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The Difference of Behavior for Undergoing Mammography Examination between Residents in Area with Organized Screening Program and Those in Areas without It: A Cross-Sectional Study in Serbia

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ABSTRACT

Introduction: Periodical mammography screening is considered to contribute to the early detection of breast cancer and reduction in its mortality. Since 2012, the organized mammography screening (organized screening) program has been introduced in Serbia. This survey was conducted to assess the relationship between the introduction of organized screening and the behavioral difference in women undergoing mammography examinations.

Methods: Females aged 50-69 years living in regions with and without the program (opportunistic screening) were interviewed. Participants were categorized into one of the four stages of concern and behavior toward breast cancer examination: Stage 1 (unconcerned), Stage 2 (concerned), Stage 3 (occasional practice), and Stage 4 (regular practice). Comparisons between the organized screening group and opportunistic screening group were conducted using the chi-square test. The logistic regression model was used to adjust influence by socioeconomic factors.

Results: Among 1,204 participants, 622 (51.6%) were from the organized screening group and 582 (48.4%) were from the opportunistic screening group. The percentage of Stage 2 or higher was significantly higher in the organized screening group than in the opportunistic screening group (adjusted odds ratio [AOR] 1.36, 95% confidence interval [CI] 1.02-1.82). The percentage of Stage 3 or higher and Stage 4 was also significantly higher in the organized screening group than in the opportunistic screening group (AOR 1.42, 95% CI 1.13-1.80 and AOR 1.34, 95% CI 1.03-1.76, respectively).

Conclusions: This study revealed that the introduction of organized screening was related to the behavioral difference in women in the early diagnosis of breast cancer compared with opportunistic examinations even after adjusting for considerable socioeconomic factors. These findings suggested the must expand coverage of the organized mammography screening program.

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Introduction

Breast cancer is the most prevalent and the leading cause of death among women around the world.¹⁾ The estimated number of new breast cancer cases in 2020 was 2.2 million, representing 24.5% of all new cancer cases among women globally.²⁾ Both direct and indirect costs of breast cancer are high due to affecting a relatively younger age group.^{3,4)}

In Europe, the breast cancer incidence rate is relatively higher than in other countries,^{5,6)} accounting for 28.8% of all female cancer incidences,⁷⁾ with 425,000 new cases diagnosed annually.⁸⁾ A woman in the European Union (EU) has an 8% chance of developing breast cancer before the age of 75 years and a 2% likelihood of dying from the disease.⁹⁾ Eastern Europe has a lower incidence rate and a higher mortality of breast cancer compared with Western Europe.¹⁰⁾

Early diagnosis of breast cancer and optimum treatment are effective in reducing mortality.²⁾ Particularly, periodical mammography screening is considered to contribute highly to early detection of breast cancer, which reportedly leads to a 15%-20% reduction in breast cancer mortality.¹¹⁻¹³⁾ In a previous study, a randomized trial showed that mammography screening reduced breast cancer mortality by 18%-30%.¹⁴⁾ These findings resulted in population-based breast cancer prevention programs being implemented in many countries,¹⁵⁾ although there is still a debate on their benefits.^{16,17)} Previous studies reported that factors associated with nonattendance to mammography screening might differ between opportunistic breast cancer screening, which is spontaneous breast cancer examination regardless of the existence of symptoms, and organized breast cancer screening programs, which is the government initiative to invite the target population for examination.^{18,19)} Furthermore, the socioeconomic factors that affect the behavior of seeking breast cancer examination services include educational status, occupational status,²⁰⁾ the existence of a partner,^{21,22)} and nationality/migration status.^{23,24)}

The Republic of Serbia (Serbia) showed a relatively low incidence rate of breast cancer, with 69.0 cases per 100,000 population, ranking 19th among 40 European countries, but a very high mortality rate, ranking second among

them.⁶⁾ According to the document published by the government of Serbia, breast cancer was usually discovered at an advanced stage in Serbia. At the time of diagnosis, the cancer had metastasized from the breast to the regional lymph nodes and skin or there were already distant metastases in more than half the women, which significantly reduced their chances for recovery. Moreover, only 30% of women diagnosed with breast cancer were detected, however, with tumors of smaller sizes, i.e., up to 2 cm.²⁵⁾ One major reason for these findings was the lack of regular breast cancer examinations. To improve such situation, the EU has enhanced screening for three major cancers (breast, cervical, and colon cancers) across the European region. Based on the recommendation and support of the EU and support from Japan through the Japan Grant Aid Project "Breast cancer early detection equipment plan in Serbia" in 2010,²⁶⁾ Serbia introduced the National Breast Cancer Screening Program in 2012 to provide organized breast cancer screening services free of charge.

