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Original Article

Sociodemographic Factors Associated with Breast Cancer Screening among Women in Serbia, National Health Survey

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Abstract

Background: Approximately 2.3 million female breast cancer cases were identified globally in 2020, resulting in 685,000 fatalities among women. Serbia too experiences a high breast cancer burden. Effective reduction of breast cancer incidence and mortality necessitates strategic measures encompassing the implementation of cost-effective screening technology. However, various impediments to screening implementation persist. We aimed to estimate the impact of socioeconomic factors on breast cancer screening in Serbia.

Methods: Data from the 2019 National Health Survey of the population of Serbia was. The research was a descriptive, cross-sectional analytical study by design, on a representative sample of the population of Serbia. Data from women aged 15+ yr were used to examine the demographic and socioeconomic factors associated with breast cancer screening inequalities.

Results: In Serbia the age group of women who predominantly participated in organized breast cancer screening (39.5%) were the ones aged 65+ yr. Women with a secondary education were 2.1x more likely to undergo a screening exam voluntarily (57.5%), compared to women with a higher education background (26.6%). When considering marital and financial circumstances, married/unmarried women from an affluent financial category exhibited a notably higher frequency of self-initiating a mammography (73% and 48.5%) in comparison to those financially struggling (27.6%).

Conclusion: Strong support is imperative for countries to establish prevention and early detection programs for cancer.

Keywords: Socioeconomic inequalities; Breast cancer screening; Mammography; National health survey; Serbia

Introduction

In the year 2020 approximately 2.3 million cases of female breast cancer were identified globally, resulting in 685,000 fatalities among women. Regions with the highest incidence rates (exceeding 80 per 100,000 women) included Australia/New Zealand, Western Europe, Northern America, and Northern Europe, while the lowest rates (below 40 per 100,000) were observed in Central America, Eastern and Middle Africa, and South-Central Asia. Notably, breast cancer accounted for a quarter of all cancer cases in women, emerging as the predominant female cancer diagnosis in 2020. Its prevalence has been steadily increasing, especially in transition countries (1, 2).
In 2020, breast cancer claimed the lives of an estimated 685,000 women, constituting 16% of female cancer-related deaths. Recognizing the inadequacy of previous public health responses, the WHO initiated the Global Breast Cancer Initiative (3). Collaborating with global partners, this initiative aims to curtail breast cancer mortality through improved diagnostics, treatment, and patient management (4).
More than 70% of new cases and 81% of fatalities occurred in women aged 50+ yr, highlighting the global burden concentration in this age group. In 2020 breast cancer incidence rates were nearly twofold higher in transitioned countries compared to transitioning ones (ASR 55.9 versus 29.7 per 100,000, respectively). However, transitioning countries reported a 17% higher mortality rate (15.0 and 12.8 per 100,000, respectively). Approximately 20% of all cancer cases and 30% of all deaths globally in 2020 were attributed to breast cancer in transitioning countries, revealing disparities across pre- and postmenopausal ages. Premenopausal women in low HDI countries exhibited mortality rates twice as high as those in other HDI levels, with less pronounced differences observed in women aged 50+yr (5).
Data from the Cancer Registry of the Republic of Serbia in 2020 underscored a substantial breast cancer burden, with standardized incidence and mortality rates of 116.2 and 45.7 per 100,000 women, respectively (6). To effectively reduce this incidence and mortality, strategic measures, including the implementation of cost-effective screening technology, are imperative (7).
Most governments globally have integrated breast cancer screening into their healthcare systems (8,9). In this context, the Republic of Serbia has made notable progress by introducing organized breast cancer screening since 2012, expanding preventive healthcare services for women in the realm of reproductive health (10). However, persistent impediments linked to demographic, socioeconomic, and cultural factors hinder screening implementation.
We aimed to estimate the socioeconomic factors associated with breast cancer screening among women in Serbia. The results of this study expected to help decision makers, health care providers and community to design strategies in order to effectively reduce inequalities in breast cancer screening of mammography screening.

