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Research Article

Impact of Education and Health Treatment Options on Performance of Clinical Breast Examination

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Abstract

Introduction: Brazil has low utilization of mammography screening, and breast cancer patients are frequently less than 50 years old. Clinical breast examination could help to improve early detection of breast cancer.

Objectives: The present study addressed socio-demographic variables and their impact on performance of clinical breast examination.

Methods: We interviewed 396 women who had not any type of ovarian or breast cancer in two public health care centres in Campina Grande, Northeast Brazil. Nominal logistic regression was used to estimate odds ratios and to generate a model of independent socio-demographic variables.

Results: Of all 396 interviewed women 145 (36.6%) performed clinical breast examination each year or each second year, whereas 187 (47.2%) and 64 (16.2%) performed it some times and never. Of all women, 323 (81.6%) and 86 (21.7%) cited television and communication with a physician, respectively, as sources of information regarding early detection of breast cancer. Logistic regression modeling indicated that women who had low educational levels, and who exclusively used public health care providers, performed clinical breast examination less frequently (p = 0.026, p = 0.031, respectively). Women with low educational level performed clinical breast examination 1.96 (OR = 0.510; 95%CI: 0.279 - 0.933) times less often, than did women with high educational levels. Women who received treatment not only by public health care providers had a 2.474 (95%CI:1.087 - 5.628) and 2.84 (95%CI:1.218 - 6.617) increased chance of performing clinical breast examination sometimes and regularly, respectively, than did women who received treatment exclusively by public health care providers.

Conclusion: Low educational level and exclusive use of public health care providers were associated with a decreased chance of clinical breast examination performance. Advertisements for clinical breast examination, designed to improve early detection, should focus on women with low educational levels and those who use public health care providers.

Keywords: Breast Cancer; Prevention Behavior; Early Detection; Clinical Breast Examination

Abbreviations

CBE: Clinical Breast Examination

Introduction

In the developed countries of Europe and North America incidence and mortality rates of breast cancer are stable and have even declined [1]. This is in contrast to developing countries of Asia, Africa and South America, where incidence and mortality rates are increasing [1]. In the last decade the breast cancer survival rate were worse for low and low- middle income countries such as Gambia (12.0%), India (52.0%) and Brazil (58.4%), compared to high income countries such as Australia (80.7%) and Sweden (82.0%) [2,3]. In developing countries breast cancer patients represent disease often at an advanced stage [2].

Literature regarding the effects of clinical breast examination (CBE) on early detection of breast cancer and reduction of related mortality has returned inconsistent results. Some several well-designed clinical trials showed that CBE gave no reduction in breast cancer mortality [4]. Nevertheless, organizational guidelines of the U.S. National Comprehensive Cancer Network (2014) and the American College of Obstetricians and Gynecologists (2011) include CBE in their recommendations [5,6]. A recent Canadian study suggested that mammography combined with CBE, may be more effective than either screening method alone, and that tumors detected by CBE had more aggressive features [7]. As CBE is a low-cost test that can improve early detection of breast cancer, several previous studies have studied socio-economic factors affecting women's participation in CBE screening [8-16].

In Brazil, breast cancer incidence rates increased between 2006 and 2018 from 52 to 56 new cases per 100,000 women [17,18]. Since 2003, Brazil has a public program for early detection of breast cancer. This is an opportunistic and not an organized screening program: Participating women are not registered and invited to adhere on the CBE and mammography- screening program. Mammography screening is mainly performed in the month of October during the campaign "October Rosa". CBE is mainly performed when women visit for other reasons than breast health basic health service units, like for example during pregnancy. The Brazilian ministry of health recommends annual CBE for women aged 40 years or older. The recommended age threshold for biannual mammography screening is 50 years [18]. Prospective studies regarding the effectiveness of mammography and CBE in reducing breast cancer mortality in Brazil are lacking. Mammography utilization rates ranging between 25% and 32% were reported for the entire country [19,20]. Recent studies including data from various regions revealed a mean age of breast cancer patients of about 55 years, including about 40.0% of patients that were 50 years old or younger [21-23]. As density of breast tissue is increased at younger ages, the benefit of mammography screening for women aged ≤ 50 years is contested [24,25]. Low mammography utilization in combination with young age of patients suggests that CBE might help improve early detection of breast tumors in Brazil. Furthermore, as mammography screening is opportunistic, and not based on an organized program with invitation of women, direct recommendation regarding participation in mammography screening may also depend on physicians who perform CBE.

