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Knowledge, Fear of Breast Cancer, and Breast Self-Examination Practices Among Female Undergraduate Students: A Cross-Sectional Study in Bekasi City, Indonesia

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ABSTRACT

Background: The practical and free breast self-examination (BSE) method can be used more widely for breast cancer screening in developing countries. This study aims to examine the relationship between a) knowledge of breast cancer, b) fear of breast cancer, and c) BSE practices among female undergraduate students.

Methods: This cross-sectional study was conducted in September 2023, surveying 261 female undergraduate students from a polytechnic of health in Bekasi City, Indonesia, using an online questionnaire via Google Forms.

Results: Overall, 66.3% of participants practiced BSE. The proportion of participants with a good knowledge of BSE was 51.3%, while those with a good knowledge of breast cancer risk factors were 29.1%. The proportion of participants who had a high fear of breast cancer reached 60.9%. Participants identified social media (28.7%), physicians (28.3%), and websites (22.6%) as the top 3 sources of breast cancer information, out of a total of 9 options. Multivariate logistic regression analysis revealed that having a good knowledge of BSE (OR, 2.460, 95% CI; 1.403–4.312, P<0.05) and being 20 years or older (OR, 2.238; 95% CI, 1.282–3.907, P<0.05) were significant independent predictors of BSE practice. Knowledge about breast cancer risk factors and fear of breast cancer were not statistically significant as determinants of BSE practice.

Conclusion: Female undergraduate students with a good knowledge of BSE and older students are more likely to practice BSE. We recommend that breast cancer awareness campaigns targeting female undergraduate students emphasize practical, hands-on instruction on BSE techniques via social media or interactive mobile applications by physicians, including health information messages, video-based tutorials, and Q&A sessions.

INTRODUCTION

Eradicating cancer is one of the serious challenges facing global health in the modern era. In 2020, based on data from the Globocan Project[1], breast cancer was one of the cancers with the largest number of new cases (11.7% of all new cancer cases) and one of the cancers with the highest number of deaths (6.9% of all cancer deaths). The Globocan Project[2] also showed that the incidence of new cases of breast cancer in Indonesia accounts for the largest proportion (16.6%) compared to the number of new cases of other cancers. The proportion of new cases of breast cancer from the total number of new cases in women in Indonesia is even greater, reaching 30.8%.[2]

The latest developments in multidisciplinary medical science and technology allow for an increase in the chances of successful therapy in breast cancer

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patients, although it requires a more comprehensive therapeutic approach.[3] However, a preventive approach by suppressing risk factors remains one of the keys to success in controlling breast cancer.[4] Another important factor in controlling this disease is detecting breast cancer at the earliest possible stage in order to increase the chances of successful therapy and reduce the risk of suffering and death.[3,4]

There are several methods used for breast cancer screening, including mammography and various other imaging techniques, clinical breast examination (CBE), and breast self-examination (BSE).[3] Until now, mammography has been the definitive method used for early detection because of its effectiveness and contribution to reducing breast cancer mortality rates.[5] However, this method requires the support of adequate health facilities, infrastructure, and resources.[6] In developed countries, the use of imaging methods such as mammography may not face major obstacles, but in developing countries, limited health facilities and resources are a very serious challenge. Therefore, in developing countries, CBE and BSE, which are more resource-efficient, may need to be considered for campaigning so that they can be implemented more widely in the community. These practices are expected to help increase the chances of successfully detecting breast cancer at the earliest possible stage.[7]

In Indonesia, the CBE screening program is implemented in primary health care facilities by general practitioners and trained midwives.[8] However, a study by Wahidin *et al.*[9] showed that the coverage of CBE is still low, reaching only 9.8% of the target population of women aged 30 to 50 years. The study also showed that although this program is implemented in all provinces, only about 51% of primary health centers have implemented it. There appear to be serious obstacles to expanding the coverage of this program evenly across regions due to the high disparity in resources between provinces and the limited capacity of primary health care facilities and finances in the regions.[9] Therefore, increasing the coverage of BSE participation can be a rational choice in improving the success of screening. BSE also seems more likely to be practiced widely and routinely in women because it is practical, can be done at home, is free and non-invasive, and seems to be preferred by women.[10,11] Although it is not a substitute for imaging methods such as mammography,[3] screening using BSE is also expected to initiate women to carry out further breast examinations in healthcare facilities and form habits and high awareness of their respective breast health.[6]