Methods

Study type

The study is a part of the population health research of Serbia, conducted in the period from October to December 2019 by the Institute of Statistics of the Republic of Serbia in cooperation with the Institute of Public Health of Serbia „Dr. Milan Jovanović Batut“ and the Ministry of Health of the Republic of Serbia. The research was conducted as a descriptive, cross-sectional analytical study on a representative sample of the population of Serbia.

Population to be research

A total of 6,747 women aged 15 years and older were surveyed.

Collection

A two-stage stratified sample was used for the study. Stratification was done by type of

settlement (urban and other settlements) and by geographical areas (Belgrade region, Vojvodina region, Shumadija region, and Western Serbia, Southern and Eastern Serbia region). The 2011 census conducted in the Republic of Serbia was used as a framework for sample selection. The sample size was calculated based on the precision requirements of the assessments for the evaluation of the standard error of the indicator & quot; proportion of people prevented from performing daily activities & quot; and according to the recommendations of EUROSTAT for conducting population health surveys. A sample of 5,114 households was conducted, registering a total of 15,621 people, of whom 13,589 were aged 15 yr and older and 1,493 were children aged 5 to 14.

The survey was conducted between October and December 2019, in accordance with the recommendations of the European Health Survey — third wave, according to which the period of data collection in the field must last at least three months, of which at least one month must be in the period September — December, i.e. in autumn.

Ethical standards in Health research of the Serbian population are in accordance with the international Declaration of Helsinki, adopted at the General Assembly of the World Medical Association in 1964 and improved by amendments in 2013, as well as with the legislation of the Republic of Serbia. In order to maintain the privacy of research participants and the confidentiality of information collected about them, all necessary steps were taken in accordance with the General Data Protection Regulation (GDPR), a new European legal framework that prescribes the handling of citizens' personal data, as well as the National Personal Data Protection Act, the Personal Data Protection Strategy, and the Official Statistics Act, with the application of the principle of statistical confidentiality.

The existing database was transferred to the University of Kragujevac with an official letter from the Serbian Institute of Public Health of Serbia. This study was approved by the competent territorial Ethics Committees of the four main regions of Serbia with headquarters in the Republic Institute for Public Health in Belgrade.

Research instrument

Standardized questionnaires constructed according to the European Health Interview Survey

(EHIS - European Health Interview Survey, wave 3), (11) and adapted to the specifics of ourregion served as the research instrument.

Variables measured in the study

The independent variables encompass demographic: age, marital status, and region and socioeconomic factors: education, employment status, welfare index and self-assessment of health. On the other hand, the dependent variable of interest is the utilization of breast cancer screening.

Statistical methods

All data of interest are presented and analyzed by adequate mathematical-statistical methods appropriate for the data type. $\chi 2$ test was applied to test the difference in the frequency of categorical variables. Logistic regression analysis was applied to examine demographic and socio-economic factors associated with inequalities in utilization of breast cancer screening. All results with the probability that is equal to, or less than 5% ($p \leq 0.05$) were considered statistically significant. Statistical analysis was performed using a commercial, standard software package the Statistical Package for Social Sciences software SPSS, version 19.0. (IBM Corp., Armonk, NY, USA).

Results

Sociodemographic characteristics are presented in Table 1. Approximately 39.5% of the participants had undergone mammography at least once in their lifetime. Among them, 28.1%, who underwent breast cancer screening in the previous

three years (6.6% in the last 12 months, 9.4% less than two years ago and 12.1% two to three years ago). A total of 59.3% of women had never undergone mammography. When analyzed by demographic and socio-economic characteristics, a statistically significant correlation was observed between all the features and the frequency of breast cancer screening. Tage of respondents underwent the mammography based on the advice of doctors (11.1%), followed by 8.3% who initiated it on their own, and only 3% who did so in response to a doctor's recommendation within an organized screening program.

When analyzed by demographic and socio-economic characteristics, a statistically significant correlation was observed between all the features and the frequency of breast cancer screening. During the last 12 months, the mammography was most commonly conducted among women aged 65 years and older (33.2%), those who were married /non-marital union (69.8%), residents in Belgrade (27.2%), that belong to the category of secondary education (55.7%), that are inactive (46.5%), that belongs to the richest part of the population (50.5%) and those who perceive their health as health good and very good 47.4% (Table 1).