The National Screening Program in Serbia targets women aged 50-69 years, providing mammography-screening services once every 2 years. Primary health care institutions undertake promotional activities for the target population to participate in mammography screening, including invitations and coordination of screening services in their coverage areas. Organized breast cancer screening (organized screening) is only introduced in public health facilities with mammography equipment and qualified human resources for screening services. In areas where organized screening had not yet been introduced, opportunistic screening, a breast cancer examination in which the women take their own initiative or follow the advice of their gynecologists or general practitioners, had been applied.²⁵⁾ Among a total of 217 districts, the program had been gradually introduced in 29 districts (13.4%) in 2013, 49 districts (22.6%) in 2014, 59 districts (27.2%) in 2015, and 60 districts (27.6%) (Fig. 1).

This study aimed to assess the relationship between the introduction of organized screening and the behavioral difference in women undergoing mammography examinations. We hypothesized that organized screening would be associated with improving positive attitudes and mammography practices among target women in Serbia.

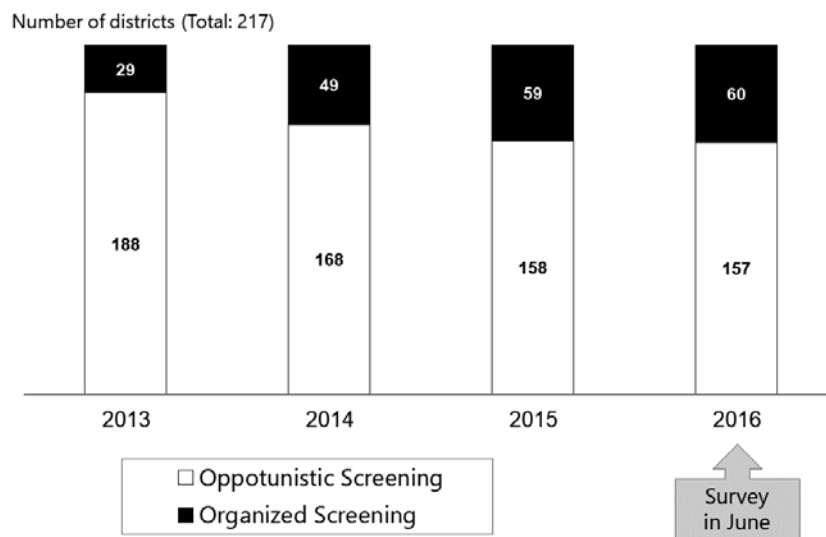


Fig. 1 Number of districts introducing organized screening and opportunistic screening (N = 217)

Methods

Study population and design

This study involved a secondary data analysis using data from the questionnaire survey conducted within the project of strengthening the national program for early detection of breast cancer implemented by the Japan International Cooperation Agency.²⁷⁾ Ethical approval was obtained from the Ethics Committee of Toho University School of Medicine (No. A21049). The whole process of the secondary data transfer and data analysis was conducted according to the Act on the Protection of Personal Information and the Ethical Guidelines for Medical and Biological Research Involving Human Subjects in Japan.

The study population of the survey was women aged between 50 and 69 years throughout Serbia. They were recruited from 28 districts in which organized screening has been introduced (the organized screening group) and 35 districts in which it has not been introduced yet (the opportunistic screening group). The sample size was set as 1,200 and stratified by regional administrative divisions (Belgrade, Vojvodina, and Central Serbia), age group (50-59 and 60-69 years old), and urban/rural setting. Among them, surveyors visited selected households at certain intervals of the address numbers, once the existence of the target population was confirmed, the surveyors explained the purposes of the survey and obtained verbal consent from the subjects. The interview session was conducted using a structured questionnaire at the subject's home,

and the surveyor verbally asked questions and entered responses using a tablet. All data were kept anonymous.