Thus, identifying factors associated with BSE practices in female populations in developing countries becomes even more crucial.[3] Initially, identification may need to be prioritized in a more specific population.[6] Prioritizing female health science students may be appropriate, given their greater exposure to health information and knowledge, as well as their potential for greater influence on the general female population in the future. The results of various studies seem to indicate a tendency for diverse factors to be associated with both general breast cancer screening[3,12] and BSE participation rates among female students in developing countries.[13–15]

Two factors seem crucial to investigate in their association with BSE participation. First, knowledge about breast cancer, specifically about BSE. The association between knowledge about BSE and BSE practice has been demonstrated by several studies,[10,14,16] but it seems that the relationship between knowledge about breast cancer risk factors and BSE practice has not been widely demonstrated. The second factor is fear of breast cancer, which seems to be prevalent in the female population and has been widely studied.[17–21] The hypothesis that fear factors are related to breast cancer screening participation[17] seems quite reasonable, although it has not been proven by several previous studies;[19,21,22] thus, gathering evidence in different populations seems necessary.

Although there have been studies on BSE in Indonesia,[23–25] domestic studies that quantitatively describe breast cancer fear in the local population have not been conducted. Furthermore, domestic studies that examine the interaction between breast cancer knowledge and fear in the context of their association with BSE participation—to our knowledge—appear to be lacking. Therefore, to address these research gaps, this study aims to examine the relationship between a) breast cancer knowledge, b) breast cancer fear, and c) BSE practice among female undergraduate students.

METHODS

This study uses a cross-sectional design because this design is relatively easy to carry out, can collect many measurement results of research variables at the same time quickly, so that it is suitable for use when resources are very limited, and is the main choice for determining the prevalence and relationships between many variables.[26] Data were collected in September 2023. Participants were female students of the Health Polytechnic of the Ministry of Health, Jakarta III, located in Bekasi City, West Java, Indonesia. This campus is the only state campus majoring in health in Bekasi City, making it suitable to be chosen as a research location in accordance with the background that we have mentioned previously, to focus on the population of female health students as our research

subjects. The minimum sample size was estimated based on the formula proposed by Lemeshow *et al.*[27] for proportion: $n = \frac{Z^2_{1-\alpha/2}P(1-P)}{d^2}$ where $Z^2_{1-\alpha/2}$ is the Z statistic (1.96 at a 95% confidence level), and "P" is the estimated proportion of female students who practice BSE. In this study, "P" was 0.499, referring to the results of a meta-analysis of studies from 2017–2022 in Indonesia,[23] while "d" is the absolute precision, which we set at 10%. After calculating with a laptop calculator, we got a minimum sample size (n) of 97 participants.

For sample selection, we used the convenience sampling method. Data were collected from participants using an online questionnaire (Google Form) in Indonesian until the minimum sample size was exceeded. We distributed the questionnaire link to prospective participants through face-to-face meetings in class and also distributed it via the class WhatsApp group. At the beginning of the questionnaire, there was a written explanation of the study. Only prospective participants who voluntarily gave online consent to participate in this study could continue to fill out the questionnaire. We made arrangements so that each participant could only fill out the questionnaire once. We ensured that the participants who filled out the questionnaire were female students at the campus by verifying the participants' identities. In addition, we also took steps to protect data confidentiality by providing passwords for both the data file and the laptop used to store and process data. After verifying the participant's identity, in further data processing and analysis, we replaced it with a number code.

Measurement

Participant characteristics and BSE practices

We developed a questionnaire to determine the sociodemographic profile, education, and health history of the participants by referring to various references.[10,15,28–32] In addition, we also developed a questionnaire to determine BSE practices based on previous studies.[15,28–30] We defined participants who practiced BSE as participants who admitted to having practiced BSE or admitted to being accustomed to doing BSE regularly.