Women in the oldest age group, 65 and above, predominantly participate in organized breast cancer screening (39.5%). Women falling within the secondary education category are 2.1 times more likely to undergo a screening examination voluntarily (57.5%) compared to women with the highest level of education (26.6%), while women with the lowest education levels most by the doctor's advice (27.9%). When considering marital and financial circumstances, marital /non -marital women belonging to the most affluent category notably exhibit a higher frequency of self-initiating a mammography (73% and 48.5%) in comparison to those in the least affluent category (27.6%). Conversely, an inverse correlation becomes apparent when opting for screening based on medical advice or within the context of organized screening, with the highest percentage (39%) being observed among women characterized by the least favorable financial status. In terms of employment status, employed women display a higher propensity for self-initiating a mammography (43.2%), in contrast to their unemployed (15.6%) and inactive counterparts (41.2%). Women residing in Southern and Eastern Serbia predominantly undergo a mammography through their own initiative (34.4%), whereas women from Vojvodina commonly seek the counsel of a doctor (32.4%), and those from Šumadia and Western Serbia primarily participate as part of an organized screening effort (39.2%). A substantial proportion of women, particularly those who rate their health as good or very good, opt for self-initiated mammography (60.1%), whereas those who perceive their health as poor or very poor more frequently participate within the context of organized screening (16.1%), Table 2.

In the univariate model, age, marital status, well-being index, region and self-assessment of health were singled out as predictors of not using mammography. With age, it is more likely that the respondents never complete a mammography, followed by married people, women from the wealthiest strata who come from the regions of Southern and Eastern Serbia. In the multivariate model, the Belgrade region and poorly rated health were singled out as predictors of non-use of mammography (Table 3). Older age, marital status, primary and lower education, the region of Šumadija and western Serbia, poverty and self-assessment of health were identified as predictors of self-initiated mammography examination in the univariate model, while in the multivariate model only self-assessment. Health was the most important predictor (Table 4).

Table 1: Socio-demographic characteristics of the respondents and the frequency of the breast cancer screening (mammography) *P*<0.001

Variables ***Age(yr)***	***N (%)***	***During last 12 months***	***1-2 years ago***	***2-3 years ago***	***3 or more years ago***	***Never***
15-19	189 (2.8)	0	0	0	0	0
20-24	526 (7.8)	1.6	0.5	0.4	0.4	11.5
25-29	363 (5.4)	1.8	1.4	1.3	0.5	7,7
30-34	401 (5.9)	2.7	3.1	1.9	1.6	8.0
35-39	460 (6.8)	4.5	10.7	7.0	5.2	3.8
40-44	494 (7.3)	10.4	3.6	4.6	2.5	8.8
45-49	468 (6.9)	6.3	6.3	5.0	3.2	8.9
50-54	524 (7.8)	6.9	8.8	5.7	6.1	7.1
55-59	633 (9.4)	14.5	15.1	13.0	10.5	5.0
60-64	628 (9.3)	18.1	18.5	17.0	11.6	5.8
≥65	2061 (30.5)	33.2	32	44.1	58.4	58.4
Never (un)married community	1161 (17.2)	4.7	4.3	5.5	3.3	23.5
Divorce, separation, death of a partner	1659 (24.6)	25.5	20.6	27.4	33.3	22.6
Marriage/non-marital union	3927 (58.1)	69.8	75.1	67.1	63.4	53.9
Primary and lower	2113 (31.3)	23.7	22.9	23.9	33.7	33.0
Secondary	3390 (50.3)	55.7	54.6	60.3	46.8	40.2
High	1244 (18.4)	20.6	22.4	15.8	19.5	17.8
Unemployed	1140 (17.0)	16.4	16.6	13.7	11.5	19.00
Inactive	3482 (52.0)	46.5	45.9	53.4	67.1	49.5
Employed	2125 (31.0)	37.1	37.5	32.9	21.4	31.5
The poorest	2787 (41.3)	36.0	33,3	35,7	39.2	44.3
Middle layer	1381 (20.5)	19.0	21.5	22.9	22.5	20.0
The richest layer	2579 (38.2)	45.0	45.2	41.4	38.3	35.7
Belgrade	1527 (22.6)	27.2	23.2	18.1	23.8	21.1
Vojvodina	2117 (31.4)	25.1	38.3	33.0	27.8	32.7
Shumadia and Western Serbia	1478 (21.9)	20.6	16.5	19.3	25.2	22.2
Southern and Eastern Serbia	1625 (24.1)	27.1	22.0	29.6	23.2	24.0
Bad and very bad	1176 (8.3)	15.2	11.6	15.8	20.4	19.6
Medium	1741 (27.1)	37.4	32.5	33.0	37.0	22.3
Good and very good	3830 (56.7)	47.4	55.9	51.3	42.6	58.1