Evaluation items

Fig. 2 shows the transtheoretical behavior change model used in this survey. The survey was focused on the evaluation of the relationship between the organized breast cancer screening program and the attitudes and behavior of the target women to receive mammography examinations. The organized breast cancer screening program includes interventions expected to influence attitude and behavior. There were two groups, with or without an organized breast cancer screening program. Women's attitudes and behavior were evaluated using a series of questions: 1) "Would you like to receive mammography screening?" 2) "Have you ever received a mammography examination?" and 3) "Have you received a mammography examination at least every two years?" Based on the answers, the participants were categorized into one of the four stages of concern and behavior toward breast cancer examination: Stage 1 (unconcerned period) when they were not interested in breast cancer examination, Stage 2 (concerned period) when they were interested in breast cancer and screening but had not yet achieved the screening behavior, Stage 3 (occasional practice period) when they had undergone examinations but did not yet receive them regularly, and Stage 4 (regular practice period) when they regularly underwent breast cancer examinations, at least every 2 years.

The participants of Stage 1 were the group to answer

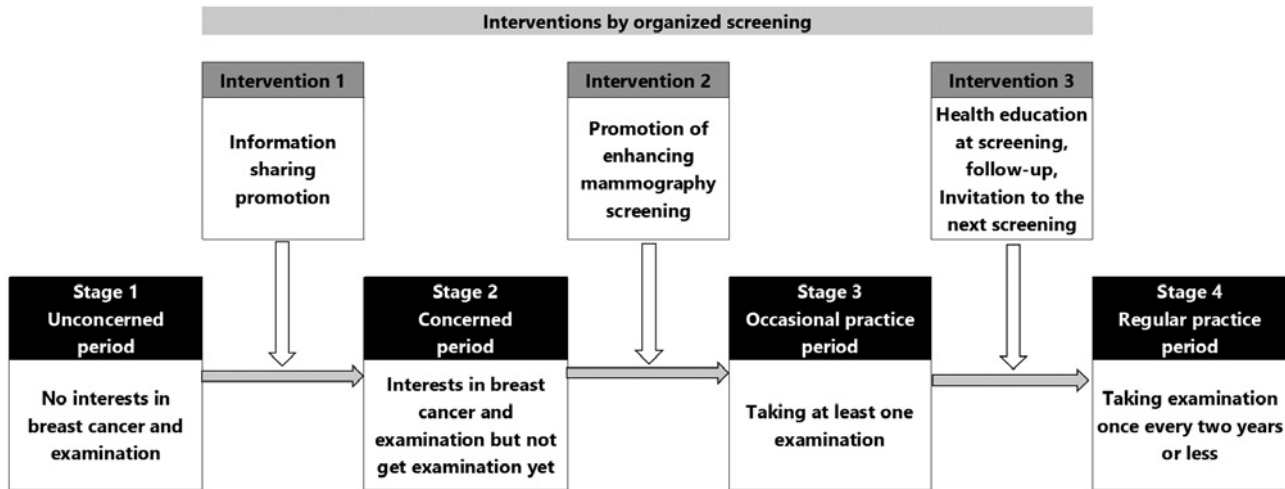


Fig. 2 Evaluation model of behavioral change on mammography examination

“No” to a) Willingness to receive mammography examination” and those of Stage 2 or higher were the group to answer “Yes.” The participants of Stage 3 or higher were the group answering “Yes” to b) Experience of mammography examination, and others were the group answering “No.” The Stage 4 group was answering “Yes” to c) Regular mammography examination at least once every 2 years, and others were the group to answer “No.”

Information regarding the socioeconomic variables was collected, such as educational status (low: primary level or unfinished, middle: secondary level, or high: tertiary level or above), marital status (married or single, widowed, or divorced), employment status (unemployed/retired or employed), and self-reported financial status (below average, average, and above average) to adjust the influences of these factors.

Statistical analysis

The chi-square test was used to assess the relationship between organized screening and behavioral stages. To evaluate the relation between the introduction of organized screening and the attitude/behavior of the target population, the multivariate logistic regression model was used for calculating the adjusted odds ratios (AORs) and 95% confidence intervals (CIs) with the introduction of organized screening as major independent variables, attitude and behavior as dependent variables, and socioeconomic statuses such as age, educational status, marital status, employment status, and financial status as covariates. All p-values reported were two-sided with an alpha error of 5%. Statistical analyses were performed with the use of SPSS software, version 26.0.0.

