

14. Republički zavod za statistiku, Republika Srbija, popis stanovništva 2011. godine. Preuzeto sa: http://www.stat.gov.rs/sr-latn/oblasti/popis/popis-2011/popisni-podaci-eksel-tabele/

15. Moon HJ, Kim MJ, Kwak JY, Kim EK. Probably benign breast lesions on ultrasonography: a retrospective review of ultrasonographic features and clinical factors affecting the BI-RADS categorization. Acta Radiol. 2010;51(4):375-82.

16. Independent UK Panel on Breast Cancer Screening. The benefits and harms of breast cancer screening: an independent review. Lancet. 2012;380(9855):1778-86.

17. Altobelli E, Lattanzi A. Breast cancer in European Union: an update of screening programmes as of March 2014 (review). Int J Oncol. 2014;45(5):1785-92.

18. Jovićević A. Ispitivanje faktora koji utiču na znanje, stavove i ponašanje žena u odnosu na rano otkrivanje raka dojke. [doktorska disertacija]. Univerzitet u Beodradu, Medicinski fakultet, 2018. Dostupno na: https://nardus.mpn.gov.rs/handle/123456789/10713

19. O'Driscoll D, Warren R, MacKay J, Britton P, Day NE. Screening with breast ultrasound in a population at moderate risk due to family history. J Med Screen. 2001;8(2):106-9.

20. Giudici F, Bortul M, Clagnan E, et al. Effetti precoci dell'adesione al programma di screening mammografico della Regione Friuli Venezia Giulia sull'incidenza del cancro della mammella in stadio avanzato: uno studio di coorte [Early effects of attendance to the Friuli Venezia Giulia (Northern Italy) mammography screening programme on the incidence of advanced-stage breast cancer: a cohort study]. Epidemiol Prev. 2020;44(2-3):145-153.

■The paper was received / Rad primljen: 20.02.2024.
Accepted / Rad prihvaćen: 13.05.2024.