Previous Brazilian studies regarding socio-economic variables that affect CBE performance focused on populations of southern Brazilian regions, including São Paulo and Rio Grande do Sul [26-28]. There are no studies regarding CBE performance in Northeast Brazil. Increasing incidence and mortality rates underscore the need to understand women's motivation to perform CBE. The present study focused on a population in Northeast Brazil and assessed sources and content of information regarding early detection of breast cancer. We studied socio-demographic variables that affected CBE performance in this population, and evaluated how CBE was related to utilization of mammography screening.

Methods

Study population and data collection

The data sampling protocol was reviewed and approved by the Brazilian National Ethics Research Committee (CAAE Plataforma Brasil: 63089416.0.0000.5187). Written informed consent was obtained from each participant of the study. Women were eligible for the study if they were 40 years or older and have not had any type of breast or ovarian cancer. Data sampling was based on interviews of participants by one of the authors. Interviews were performed between March and October 2017. Of each group of related persons, only one woman was interviewed to avoid possible repetitive information from family members. Participating women were directly contacted and interviewed in waiting rooms of the health service center "Dr. Francisco Pinto" and the "Hospital Municipal Dr. Edgley", both in Campina Grande, Paraíba. There were no differences between women at both health service centers. Situated in the interior, about 120 km west of the state capital João Pessoa on the Atlantic coast, Campina Grande has a population of 385,276 (2010), making it the second largest city in the state of Paraíba [29].

Questionnaire and measures

Interviews were based on a modified structured questionnaire developed in previous studies [30,31]. The questionnaire was subdivided into the following sections: 1. Socioeconomic characteristics; 2. Reproductive and health characteristics, including information regarding previous biopsies, and breast or ovarian cancer of the participant and first-degree relatives; 3. Performance of CBE and mammography.

Educational levels were defined as follows: Elementary school with duration nine years was defined as "Low"; Middle school with duration of 12 years was defined as "middle". Higher educational

levels were defined as "high". Income was defined as minimum wage and multiple values of the minimum. In 2017, the minimum wage was R$937.00/month. In December 2017, this value was equivalent to about US$290.00/month. The following definitions were applied: ≤ 1 x minimum wage for low income; > 1 x minimum wage and ≤ 2 x minimum wage for intermediate income; > 2 x minimum wage for high income. Ethnic origin was based on self-reporting by interviewed women.

Women were asked about their actual adherence to recommendations by the public screening program. If asked about CBE performance the following options were distinguished: Never, sometimes, each year and each second year. Participation on CBE screening in each or each second year was defined as regular performance. Participation on mammography screening was defined in the same way.

Statistical analysis

Pearson's Chi-Square (χ^2) test was applied to compare categorized variables. T-test was applied to compare continuous parametric variables. Results of multinomial logistic regression were presented as adjusted odd ratios (OR), 95% confidence interval (95%CI) and P-value. P values of regression analyses were calculated using likelihood ratio tests (PLRT) for each independent variable. Significant variables of univariate regression analysis were used for regression modeling: Variables with significance level less than 0.2 in the univariate analysis were entered into the model. Then, variables with significance level less than 0.05 were kept in the model. Backward selection was used when significant variables were selected. The final model was tested for fitness using the likelihood ratio test. Statistical analysis was performed using SPSS STATISTICS™ software (SPPS; IBM company; version 24).

Results

Mean age was 54.59 (SD = 11.93) years (Table 1). Of 396 women, 167 (42.2%) were between 40 and 49 years old, and 229 (57.8%) were 50 years and older (Table 1). Two hundred fifty (63.1%) had low educational level. Two hundred eighty-six (72.2%) and 249 (62.9%) were not employed and had a low income, respectively (Table 1). Both public and private health care services were used by 104 (26.3%) women (Table 1).

Age	
Mean (years)	54.59 (SD= 11.93)
	N (%)
40 - 49 years	167 (42.2%)
50 - 59 years	102 (25.8%)
60 - 69 years	69 (17.4%)
≥ 70 years	58 (14.6%)
Education	
Low	250 (63.1%)
Intermediate	114 (28.8%)
High	32 (8.1%)
Occupation status	
Not occupied	286 (72.2%)
Occupied	110 (27.8%)
Income	
Low	249 (62.9%)
Middle	130 (32.8%)
High	17 (4.3%)
Treatment opportunity	
Only public	292 (73.7%)
Not only public	104 (26.3%)
Marital status	
No stable union	152 (38.4%)
Stable union	244 (61.6%)
Ethnic origin	
Mixed ancestry	256 (64.6%)
European ancestry	140 (35.4%)
Family history of cancer	
No	150 (37.9%)
Yes	246 (62.1%)
Family history of breast cancer	
No	328 (82.8%)
Yes	68 (17.2%)

Table 1: Socio- economic variables of women (N= 396).