Results

Study population

The survey took place from June 2016 to August 2016. Table 1 provides details on the socioeconomic characteristics of the sample population. A total of 155 units were randomly selected, with 36 in Belgrade, 42 in Vojvodina, and 77 in Central Serbia. A total of 1,204 effective answers were collected. Among them, 622 participants (51.6%) were from the areas with organized screening (133 from Belgrade, 160 from Vojvodina, and 329 from Central Serbia) and 582 (48.4%) were from the areas with opportunistic screening (119 from Belgrade, 176 from Vojvodina, and 287 from Central Serbia). The participants' characteristics were generally well balanced between the organized screening group and opportunistic screening group, except for educational status. Table 2 shows the number and proportion of participants in both groups by stage.

Difference of behavior of mammography examination among women with and without organized screening

The relationship between organized screening and the behavior of mammography examination is shown in Table 3. The percentage of participants in Stage 2 or higher was significantly higher in the organized screening than in the opportunistic screening group (82.3% vs. 77.1%; $p = 0.026$). The percentage of participants in Stage 3 or higher was higher in the organized screening group than in the opportunistic screening group (53.1% vs. 44.7%; $p = 0.004$). The percentage of participants in Stage 4 was also significantly higher in the organized screening group than in the oppor-

Table 1 Background information

Characteristics	Details	OS		No OS		<i>p</i> -Value*
		N	%	N	%	
Total		622	100.0	582	100.0	
Age group	50–59 Years of age	343	55.1	317	54.5	0.813
	60–69 Years of age	279	44.9	265	45.5	
Educational status	Primary or unfinished	137	22.0	163	28.0	0.011
	Secondary	361	58.0	333	57.2	
	High school and more	124	19.9	86	14.8	
Marital status	Married	444	71.4	419	72.0	0.848
	Single, widowed, or divorced	178	28.6	163	28.0	
Employment status	Employed (full-time or part-time)	158	25.4	164	28.2	0.297
	Unemployed, retired, or housewife	464	74.6	418	71.8	
Financial status (self-report)	Less than average	305	49.0	269	46.2	0.206
	Average	276	44.4	265	45.5	
	More than average	36	5.8	21	3.6	
	do not know	5	0.8	27	4.6	

OS: Organized screening group

No OS: No organized screening group (opportunistic screening group)

N: Number of participants

* Chi-square test.

Table 2 Breakdown of participants by stage

	Total	Stage 1 Unconcerned period	Stage 2 Concerned period	Stage 3 Occasional practice period	Stage 4 Regular practice period
Organized screening group	622 cases	110 (17.7)	182 (29.3)	158 (25.4)	172 (27.7)
Opportunistic screening group	582 cases	133 (22.9)	189 (32.5)	131 (22.5)	129 (22.2)

Kendall rank correlation coefficient $\tau = 0.099$, $p = 0.002$.

tunistic screening group (27.7% vs. 22.2%; $p = 0.028$).

The percentage of respondents with the willingness to receive mammography examination (Stage 2 or higher) was statistically higher for the younger age group (50-59 years old), the higher educational status groups, the married group, and the employed group. Additionally, the percentage of respondents with experience of mammography examination (Stage 3 or higher) was statistically higher for the higher educational status groups and the employed group, and the percentage of the respondents with regular mammography examination (Stage 4) was higher for the higher educational status groups.

Influence of organized screening and other socioeconomic variables on the difference in behavior

The results of the multivariate logistics regression model analysis are presented in Table 4. Desire for breast

cancer examination (Stage 2 or higher) was significantly higher among women in the organized screening group than in the opportunistic screening group (AOR 1.36, 95% CI 1.02-1.82). Organized screening had significant influences on participants moving to taking mammography examination (Stage 3 or higher) and regular mammography examination (Stage 4) showing AOR 1.42, 95% CI 1.13-1.80 and AOR 1.34, 95% CI 1.03-1.76, respectively.

Among the socioeconomic factors evaluated as having a possible influence on behaviors related to breast cancer examination, higher educational status affected the difference in all three attitudes and behaviors. Married status affected willingness to undergo examination, and older age group and employed status affected occasional practice.