Knowledge of BSE and breast cancer risk factors

We used a form containing 17 statements to measure knowledge about BSE, which was compiled based on the literature on breast cancer management.[28,29,31–35] We also used a form to measure knowledge about breast cancer risk factors, consisting of 13 statements, also compiled with reference to various references.[3,4,15,32,36] In each statement from both parts of the questionnaire, there are answer choices: *true*, *false*, and *don't know*. The correct answer to each statement gets a score of "1" (one); the incorrect answer is given a score of "0" (zero). The knowledge score is the sum of the scores from all the answers.

BSE knowledge score and breast cancer risk factor knowledge score were categorized by referring to the modified Bloom's cutoff.[37] We used a modification as in a previous study,[38] dividing the knowledge level into 2 with a score of 60% of the maximum score as the cutoff. Thus, knowledge about BSE was categorized as "poor" if the total score is 0–10 and "good" if the total score is 11–17. Meanwhile, knowledge about breast cancer risk factors was categorized as "poor" if the score was 0–7 and "good" if the score was 8–13.

Fear of breast cancer

The breast cancer fear variable was measured using a questionnaire adapted from Champion's Breast Cancer Fear Scale (CBCFS).[17] This questionnaire has been frequently used in previous studies[18,19,39,40] for various populations. The translation of CBCFS from English to Indonesian was carried out by 2 authors: each translated independently, and then synchronized. CBCFS consists of 8 statement items on a 5-point Likert scale: point 1 for the answer "strongly disagree" to point 5 for "strongly agree". The CBCFS score has a linear meaning: the higher the score, the higher the fear of breast cancer. The CBCFS score classification refers to the one proposed by Champion *et al.*[17] who categorized it as "low" if the total score is 8–15, "moderate" if the total score is 16–23, and "high" if the total score is 24–40.

Pilot study

Before data collection, we conducted a pilot study to test the questionnaire and identify and anticipate possible technical constraints. The pilot study was conducted on 35 female volunteer students. This number exceeded the sample size recommended by Conroy[41] for the Cronbach's alpha test: a minimum of 30 people. Participants who had participated in the pilot study were not included in the actual study. Validity testing was conducted on each questionnaire using the Pearson Product-Moment test. The results showed that 8 statement items in the CBCFS, 17 statement items in the BSE knowledge questionnaire, and 13 statement items in the breast cancer risk factor knowledge questionnaire, each had a significant ($P<0.05$, 2-tailed) and a positive Pearson correlation, so they were valid. Furthermore, a reliability test was conducted. The Cronbach's alpha value for each CBCFS item was between 0.854 and 0.899, and the overall alpha value was 0.885. Meanwhile, the

Cronbach's alpha value for each item of the questionnaire on BSE knowledge ranged from 0.863 to 0.880 and the overall Cronbach's alpha value was 0.879. Also, the Cronbach's alpha value for each item of the questionnaire on breast cancer risk factor knowledge ranged from 0.790 to 0.828, with an overall Cronbach's alpha value of 0.818. Thus, the questionnaires were valid and reliable for use in research.

Table 1. Characteristics of the Participants (n=261)

