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## A Study on the knowledge, perception and use of breast cancer screening methods and quality of care among women from central Mexico

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### Abstract

Studies on health behaviors have observed several barriers to breast cancer screening, including lack of breast cancer knowledge, distrust of health care providers, long waiting times to be screened or to receive screening results. We conducted a nested case-control study among a subsample of 200 women 21 years of age and older (100 cases, who had been diagnosed with breast cancer, and 100 controls, who were screened and found to be free of breast cancer), all residing in the Toluca metropolitan area in central Mexico. We examined how knowledge of

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breast cancer screening guidelines, perceptions of screening methods, and quality of health care influenced the use of breast cancer screening among study participants. Our study found that the most important factors associated with the decision to have breast cancer screenings was having a positive perception of the quality of care provided by the local health care centers, such as having competent clinic personnel, sufficient screening equipment, and reasonable waiting times to receive screening and to receive the screening results. Therefore, individual health care centers need to focus on the patients' perception of the services received by optimizing the care provided, and in so doing increase the rates of early diagnosis, reduce the rate of mortality from breast cancer as well as its associated treatment costs.

## Keywords

Breast Cancer; Knowledge; Perception; Screening; Use

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## Introduction

Since 2006, breast cancer has been the leading cause of cancer-related death among Mexican women [1], and the second-leading cause of cancer-related death among Mexican women 30-54 years of age [2]. In 2007, the risk of dying from this disease among women older than 25 years in the State of Mexico was 14.2 deaths per 100,000 women [3]. A Mexican national study published in 2009 found that only 37% of Mexican women performed monthly breast-self examination (BSE) [4].

The Mexican Department of Health recommends that BSE be performed monthly, by premenopausal women between the seventh and tenth day after menstruation begins and by menopausal women on the same day each month. Additionally, the Mexican Department of Health recommends an annual clinical breast examination (CBE) starting at age 25, mammography every 2 years among women 40-49 years of age with 2 or more breast cancer risk factors, and annual mammography among women 50 years of age and older [5]. Additionally, ultrasound has been recommended by other experts for women with breast implants [6-7], particularly women 35-40 years of age with suspicious breast lesions [8].

Breast cancer survival depends on early detection and treatment [4]. Attitudes toward breast cancer are crucial determinants of early detection [9], and the Mexican public health system has attempted to increase the use of early detection services by changing women's attitudes about breast cancer, however, those efforts have not been successful [10]. Previous studies from different countries among various groups of women have noted several barriers to breast cancer screening, including beliefs about the efficacy of early detection, lack of knowledge about breast cancer and breast cancer screening methods, the perception that BSE and breast cancer screening is of low importance, embarrassment associated with touching one's own body, and fear of a breast cancer diagnosis [11-14]. Previously reported organizational barriers to breast cancer screening include factors such as distrust of health care providers [13-14] and long waiting times in clinics [15].

Therefore, we wanted to obtain preliminary data to explore the factors that could affect Mexican women's decision to obtain breast cancer screening (BSE, CBE, mammography,

and ultrasound). Additionally, we further wanted to investigate how knowledge of breast cancer screening guidelines, perceptions of breast cancer screening methods, and perceptions of the quality of care provided by Mexican health centers were associated with the use of breast cancer screening by these women.

## Methods

A nested case-control study was conducted within a larger Eco-health case-control study on breast cancer and phthalate exposure conducted in 2012 by the Universidad Autónoma del Estado de México and the Centro Oncológico from the Instituto de Seguridad Social del Estado de México y Municipios. An Eco-health study is a transdisciplinary study that incorporates biophysical, social, cultural, political and economic factors to study the relationship between the ecosystem and human health. The research ethics committees of all participating institutions approved the study.

### Study Population

The present study included a subsample of 200 women 21 years of age and older without a family history of breast cancer residing in the State of Mexico who had participated in the aforementioned Eco-health study. All women were receiving health care services from the Centro Oncológico (cancer center) or from clinics affiliated with the Instituto de Seguridad Social del Estado de México y Municipios in the city of Toluca, State of Mexico. The women were recruited at their homes while researchers were providing the results of the Ecohealth study on phthalate exposure. During home visits, the women were invited to participate in the present study, and the study was explained in detail. The study population consisted of 100 women who had been diagnosed with breast cancer in 2012 (cases) and 100 women who were screened and found to be free of breast cancer during the same year (controls). The response rate was 100%.