Table 3 Relationship between willingness, experience of mammography examination, and undergoing regular mammography examination and sociodemographic categories

Category	Subgroup	Total	Yes		No		<i>p</i> -Value*
		N	N	%	N	%	
Total		1204					
a) Willingness to receive mammography examination (Yes: Stage 2 or higher, No: Stage 1)							
Breast cancer screening	Organized	622	512	82.3%	110	17.7%	0.026
	Opportunistic	582	449	77.1%	133	22.9%	
Age group	50-59 years old	660	543	82.3%	117	17.7%	0.021
	60-69 years old	544	418	76.8%	126	23.2%	
Educational status	Primary level or unfinished	300	222	74.0%	78	26.0%	0.003
	Secondary level	694	558	80.4%	136	19.6%	
	Tertiary level or above	210	181	86.2%	29	13.8%	
Marital status	Married	863	705	81.7%	158	18.3%	0.011
	Single, widowed, or divorced	341	256	75.1%	85	24.9%	
Employment status	Employed	322	275	85.4%	47	14.6%	0.003
	Unemployed or retired	882	686	77.8%	196	22.2%	
Financial status	Below average	574	454	79.1%	120	20.9%	0.692
	Average	541	437	80.8%	104	19.2%	
	Above average	57	44	77.2%	13	22.8%	
b) Experience of mammography examination (Yes: Stage 3 or higher, No: Stages 1 and 2)							
Breast cancer screening	Organized	622	330	53.1%	292	46.9%	0.004
	Opportunistic	582	260	44.7%	322	55.3%	
Age group	50-59 years old	660	319	48.3%	341	51.7%	0.643
	60-69 years old	544	271	49.8%	273	50.2%	
Educational status	Primary level or unfinished	300	116	38.7%	184	61.3%	<0.001
	Secondary level	694	356	51.3%	338	48.7%	
	Tertiary level or above	210	118	56.2%	92	43.8%	
Marital status	Married	863	431	49.9%	432	50.1%	0.307
	Single, widowed, or divorced	341	159	46.6%	182	53.4%	
Employment status	Employed	322	177	55.0%	145	45.0%	0.013
	Unemployed or retired	882	413	46.8%	469	53.2%	
Financial status	Below average	574	265	46.2%	309	53.8%	0.144
	Average	541	276	51.0%	265	49.0%	
	Above average	57	32	56.1%	25	43.9%	
c) Regular mammography examination at least once every 2 years (Yes: Stage 4, No: Others)							
Breast cancer screening	Organized	622	172	27.7%	450	72.3%	0.028
	Opportunistic	582	129	22.2%	453	77.8%	
Age group	50-59 years old	660	169	25.6%	491	74.4%	0.640
	60-69 years old	544	132	24.3%	412	75.7%	
Educational status	Primary level or unfinished	300	53	17.7%	247	82.3%	0.003
	Secondary level	694	194	28.0%	500	72.0%	
	Tertiary level or above	210	54	25.7%	156	74.3%	
Marital status	Married	863	227	26.3%	636	73.7%	0.104
	Single, widowed, or divorced	341	74	21.7%	267	78.3%	
Employment status	Employed	322	94	29.2%	228	70.8%	0.050
	Unemployed or retired	882	207	23.5%	675	76.5%	
Financial status	Below average	574	133	23.2%	441	76.8%	0.158
	Average	541	143	26.4%	398	73.6%	
	Above average	57	19	33.3%	38	66.7%	

* Chi-square test.

Table 4 Influence of organizational screening on willingness, experience, and regular practice of mammography examination

Category	Subgroup	Adjusted odds ratio	95%CI*
a) Willingness to receive mammography examination (Stage 2 or higher vs. Stage 1)			
Breast cancer screening	Opportunistic	1.00	
	Organized	1.36	1.02–1.82
Age group	50–59 years old	1.00	
	60–69 years old	0.87	0.63–1.22
Educational status	Primary level or unfinished	1.00	
	Secondary level	1.27	0.91–1.79
	Tertiary level or above	1.85	1.12–3.08
Marital status	Single/widowed	1.00	
	Married	1.43	1.05–1.96
Employment status	Unemployed or retired	1.00	
	Employed	1.37	0.91–2.07
Financial status	Below average	1.00	
	Average	0.94	0.69–1.28
	Above average	0.69	0.35–1.36
b) Experience of mammography examination (Stage 3 or higher vs. Stages 1–2)			
Breast cancer screening	Opportunistic	1.00	
	Organized	1.42	1.13–1.80
Age group	50–59 years old	1.00	
	60–69 years old	1.34	1.02–1.76
Educational status	Primary level or unfinished	1.00	
	Secondary level	1.58	1.18–2.12
	Tertiary level or above	1.73	1.17–2.56
Marital status	Single/widowed	1.00	
	Married	1.19	0.91–1.55
Employment status	Unemployed or retired	1.00	
	Employed	1.39	1.02–1.90
Financial status	Below average	1.00	
	Average	1.05	0.82–1.34
	Above average	1.19	0.68–2.10
c) Regular mammography examination at least once every two years (Stage 4 vs. Stages 1–3)			
Breast cancer screening	Opportunistic	1.00	
	Organized	1.34	1.03–1.76
Age group	50–59 years old	1.00	
	60–69 years old	1.14	0.83–1.56
Educational status	Primary level or unfinished	1.00	
	Secondary level	1.76	1.23–2.53
	Tertiary level or above	1.44	0.90–2.29
Marital status	Single/widowed	1.00	
	Married	1.28	0.94–1.75
Employment status	Unemployed or retired	1.00	
	Employed	1.27	0.89–1.79
Financial status	Below average	1.00	
	Average	1.06	0.80–1.42
	Above average	1.47	0.81–2.69