Table 2: The frequency of subjects according the breast cancer screening (mammography) and upon whose initiative it was done ($P<0.001$)

Variables Age (yr)	***By own initiative***	***By the doctor's advice***	***By the doctor's call within the screening***
15-19	0	0	0
20-24	0.7	0.9	0.5
25-29	1.8	1.5	0.5
30-34	2.9	3.2	0
35-39	5.7	3.4	2.9
40-44	7.5	5.6	2.9
45-49	7.7	7.4	5.9
50-54	16.0	13.6	12.2
55-59	18.9	17.6	16.6
60-64	13.5	16.5	19.0
≥65	25.3	30.3	39.5
Never (un)married community	5.9	4.8	1.5
Divorce, separation, death of a partner	21.1	25.3	26.8
Marriage/non-marital union	73.0	69.8	71.7
Primary and lower	16.0	27.9	25.9
Secondary	57.4	56.8	54.6
High	26.6	15.3	19.5
Unemployed	15.6	17.5	8.9
Inactive	41.2	50.8	58.6
Employed	43.2	31.8	32.5
The poorest	31.2	36.4	39.0
Middle layer	20.3	21.2	23.4
The richest layer	48.5	42.4	37.6
Belgrade	21.4	22.1	20.9
Vojvodina	26.6	32.4	29.1
Shumadia and Western Serbia	17.6	17.3	39.2
Southern and Eastern Serbia	34.4	28.2	10.8
Bad and very bad	10.2	15.9	16.1
Medium	29.8	35.9	38.5
Good and very good	60.1	48.2	45.4

Table 3: The cross ratios (OR) and 95% confidence intervals (CI) for women who never used the breast cancer screening (mammography) according to the demographic and socio-economic characteristics

Variables	***Univariate model***		***Multivariate model***	
	Or (95%ci)	*P**	Or (95%ci)	*P**
Age(yr)				
15-19	2.590 (1.912 – 3.268)	< 0.001	1.062 (0.671 – 2.280)	0.015
20-24	2.344 (1.706 – 2.981)	< 0.001	2.832 (1.287 – 4.142)	0.355
25-29	2.440 (1.792 – 3.088)	< 0.001	2.188 (1.050 – 3.275)	0.386
30-34	2.356 (1.712 – 3.001)	< 0.001	3.032 (1.618 – 5.283)	0.437
35-39	2.336 (1.695 – 2.977)	< 0.001	2.900 (1.053 – 4.731)	0.430
40-44	2.253 (1.614 – 2.892)	< 0.001	2.182 (1.469 – 3.834)	0.576
45-49	1.990 (1.350 – 2.630)	< 0.001	1.739 (0.912 – 3.389)	0.460
50-54	1.476 (0.838 – 2.113)	< 0.001	0.846 (0.342 – 2.175)	0.312
55-59	1.402 (0.769 – 2.036)	< 0.001	0.934 (0.618 – 1.722)	0.656
60-64	1.817 (1.165 – 2.468)	< 0.001	1.900 (1.338 – 2.538)	0.563
≥65	1		1	
Marital status				
Never (un)married community	0.959 (0.365 – 1.805)	< 0.001	0.893 (0.106 – 1.376)	0.149
Divorce, separation, death of a partner	0.793 (0.375 – 0.960)	0.146	0.620 (0.252 –1.022)	0.895
Marriage/non-marital union	1		1	
Education				
Primary and lower	0.174 (0.071 – 0.364)	0.317	0.154 (0.055 – 0.298)	0.545
Secondary	0.068 (0.030 – 0.105)	0.665	0.282 (0.128 – 0.464)	0.397
High	1		1	
Working status				
Unemployed	2.061 (1.112 – 2.958)	0.600	1.584 (0.621– 3.072)	0.915
Inactive	1.266 (0.680 – 2.427)	0.539	0.832 (0.183 – 1.309)	0.891
Employed	1		1	
Wellbeing index				
The poorest	0.243 (0.133 – 0.354)	< 0.001	0.204 (0.049 – 0.358)	0.053
Middle layer	0.149 (0.014 – 0.284)	0.030	0.230 (0.003 – 0.460)	0.114
The richest layer	1		1	
Region				
Belgrade	0.298 (0.154 – 0.442)	< 0.001	0.278 (0.092 – 0.463)	0.003
Vojvodina	0.142 (0.009 – 0.275)	0.037	0.102 (0.067 – 0.236)	0.438
Shumadia and western Serbia	0.113 (0.032 – 0.177)	0.661	0.148 (0.095 – 0.338)	0.445
Southern and eastern Serbia	1		1	
Self-assessment of health				
Bad and very bad	0.243 (0.133 – 0.354)	< 0.001	0.279 (0.119 – 0.435)	< 0.001
Medium	0.149 (0.014 – 0.284)	0.030	0.117 (0.015 – 0.374)	0.099
Good and very good	1		1	