### Survey Instrument

A questionnaire previously developed and validated by Wall, et al. [11] to identify determinants of the use of breast cancer screening methods among cancer-free women from Monterrey, Nuevo León, in northern Mexico, was used in this study. Before women were enrolled in the study reported herein, a pilot study ( $n=47$ ) was conducted to validate the questionnaire among breast cancer survivors from central Mexico who were members of the Grupo Reto, a Mexican breast cancer survivors' network with headquarters in Mexico City. One of the study goals was to determine if the questionnaire used in northern Mexico would also be applicable to women from central Mexico. The pilot results indicated that women from central Mexico were able to comprehend the questions used in the survey instrument.

Sociodemographic information collected using the questionnaire included the women's age (continuous), educational attainment (< high school, high school), marital status (married, not married), occupational status (state civil service, self-employed, homemaker), monthly family income (continuous, in Mexican pesos), age at first pregnancy (continuous), previous pregnancy status (pregnant, not pregnant) and number of children (continuous). All participants were asked whether they had conducted monthly BSEs during the previous year

and whether they had undergone a CBE in the previous year. Participants who were older than 40 years of age were asked if they had undergone mammography in the previous year, and participants who were between 35 and 40 years of age were asked if they had undergone ultrasound in the previous year.

The questionnaire also included questions about the study participants' knowledge about breast cancer screening guidelines, their perceptions of all 4 breast cancer screening methods (BSE, CBE, mammography, and ultrasound), and their perceptions of the quality of care provided by the health care center they attended. Cases were asked to recall their breast cancer knowledge and perceptions *before* they were diagnosed with breast cancer, whereas controls were asked about their *current* breast cancer knowledge and perceptions.

Knowledge of breast cancer screening methods was determined by assessing the women's awareness of the Mexican Department of Health guidelines for each of the 4 screening methods by asking, "Do you know the frequency of use recommended for [screening method]?" Although 5 possible answers were provided for each question (only 1 was the correct answer), we dichotomized the responses to indicate whether respondents knew the current guidelines or not (1=know; 0=does not know).

Perceptions of the 4 breast cancer screening methods were elicited through questions regarding participants' feelings about each screening method. For BSE, participants were asked, "Do you think that performing a BSE is important for your health?" Five answers were possible, ranging from 1 (no, not important at all) to 5 (yes, very important). For the clinical screening methods (CBE, mammography, and ultrasound), participants were asked 2 questions: "Are you afraid of having a [screening method]?" and "Do you feel ashamed of having a [screening method]?" Five answers were possible, ranging from 1 (yes, very afraid/ashamed) to 5 (no, not afraid/ashamed). After the reliability of the fear and shame items was confirmed (Cronbach's alpha: 0.60 for CBE, 0.61 for mammography, and 0.61 for ultrasound), we reverse-coded the items and summed the scores to create a single perception-of-screening variable for each of the 3 clinical screening methods.

Women's perceptions regarding the quality of care received at the health care centers they attended, which provided CBE, mammography, and ultrasound, were elicited with 4 questions: Two of the questions addressed quality: "Do you think that upon your arrival to the health center to receive a [screening method] there was sufficient personnel and equipment available to conduct the procedure?" and "How do you rate the quality of service received when you had your [screening method]?" The possible responses to these questions were 0=did not receive service/do not know; 1=very low; 2=low; 3=okay; 4=good; and 5=very good. Two additional items assessed the women's perceived waiting time to receive screening and results: "How long did you have to wait before your [screening method] was conducted?" and "How long did you have to wait before receiving the results of your [screening method]?" The possible responses to these questions were 0=did not receive service/do not know; 1=no wait at all; 2=very little; 3=a little; 4=somewhat long; 5=very long. The waiting-time questions were assessed for reliability (Cronbach's alpha: 0.91 for CBE, 0.96 for mammography, and 0.97 for ultrasound) and reverse-coded to ensure that all

questions were codified in the same direction. Scores from all 4 perception items were summed to create a single perception-of-quality-of-care score.

### Statistical Analysis

Statistical analyses were performed using Stata for Windows (version 8.0, 2003, Stata Corp., College Station, Texas). All analyses were 2-sided, and significance was assessed at  $p$  0.05. Differences between cases and controls were assessed using Student's  $t$  test for the continuous variables and Pearson's  $\chi^2$  tests for the categorical variables. Multiple logistic regression analyses (odds ratios and 95% confidence intervals) were performed to identify the factors associated with the use of each breast cancer screening method; these analyses were adjusted for age, income, and case/control status. The rest of the sociodemographic variables were similar between cases and controls.