* The Wald test.

Discussion

In this survey, our findings revealed that organized screening was highly associated with progress in the behavior of seeking breast cancer examination based on the behavioral change model. Even after adjusting for the influence of other factors such as age group, educational status, marital status, employment status, and financial status in the multivariate logistic regression models, the differences in behaviors in all three stages related to breast cancer examination were confirmed between the women with and without the organized screening program.

Pletscher reported that introducing organized screening in Switzerland was considered one of the factors to increase target women's motivation to participate in mammography screening among women who had never received a mammography examination before.²⁸⁾ Eichholzer and colleagues reported that there was a lower breast cancer screening attendance rate in the region without organized breast cancer screening than in the region with organized screening.²⁹⁾ Both studies pointed out that the recommendations and promotions by healthcare professionals would contribute to motivating women to undergo a mammography examination. The organized screening process we examined in this study included the promotional activities of health workers to encourage target women to undergo mammography screening. These results suggest that health professionals' recommendations might influence the progress in the behavior of seeking breast cancer examinations.

The previous articles reported that behaviors of seeking and receiving mammography examinations were related to several socioeconomic factors such as educational status, financial status, and marital status.³⁰⁻³⁴⁾ The survey also evaluated the relationship between the organized breast cancer screening program and behaviors by adjusting for socioeconomic factors such as age group, educational status, marital status, employment status, and financial status. Our results also showed that higher educational status, married status, and employed status had a positive impact on the behavior to take the mammography examination. Even after adjusting for these factors, our survey identified that more target women with organized screening tend to have positive attitudes and behaviors to take mammography examinations.

There were several limitations in our survey. This

study was conducted as a snapshot survey, not a before-after study. Therefore, it could not evaluate the impact of introducing the organized screening. Moreover, this survey did not assess the duration of the intervention. The effect might be enhanced by a longer intervention period. Regarding sample collection, there was a possibility of bias because we collected data from participants who agreed on joining the survey. Thus, the participants might have been more positive about the breast cancer issues. Another possible limitation was that the whole process of organized screening was not entirely standardized, and the means of invitation, promotion, and education were different among health institutions in Serbia. Several previous survey reports indicated that effective screening and diagnostic services need appropriate program management; a network of services among service providers in a community; evidence-based knowledge, methods, and techniques;³⁵⁾ and an effective approach to the target population.³⁶⁻³⁸⁾ In our survey, we did not investigate how each promotional strategy affected the difference in behaviors. The influence of different processes of promotion should be evaluated in the next survey to identify more effective approaches.

Conclusions

This study revealed that the introduction of organized screening was related to the differences in attitudes and behaviors in women toward occasional and routine practices for the early diagnosis of breast cancer compared with opportunistic screening, even after adjusting for considerable socioeconomic factors. The study results can provide evidence to encourage decision makers to scale up the organized screening program across the country and contribute to increasing the seeking of breast cancer examination services for early detection of breast cancer, which might result in reducing the mortality rate of women suffering from breast cancer.

Thus, based on our survey results, it is suggested to expand coverage of the national program throughout Serbia and to promote organized screening to increase screening rates.

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Authors' contribution: KT and YH obtained data. KT conceptualized the study, performed the analysis and interpretation of data, and wrote the draft manuscript. TH supervised overall of the survey. YH, KM, RO, and KS reviewed and edited the draft manuscript and all authors approved the final manuscript.

Ethics statement: In this study, all subjects provided verbal consent, and the study protocol was approved by the Ethics Committee of the Toho University School of Medicine (No. A21049).

Conflicts of interest: KT is an employee of Fujita Planning Co., Ltd. The other authors declare that they have no relevant conflicts of interest.

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