*Reference category: never had a mammography

Table 4: The cross ratios (OR) and 95% confidence intervals (CI) for used the breast cancer screening (mammography) own initiative according to the demographic and socioeconomic characteristics

Variables	*Univariate model*		*Multivariate model*	
	Or (95%ci)	P*	Or (95%ci)	P*
Age(yr)				
15-19	0.667 (0.476 – 1.089)	0.783	0.338 (0.171 – 0.581)	0.647
20-24	0.321 (0.054 – 0.697)	0.954	0.244 (0.058 – 0.465)	0.698
25-29	0.329 (0.157 – 0.644)	0.527	0.416 (0.412 – 2.244)	0.634
30-34	0.498 (0.187 – 0.782)	0.228	0.571 (0.114 – 1.056)	0.412
35-39	0.937 (0.044 – 1.819)	0.075	1.072 (0.944 – 2.088)	0.355
40-44	0.601 (0.121 – 1.081)	0.014	1.483 (0.336 – 2.301)	0.312
45-49	0.837 (0.356 – 1.318)	0.001	1.438 (1.382 – 3.258)	0.294
50-54	1.507 (1.028 – 1.986)	< 0.001	2.721 (1.051 – 4.494)	0.110
55-59	1.579 (1.104 – 2.055)	< 0.001	3.002 (1.816 – 5.821)	0.193
60-64	0.751 (0.476 – 1.240)	0.147	1.310 (0.557 – 2.277)	0.423
≥65	1		1	
Marital status				
Never (un)married community	0.836 (0.135 – 1.507)	< 0.001	1.099 (0.113 – 2.311)	0.729
Divorce, separation, death of a partner	0.202 (0.011 – 0.438)	< 0.001	0.540 (0.347 – 0.952)	0.426
Marriage/non-marital union	1		1	
Education				
Primary and lower	0.237 (0.124 – 0.351)	< 0.001	0.567 (0.198 – 1.032)	0.692
Secondary	0.071 (0.034 – 0.176)	0.184	0.221 (0.068 – 0.503)	0.631
High	1		1	
Working status				
Unemployed	1.622 (0.792 – 2.387)	0.625	0.896 (0.275 – 1.474)	0.942
Inactive	0.992 (0.448 – 1.317)	0.541	0.437 (0.245 – 0.937)	0.858
Employed	1		1	
Wellbeing index				
The poorest	0.242 (0.155 – 0.329)	< 0.001	0.186 (0.080 – 0.309)	0.203
Middle layer	0.078 (0.027 – 0.184)	0.146	0.138 (0.095 – 0.246)	0.215
The richest layer	1		1	
Region				
Belgrade	0.070 (0.044 – 0.117)	0.451	0.117 (0.059 – 0.208)	0.242
Vojvodina	0.078 (0.027 – 0.131)	0.618	0.096 (0.007 – 0.186)	0.505
Shumadia and western serbia	0.156 (0.042 – 0.271)	0.007	0.110 (0.023 – 1.941)	0.067
Southern and eastern serbia	1		1	
Self-assessment of health				
Bad and very bad	0.142 (0.034– 0.251)	0.010	0.136 (0.028 – 0.210)	0.130
Medium	0.310 (0.216 – 0.405)	< 0.001	0.468 (0.201 – 0.735)	0.001
Good and very good	1		1	