Variables		Frequency	Proportion
Age (years)	Mean ± SD	20.39 ± 2.57	
	Median (min-max)	20 (17–29)	
	≥20 years	138	52.9%
	<20 years	123	47.1%
Age at menarche (years)	Mean ± SD	12.78 ± 1.34	
	Median (min-max)	13 (9–16)	
	≥12 years	221	84.7%
	<12 years	40	15.3%
Marital status	Married/widowed	10	3.8%
	Not married yet	251	96.2%
Study program	Midwifery	33	12.6%
	Physiotherapy	13	5.0%
	Medical laboratory technology	178	68.2%
	Health promotion	37	14.2%
Work	Yes	73	28.0%
	No	188	72.0%
Father's education	Undergraduate/graduate/postgraduate	91	34.9%
	Postgraduate	3	1.2%
	Graduate	14	5.4%
	Undergraduate	74	28.3%
	Elementary/middle/high school/other	170	65.1%
	High school	136	52.1%
	Middle school	15	5.7%
	Elementary school	17	6.5%
	Others	2	0.8%
Mother's education	Undergraduate/graduate/postgraduate	77	29.5%
	Postgraduate	2	0.8%
	Graduate	6	2.3%
	Undergraduate	69	26.4%
	Elementary/middle/high school/other	184	70.5%
	High school	125	47.9%
	Middle school	34	13.0%
	Elementary school	25	9.6%
	Others	0	0.0%
Average income of parents per month	≥IDR 5 million	103	39.5%
	<IDR 5 million	158	60.5%
Family history of breast cancer	Yes	21	8.1%
	No	240	91.9%
Family history of other cancers	Yes	40	15.3%
	No	221	84.7%
Primary source to choose for breast cancer information	Social media	75	28.7%
	Physicians	74	28.3%
	Website	59	22.6%
	Seminar/webinars	35	13.4%
	Health workers	11	4.2%
	Family	2	0.8%
	Friends	2	0.8%
	Others	2	0.8%
	Television	1	0.4%

SD, standard deviation; min, minimum; max, maximum; IDR, Indonesian rupiah.

Statistical methods

We conducted a bivariate test to determine the association of each independent variable (breast cancer fear score, knowledge, and participant characteristics), respectively, with BSE practices. The bivariate test on categorical independent variables used the chi-square test. When the chi-square test did not meet the requirements, Fisher's exact test was used. In addition, the Mann-Whitney test was used to test the bivariate relationship between breast cancer fear score and BSE practices. We used the Mann-Whitney test because, based on the Kolmogorov-Smirnov test, the breast cancer fear score in the group practicing BSE was not normally distributed (P-value <0.05). A multivariate logistic regression test was used to determine the determinant factors in practicing BSE because the dependent variable in this study was in the form of a binary category with many independent variables.[42] Only independent variables with a P-value ≤0.25 in the bivariate test were then included in the multivariate logistic regression test.[43] References[44,45] show that a P-value cutoff of 0.25 can be used as a basis for selecting independent variables that are considered statistically important so that they are worthy of being included in logistic regression. Both bivariate and multivariate analyses were performed with a significance level of 0.05 at a 95% confidence interval. Data analysis was performed using IBM SPSS version 20.

RESULTS

Overall, of the 320 participants who filled out the questionnaire for this study, 59 participants were excluded from further data analysis because they were 30 years old and above, the campus location was outside Bekasi City, or the profile data was incomplete. Thus, the number of participants in this study was 261 female undergraduate students.

Digital-based information media seems to be the main choice of participants to get information about breast cancer. It can be seen that social media (28.7%), physicians (28.3%), and websites (22.6%) were chosen by far more participants than conventional media such as television (0.4%). More complete characteristics of the participants in this study are shown in Table 1. The proportion of participants who had a good knowledge of BSE was slightly larger than those who had a poor knowledge. The majority of participants had a poor knowledge of breast cancer risk factors. In addition, the majority of participants had high CBCFS scores (Table 2).

Table 2. Knowledge Score and CBCFS Score

Variables		Frequency	Proportion
Knowledge about BSE	Mean ± SD: 9.93 ± 3.97		
	Median (min–max): 11 (0–17)		
	Good	134	51.3%
	Poor	127	48.7%
Knowledge about breast cancer risk factors	Mean ± SD: 5.41 ± 3.49		
	Median (min–max): 5 (0–13)		
	Good	76	29.1%
	Poor	185	70.9%
CBCFS	Mean ± SD: 25.28 ± 6.40		
	Median (min–max): 26 (9–40)		
	High	159	60.9%
	Medium	88	33.7%
	Low	14	5.4%

CBCFS, Champion's Breast Cancer Fear Scale; max, maximum; min, minimum; SD, standard deviation.