### Results

Selected sociodemographic characteristics of the cases and controls are summarized in Table 1. Both groups of women had similar sociodemographic characteristics except that cases were on average 10 years older than controls ( $p<0.001$ ).

Study participants' knowledge about breast cancer screening guidelines and perceptions about breast cancer screening methods and quality of health care received are summarized in Table 2. More than half of the participants knew the guidelines for CBE and mammography screening, but slightly less than half knew the guidelines for BSE and ultrasound. No significant differences were observed between cases and controls with respect to their knowledge of breast cancer screening methods. In contrast, compared to controls, cases were more likely to believe that BSE was important to their health ( $p<0.001$ ) and had more positive perceptions of CBE ( $p=0.02$ ) and ultrasound ( $p=0.01$ ). Cases and controls did not differ significantly in their perceptions of mammography ( $p=0.38$ ). In addition, cases gave higher ratings than controls to their health center's quality of mammography ( $p<0.001$ ) and ultrasound ( $p<0.001$ ). Both groups of women did not differ with respect to their perceptions of the quality of CBE received.

Use of breast cancer screening methods by case control status is also summarized in Table 2. Significantly higher percentages of cases than controls underwent mammography ( $p<0.001$ ) and ultrasound ( $p<0.001$ ), whereas a significantly higher percentage of controls than cases practiced BSE ( $p=0.01$ ). No significant difference between the 2 groups was observed for CBE.

Multiple logistic regression analyses (Table 3) revealed several factors significantly associated with the use of breast cancer screening methods among study participants. Four separate models were tested, 1 each for BSE, CBE, mammography, and ultrasound. The BSE model showed that older women were less likely than their younger peers to practice BSE ( $p<0.001$ ) and that women with greater knowledge of the BSE guidelines were 3 times as likely as those with poor knowledge of the BSE guidelines, to practice BSE ( $p=0.03$ ). The CBE model showed that cases were more likely than controls to have undergone CBE ( $p=0.005$ ) or ultrasound ( $p=0.02$ ). Although the 95% confidence intervals were very wide

because of the small sample size, women who had a more positive perception of the quality of care received at their health centers were more likely to have undergone CBE, mammography or ultrasound ( $p < 0.001$ ). Specifically, having a positive perception of the quality of care increased the use of CBE and ultrasound by 40% and the use of mammography by 30%.

## Discussion

This study examined the impact of knowledge of breast cancer screening guidelines and perceptions about breast cancer screening methods and the quality of health care on the rates of use of BSE, CBE, mammography, and ultrasound among women who had previously been diagnosed with breast cancer and a control group of cancer-free women, all of whom lived in the State of Mexico. Knowledge of screening guidelines was positively associated with BSE, whereas a higher opinion of the quality of care received at the health clinic increased the use of CBE, mammography, or ultrasound. These results suggest that to increase breast cancer screening among Mexican women, health care organizations must increase the women's knowledge about the different breast cancer screening guidelines and also increase the women's positive perceptions of the screening facilities available to them.

## Sociodemographic Factors

Several sociodemographic characteristics have previously been associated with adherence to screening guidelines. In particular, women with low-income levels are less likely to use screening than women with higher income levels [12, 16]. Findings from the *Encuesta Nacional de Salud y Nutrición 2012* [17] conducted by the Instituto de Salud Pública showed that women of higher economic status had more breast screening procedures than those of lower economic status. However, the income levels of the participants in our study, while low by United States (U.S.) standards, were *not* associated with screening adherence (Table 3). One important difference observed between our study and a previous study conducted in Mexico by Tejeda, et al. [18] was that all of our study participants had health insurance coverage provided through their employer or their spouse's employer. Some of the benefits included access to free breast cancer screening and related procedures. The association between income and adherence to screening may weaken when women have insurance coverage and access to health care.

The proportion of women in our study who performed BSE (39%) was almost identical to the reported in the *Encuesta Nacional de Salud y Nutrición 2012* [17]. However, 83% of our study participants versus 37% in the "*Encuesta*" [17] had had a CBE. This discrepancy is encouraging, as it suggests that the rate of CBE may increase among women of low socioeconomic status if they have access to health care.

In our study, age was the only sociodemographic factor associated with the use of BSE, and younger women were more likely than their older peers to practice BSE. This finding is consistent with findings from a previous study conducted among Korean women [19] and may reflect the preference and use of other screening methods by older women.