*reference category: self-initiated mammography

Discussion

Notwithstanding progress in medical science, breast cancer frequently manifests in advanced stages within countries possessing limited resources due to impediments in effectively advocating for early detection, diagnosis, and treatment. At the fundamental level, the encouragement of breast self-examination is a prevalent practice, while diagnostic ultrasound and mammography are accessible only to a restricted extent (12)

Breast cancer remains a complex and heterogeneous condition. The most effective approach for

early-stage disease detection and mortality reduction involves serial screening with mammography (13). The primary objective of screening is to expedite the time of diagnosis, thereby enhancing the prognosis through earlier intervention (14).

Developing nations grapple with constrained healthcare resources and employ diverse strategies for breast cancer diagnosis (12). In industrialized nations with established screening programs, a notable 20% reduction in mortality has been evidenced over an 11-year follow-up period (2). Addressing breast cancer control in Serbia, deemed a country with moderate resources, necessitates information, education, and counseling initiatives. These programs aim to enhance women's understanding of risk factors, signs, and symptoms, emphasizing the importance of seeking immediate medical attention. Such initiatives should be complemented by organized screening efforts to detect cancer at its initial stages. This comprehensive approach hinges on a robust health system equipped with diverse financial, human, and educational resources, coupled with efficient outreach to the population (15).

Through a thematic analysis based on the Health Belief Model, significant themes associated with low breast cancer screening uptake were identified. The themes are: high perceived barriers versus benefits, including fear of the breast cancer screening procedure and its possible out-comes, personal challenges that impede screening attendance and paying for screening and treatment, and low perceived susceptibility to breast cancer (16). Low- and middle-income countries (LMICs) grapple with restricted financial resources, apportioning relatively smaller segments to healthcare budgets (17).

Elevating awareness regarding breast health, encompassing prevalent cancers, holds the potential to prompt symptomatic women to seek healthcare facilities at earlier stages. Efficiently mobilizing the limited available resources toward cancer screening initiatives, coupled with heightened awareness, can enhance the acceptability of the program. The success of the screening program hinges on its outreach to achieve comprehensive population coverage, the establishment of diagnos-tic referral linkages, and the ensuring of the availability and accessibility of treatment facilities. These elements collectively shape the ultimate outcome of the screening program (18).

Not only is the availability and accessibility of services important but also the acceptability of services by overcoming socio-cultural barriers is vital. This can be achieved by incorporating culturally and linguistically appropriate education programmes and informing women about the advantages of screening.

The significance of this study lies in its endeavor to enlighten decision-makers in the Re-public of Serbia's public health domain that, despite efforts to enhance screening coverage, it re-mains suboptimal, necessitating ongoing education and awareness campaigns regarding the importance of preventive examinations.

Our study has several limitations: cross-sectional design, which does not permit inferences about potential causal relations between the explanatory variables and disorders of interest, and self-reporting is always prone to recall biases in describing. The further research in the field is also needed in order to explore longitudinal trends and identify other potential factors of inequalities in breast cancer screening.

Conclusion

Strong support is imperative for countries in establishing prevention and early detection programs for cancer, coupled with efficient treatment and care, in order to achieve a reduction in the incidence rate at a global scale. Strategies and requisite interventions should be devised to support vulnerable groups, explore barriers among women in screening utilization, and mitigate dis-parities in preventive examination usage.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission,

redundancy, etc.) have been completely observed by the authors.

Conflict of Interest

The authors declare that there is no conflict of interests.

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