Table 3 shows the description of BSE practices among participants. Although most participants admitted to having or being used to practicing BSE, only 30% of participants admitted to practicing it regularly every week/month. It was also seen that there were various reasons for participants to practice or never practice BSE, but there was no reason with a dominant proportion. It appears that although fear of breast cancer was the reason with the largest proportion, the figure did not reach half, only 39.9 percent, indicating that there were other reasons that encouraged participants to practice BSE. Most participants who had never done BSE admitted to having plans to seek more in-depth information and practice BSE. As seen in Table 4, seven variables based on bivariate tests have a P-value ≤0.25, namely breast cancer fear, knowledge of BSE, knowledge of breast cancer risk factors, age, work, father's education, and history of other cancers in the family.

Table 3. Overview of BSE Practices

Variables		Frequency	Proportion
All participants (n=261)			
Practicing BSE	Yes	173	66.3%
	Performing BSE regularly (every week/every month)	81	31.0%
	Performing BSE irregularly (every 2 months/every 6 months/every year/every few years/only 1-3 times/forgot)	92	35.3%
	No	88	33.7%
Participants who practiced BSE (n=173)			
The most important reason to practice BSE	Fear of getting breast cancer	69	39.9%
	Want breast cancer screening	38	22.0%
	Other	34	19.6%
	According to the advice of physician/health professional	23	13.3%
	There are complaints/breast problems	9	5.2%
	There is a family history of being diagnosed with cancer	0	0.0%
Frequency of performing BSE	Once/month	51	29.5%
	Until now, it has only happened 1–3 times	37	21.4%
	Once/week	30	17.3%
	Forget	28	16.2%
	Once/6 months	12	6.9%
	Once/2 months	10	5.8%
	Once/few years	4	2.3%
	Once/year	1	0.6%
Time of performing BSE	On regular days/anytime/irregular	126	72.8%
	A few days before menstruation	17	9.8%
	1–3 days after the last day of menstruation	15	8.7%
	On days when menstruation occurs	15	8.7%
Last time performing BSE	In the last 1 month	103	59.5%
	2–6 months ago	39	22.5%
	Over 1 year ago	16	9.3%
	6–12 months ago	15	8.7%
Participants who never practiced BSE (n=88)			
The main reason for never practicing BSE	Have no complaints/signs of breast disorders	54	61.4%
	Little/no knowledge about how to perform BSE	25	28.4%
	Uncomfortable/embarrassed/privacy reasons	5	5.7%
	Fear/worry of being diagnosed with breast cancer	3	3.4%
	Believing that will not get breast cancer	1	1.1%
	Other	0	0.0%
Planning to look for more in-depth information about BSE	Yes	86	97.7%
	No	2	2.3%
Planning to practice BSE	Yes	74	84.1%
	No	14	15.9%

BSE, breast self-examination.

The 7 variables were then included in the multivariate logistic regression test with the backward likelihood ratio method to determine the determinant factors of BSE practices. In the final model (step 5), the Cox and Snell R^2 value was 0.100, the Nagelkerke R^2 value was 0.139, and the Hosmer-Lemeshow test Significance was 0.862.