We thought it interesting that age was a significant predictor *only* for BSE and not for CBE, mammography, or ultrasound. It was also interesting that the literature suggests that mammography is used more frequently among older women [20], whereas our findings suggested the opposite. This difference may reflect a lack of preventive programs provided by the Mexican government and the private sector to target women older than 40 years of age. Thus, additionally research is needed to further investigate the reason for the age-related differences in BSE as part of the screening practices and/or build specific preventive programs for each age group to obtain better results from the available preventive programs.

### Knowledge

Our finding that knowledge of BSE guidelines increased the likelihood of self-screening among study participants coincides with results from previous studies conducted among Mexican women [11, 21-22] and African-American women [23]. These studies showed that lack of knowledge is a screening deterrent [12, 19, 21-23]. However, in our study, this association was observed *only* for BSE and not for the other clinical screening methods. Our finding suggests that BSE is a technique that requires more education and training for all women than the other clinical screening methods, which can be performed at health care centers and require specialized knowledge of the provider but not specialized knowledge of the recipient. Health programs targeted to increase women's knowledge about the different available screening methods other than BSE may help increase the use of CBE, mammography, and ultrasound [24].

### Perceptions

Our study corroborates the findings of a previous study conducted among women from the northern Mexican State of Nuevo León [11] that also showed a positive association between the use of breast cancer screening and women's positive perceptions of their health care centers. Thus, individual health care centers, as well as the Mexican health care system as a whole, should be cognizant that factors that reduce the perceived quality of health care, including incompetent or inexperienced personnel, insufficient screening equipment, poor service, and long waiting times to be screened or receive test results, could decrease the use of screening procedures in the population.

Several studies on health behaviors have indicated that negative perceptions of screening, such as feelings of shame, may delay screening for many women [12, 21-23, 25]. Fear has also been identified as a barrier to undergoing mammography among women of Mexican origin residing in the U.S. [19]. However, neither our study conducted in central Mexico nor a previous study conducted in northern Mexico [11] found an association between fear or shame and the use of BSE, CBE, mammography, or ultrasound. This indicates that the perceptions women hold regarding the quality of care provided by their health care centers may be even more important than their own personal feelings about screening. Therefore, health care centers in Mexico, as well as the health care system a whole, have an important role to play in increasing the rate of breast cancer screening.

## Limitations

Our study had several limitations: (1) The small number of study participants due to limited funding sources. (2) Similarities in sociodemographic characteristics between cases and controls, which did not allow for comparisons between socioeconomic levels. (3) The study participants came from a sector of the Mexican population that had health insurance coverage and therefore, had better access to screening than other segments of the population. (4) Possible recall bias among the cases because they had to remember their knowledge level and perceptions before breast cancer diagnosis.

## Conclusions

Our study findings suggest that the most important factor associated with receiving breast cancer screening among a subsample of women from central Mexico was having a positive perception of the quality of care provided by the local health care center. Thus, the individual health care centers need to focus on the patients' perception of the services they provide. Centers should focus on having competent personnel, sufficient screening equipment, and reasonable waiting times to be screened and to receive the screening results. Optimizing the care provided could increase the rates of early diagnosis, therefore decreasing the rate of mortality from breast cancer as well as its associated treatment costs.

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**Table 1**

Selected sociodemographic characteristics of breast cancer cases and controls from central Mexico (N=200)

Characteristics	Total N = 200	Cases n = 100	Controls n = 100	P *
Mean age $\pm$ SD, years	47.2 $\pm$ 12.4	52.6 $\pm$ 12.2	41.9 $\pm$ 10.3	<0.001 <sup>2</sup>
Educational status, %				0.46 <sup>3</sup>
< High school	42	24	18	
High school	158	76	82	
Marital status, %				0.30 <sup>3</sup>
Married	126	58	68	
Not married	74	42	32	
Occupational status, %				0.56 <sup>3</sup>
State civil service	112	52	60	
Self-employed	22	10	12	
Homemaker	66	38	28	
Mean income/month $\pm$ SD, Mexican pesos <sup>1</sup>	9,677 $\pm$ 6,505	9,190 $\pm$ 6,398	10,184 $\pm$ 6,645	0.22 <sup>2</sup>
Pregnancy status, %				0.44 <sup>3</sup>
Pregnant	38	22	16	
Not pregnant	162	78	84	
Mean age at first pregnancy $\pm$ SD, years	23.5 $\pm$ 4.4	24.2 $\pm$ 5.1	22.8 $\pm$ 3.7	0.09 <sup>2</sup>
Mean number of children $\pm$ SD	2.7 $\pm$ 1.6	2.8 $\pm$ 1.4	2.6 $\pm$ 1.8	0.31 <sup>2</sup>

<sup>1</sup> 12.80 Mexican pesos = 1 U.S. dollar.