Table 4. The Results of Bivariate Test

Variables		Practicing BSE				Frequency	P-value	OR (95% CI)
		Yes n=173 (66.3%)		No n=88 (33.7%)				
		n	%	n	%			
CBCFS score	Mean ± SD	25.62 ± 6.09		24.59 ± 6.95			0.216[mw]	-
	Median (min–max)	26 (9–40)		25 (10–40)				
Knowledge about BSE	Good	104	7.6%	30	22.4%	134	<0.001[cs]	2.914 (1.706–4.979)
	Poor	69	54.3%	58	45.7%	127		
Knowledge about breast cancer risk factors	Good	59	77.6%	17	22.4%	76	0.019[cs]	2.162 (1.168–4.000)
	Poor	114	61.6%	71	38.4%	185		
Age	≥20 years	106	76.8%	32	23.2%	138	<0.001[cs]	2.769 (1.628–4.710)
	<20 years	67	54.5%	56	45.5%	123		
Age at menarche	≥12 years	146	66.1%	75	33.9%	221	1.000[cs]	0.937 (0.457–1.921)
	<12 years	27	67.5%	13	32.5%	40		
Marital status	Married/widowed	8	80.0%	2	20.0%	10	0.503[ft]	2.085 (0.433–10.034)
	Not married yet	165	65.7%	86	34.3%	251		
Study program							0.413[cs]	
	Midwifery	26	78.8%	7	21.2%	33		
	Physiotherapy	9	69.2%	4	30.8%	13		
	Medical laboratory technology	115	64.6%	63	35.4%	178		
	Health promotion	23	62.2%	14	37.8%	37		
Work	Yes	56	76.7%	17	23.3%	73	0.038[cs]	1.999 (1.078–3.707)
	No	117	62.2%	71	37.8%	188		
Father's education	Undergraduate /graduate/post graduate	54	59.3%	37	40.7%	91	0.110[cs]	0.625 (0.368–1.064)
	Elementary/ middle/high school/other	119	70.0%	51	30.0%	170		
Mother's education	Undergraduate /graduate/post graduate	47	61.0%	30	39.0%	77	0.310[cs]	0.721 (0.415–1.255)
	Elementary/ middle/high school/other	126	68.5%	58	31.5%	184		
Average income of parents per month	≥IDR 5 million	72	69.9%	31	30.1%	103	0.387[cs]	1.311 (0.770–2.231)
	<IDR 5 million	101	63.9%	57	36.1%	158		
Family history of breast cancer	Yes	13	61.9%	8	38.1%	21	0.840[cs]	0.813 (0.324–2.040)
	No	160	66.7%	80	33.3%	240		
Family history of other cancers	Yes	31	77.5%	9	22.5%	40	0.147[cs]	1.916 (0.868–4.229)
	No	142	64.3%	79	35.7%	221		

CBCFS, Champion's Breast Cancer Fear Scale; CI, confidence interval; cs, chi-square test; ft, Fisher's exact test; mw, Mann-Whitney Test; OR, odds ratio.

In Table 5, it can be seen that in the final model, 2 variables were statistically significant (P-value <0.05) as determinants of BSE: knowledge of BSE and age.

Table 5. Determining factors for practicing BSE

Variables	P-value	Adjusted OR (95% CI)
Knowledge about BSE (good)	0.002	2.460 (1.403–4.312)
Age (≥20 years)	0.005	2.238 (1.282–3.907)
Father's education (Undergraduate/graduate/postgraduate)	0.069	0.594 (0.339–1.042)
Constant	0.828	1.051

BSE, breast self-examination; CI, confidence interval; OR, odds ratio.

DISCUSSION

Most participants in our study chose social media and websites as sources for obtaining information about breast cancer. This is understandable considering that among young people—especially Millennials (those born between 1981 and 1996) and Generation Z (those born between 1997 and 2012)[46]—Internet use is relatively high. The 2024 Indonesian Internet Penetration Survey[47] results prove this: 93.17% of Millennials and 87.02% of Generation Z in Indonesia use the internet. The 2024 IIPS appears to be quite strong in representing the internet behavior of the Indonesian people because it is a face-to-face survey of 8,720 respondents aged 13 years and over who are spread proportionally across all provinces and selected using multistage random sampling.[47] These findings seem to support the potential of digital media or internet-based mobile applications as health promotion media that will be more effective in increasing awareness among young women in breast cancer prevention.[48,49] In addition, our study also shows that physicians are still one of the main sources of information about breast cancer for female undergraduate students—chosen from almost throughout the participants. Apparently, the credibility of physicians as a source of health information is still relatively high from the perspective of female undergraduate students.

Although the majority of participants admitted to having practiced BSE, of that number, those who practiced it regularly every week or every month did not reach half. In addition, of the female students who practiced BSE, most did it not on the days recommended by the guidelines[31,32] (1 to 3 days after menstruation ends) but on other days at random. This seems to indicate the need for more effective education so that female students can practice BSE correctly according to the guidelines.

Based on our study, the proportion of participants who had good knowledge about BSE was 51.3 percent, not much different from the proportion of participants who had good knowledge (49.9%) in a study[10] in Ethiopia. Meanwhile, the majority (70.9%) of participants in our study had poor knowledge about breast cancer risk factors. A previous study in Bandung, Indonesia[50] also reported that most female high school students and undergraduate students (53.1%) had poor knowledge about breast cancer risks.

The main findings of our study showed that the level of BSE knowledge was a statistically significant determinant of BSE practices. Female undergraduate students with good knowledge of BSE had an odds ratio of 2.46 times to practice BSE compared to female undergraduate students with poor knowledge of BSE. This result confirms previous studies.[10,14,16] Our study also showed that having good knowledge of breast cancer risk factors was not a determining factor for female undergraduate students to practice BSE, confirming the results of a study by Al-Ismaili *et al.*[51] in Oman. Knowledge of the various conditions that increase the risk of breast cancer alone may not be enough to motivate a woman to do BSE, but there needs to be sufficient knowledge on how to practice it. That most participants who practiced BSE admitted to not doing it regularly and at the wrong time seems to be due to their poor knowledge of BSE practices. Thus, it seems reasonable that more focused education is needed to improve understanding and practical steps of BSE.

The majority of our participants tended to have high levels of fear of breast cancer. A previous study[18] among women aged 17 to 35 years in Spain, also reported similar findings: more than half of the participants (59.73 percent) had a high fear of breast cancer. A study[19] in Nigeria also reported that the majority (68%) of participants (women aged 40–64 years) had a high fear of breast cancer. An interesting finding was that fear of breast cancer, although recognized by almost 40% of our participants as the main reason for performing BSE, was not statistically significant enough as a determining factor for practicing BSE. This result strengthens the findings of previous studies.[19,21,22] The findings of a qualitative study in Turkey[12] may help explain this: fear of breast cancer and anxiety about the possibility of undergoing further diagnostic processes are factors that make many women reluctant to undergo breast cancer screening, although for some women, it is a motivation to participate in screening.

In addition, our study also showed that age is a determining factor for performing BSE. Participants aged 20–29 years were more likely to practice BSE compared to those aged 17–19 years. This result is in line with the results of another study[19], which showed that older women were more likely to participate in mammogram screening. Older women may tend to

have more exposure to health information than younger women. In addition, there also appears to be a perception among women that as they age, they are at greater risk of developing various diseases.[13]

This study also contributes to the identification of factors associated with BSE participation. However, we acknowledge the limitations of this study. Our study was only able to explain 13.9% (Nagelkerke R^2 of 0.139) of the possible factors associated with BSE participation, indicating that many factors have not been identified by our study. In addition, the convenience sampling method used in this study may lead to potential selection bias.[26] We must acknowledge that our study may not be representative of female students in general, so these results may not be directly generalizable to a wider population.

CONCLUSION

Finally, we can conclude several things. First, although the participation rate of BSE among female undergraduate students in our study appeared to be quite high, the time and frequency of the practice generally still need to be improved. In line with this, the government and organizations in the field of breast cancer control are expected to conduct massive health campaigns among female undergraduate students. Health campaigns that include the dissemination of health information messages, video-based tutorials, and Q&A sessions can be conducted primarily by doctors through social media or mobile applications, which appear to be more appropriate for young women and may be more effective.[48,49] Second, good knowledge of BSE has been proven to be a determining variable in BSE participation. Thus, campaign materials that focus on knowledge of how to perform BSE correctly are expected to increase not only the level of participation but also the quality of BSE practice. Third, other determinants of BSE participation still need to be identified in further studies. Further studies are recommended to involve more variables, larger sample sizes, and wider geographical distributions. Mixed methods studies may be needed to reveal more about the phenomenon of breast cancer fear and its interaction with breast cancer screening.

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CONFLICT OF INTEREST

We declare no conflict of interest regarding this study.

ETHICAL CONSIDERATIONS

This study protocol has been reviewed and ethically approved by the Health Study Ethics Commission, Faculty of Public Health, Universitas Muhammadiyah Jakarta (No. 10.229.B/KEPK-FKMUMJ/VII/2023).

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DATA AVAILABILITY

Data related to this study are presented in the article.

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