\* P values based on

<sup>2</sup> 2-sided t-tests<sup>3</sup>  $\chi^2$  tests between cases and controls.

**Table 2**

Knowledge and perception of breast cancer screening guidelines, screening methods, quality of care received, and use of breast cancer screening among women from central Mexico by case-control status (N=200)

Breast cancer screening methods	Total N = 200	Cases n = 100	Controls n = 100	P*
Knowledge of breast cancer screening guidelines, %				
BSE	92	44	48	0.68 <sup>5</sup>
CBE	128	58	70	0.21 <sup>5</sup>
Mammography	120	42	68	0.10 <sup>5</sup>
Ultrasonography	84	46	38	0.41 <sup>5</sup>
Perception of breast cancer screening methods $\pm$ SD				
BSE <sup>1</sup>	4.5 $\pm$ 1.2	4.2 $\pm$ 1.6	4 $\pm$ 2.8	<0.001 <sup>6</sup>
CBE <sup>2</sup>	8.3 $\pm$ 2.7	7.8 $\pm$ 3	8 $\pm$ 2.2	<0.001 <sup>6</sup>
Mammography <sup>2</sup>	8.1 $\pm$ 2.7	8.0 $\pm$ 2.7	8.2 $\pm$ 2.8	0.38 <sup>6</sup>
Ultrasound <sup>2</sup>	8.8 $\pm$ 2.6	8.2 $\pm$ 3.1	9.3 $\pm$ 2	0.01 <sup>6</sup>
Perception of quality of care $\pm$ SD <sup>3</sup>				
CBE	13.5 $\pm$ 6.6	14 $\pm$ 5.8	13 $\pm$ 7.3	0.20 <sup>6</sup>
Mammography	8.1 $\pm$ 8.4	13.7 $\pm$ 6.9	2.5 $\pm$ 5.6	<0.001 <sup>6</sup>
Ultrasound	8.2 $\pm$ 9.1	12.6 $\pm$ 9.0	3.7 $\pm$ 6.9	<0.001 <sup>6</sup>
Use of breast cancer screening <sup>3</sup> , %				
BSE	78	26	52	0.01 <sup>5</sup>
CBE	166	88	78	0.18 <sup>5</sup>
Mammography	102	84	18	<0.001 <sup>5</sup>
Ultrasound	92	68	24	<0.001 <sup>5</sup>

BSE, breast self-examination; CBE, clinical breast examination.

<sup>1</sup> Scores range from 1 (BSE is not important) to 5 (BSE is very important).

<sup>2</sup> Scores range from 1 (not afraid/ashamed to have screening) to 10 (very afraid/ashamed to have screening).

<sup>3</sup> During past month (BSE) and during previous year (CBE, mammography and ultrasonography).

<sup>4</sup> Scores range from 0 (low quality) to 20 (high quality).

\* P values based on

<sup>5</sup>  $\chi^2$  tests or

<sup>6</sup> *t*-tests between cases and controls.

**Table 3**

Multiple logistic regression models on the factors associated with the use of breast cancer screening methods among women from central Mexico by case-control status (N=200)

Factors	Breast cancer screening methods			
	BSE	CBE	Mammography	Ultrasound
	OR(95% CI)	OR(95% CI)	OR(95% CI)	OR(95% CI)
Control variables				
Age	0.90 (0.85-0.95)	1.0 (0.93-1.0)	1.0 (0.98-1.1)	0.94 (0.86-1.0)
Income	0.99 (0.99-1.0)	1.0 (0.99-1.0)	1.0 (0.99-1.0)	1.0 (0.99-1.0)
Case status <sup>1</sup>	0.81 (0.27-2.4)	29.4 (2.7-313.0)	3.0 (0.57-16.6)	13.6 (1.34-137.0)
Knowledge of guidelines <sup>2</sup>	3.0 (1.1-8.4)	3.7 (0.53-26.0)	1.9 (0.4-9.7)	1.3 (0.08-20.0)
Perception of screening methods	1.1 (0.58-2.1)	1.1 (0.79-1.4)	0.8 (0.6-1.0)	0.90 (0.62-1.2)
Perception of quality of care	N/A	1.4 (1.1-1.6)	1.3 (1.1-1.4)	1.4 (1.1-1.6)

BSE, Breast self-examination; CBE, clinical breast examination; OR, odds ratio; CI, confidence interval; N/A, not applicable.

<sup>1</sup>Cases = 1; Controls = 0

<sup>2</sup>Yes = 1; No = 0