The main source of information regarding early detection of breast cancer was television for 323 (81.6%) of women (Table 2). Two hundred thirty (58.1%) reported having received information in the form of flyers obtained at the health service, whereas 86 (21.7%) obtained information directly from talking with a physician (Table 2). Three hundred sixty-three (91.7%) and 267 (67.4%) cited etiology of disease and prevention as the main content of information received (Table 2). Information regarding mammog-

raphy was obtained by 350 (88.4%), whereas 137 (34.6%) were informed regarding CBE (Table 2). All women who received information regarding CBE were also informed regarding mammography.

Information by flyers at health service		
Yes	230	58.1%
Media as source of information		
Television	323	81.6%
Radio	39	9.9%
Internet	29	7.3%
Journals	29	7.3%
Books	10	2.5%
Conversation as source of information		
Physician	86	21.7%
Other persons	69	17.4%
Breast cancer patients	14	3.5%
Content of information		
Etiology of disease	363	91.7%
Prevention	267	67.4%
Diagnostics	185	46.7%
How does it develop	172	43.4%
Signs and symptoms	161	40.7%
Risk factors	145	36.6%
CBE performance	137	34.6%
Mammography	350	88.4%

Table 2: Women's (N= 396) source and content of information about early detection of breast cancer.

Use of health care provider was associated with income. Of 249 women with low income, 210 (84.34%) exclusively used public health care providers, whereas 39 (15.66%) used both public and private health care providers (p = 0.000). Of 145 women who performed regular CBE, 116 (80.00%) also performed annual or biannual mammography (p = 0.000).

Of all 396 women 145 (36.6%) performed CBE each year, or each second year, whereas 187 (47.2%) and 64 (16.2%) performed it some times and never (Table 3). Women with low educational level performed regular CBE 10.99 (OR = 0.091; 95% CI: 0.012 -0.702; p = 0.003) times less often than did women with high educational level (Table 3). Women who were not employed had a 2.37 (OR = 0.422; 95% CI: 0.201 -0.888) and 2.28 (OR = 0.439; 95% CI: 0.205 -0.942) decreased chance of performing CBE sometimes and regularly, respectively, compared with employed women (p = 0.045, Table 3). Furthermore, women with low and middle income tended to perform regular CBE less frequently (Table 3). Low- and middle-income women performed regular CBE 2.94 (OR = 0.340; 95% CI: 0.195 -5.538) and 1.36 (OR = 0.733; 95% CI: 0.145 -3.713) times less often, respectively, than did high-income women (p = 0.057, Table 3). Women who received treatment not only by public health care providers had a 2.7 (95% CI:1.203 -6.042) and 3.05 (95% CI: 1.342 -6.931) increased chance of performing CBE sometimes and regularly, respectively, than did women who used exclusively public health care providers (p = 0.013, Table 3). Finally, the chance of women without family history of cancer of performing regular CBE was 1.96 (OR = 0.510; 95% CI: 0.279 -0.933) times lower than that of women with family history (p = 0.064; Table 3). Family history of breast cancer, by contrast, did not lead to a heterogeneous distribution of data (p = 0.662, Table 3).

	Some times (N= 187)		**Regular (N= 145)**		
	OR	**95%CI**	**OR**	**95%CI**	**P**
Age					
40 – 49 years	0.908	0.412 - 1.999	2.393	0.960 - 5.966	0.165
50 – 59 years	1.330	0.542 - 3.267	3.077*	1.114 - 8.497	
60 – 69 years	1.027	0.397 - 2.655	2.364	0.814 – 6.866	
≥ 70 years	Ref.				
Education					
Low	0.176	0.023 - 1.372	0.091*	0.012 - 0.702	0.003
Intermediate	0.275	0.033 - 2.285	0.231	0.028 - 1.897	
High	Ref.				
Occupation status					
Not occupied	0.422*	0.201 - 0.888	0.439*	0.205 - 0.942	0.045
Occupied	Ref.				

Income					
Low	1.038	0.195 - 5.538	0.340	0.720 - 1.621	0.057
Middle	1.600	0.282 - 9.067	0.733	0.145 - 3.713	
High	Ref.				
Treatment opportunity					
Not only public	2.696*	1.203 - 6.042	3.050*	1.342 - 6.931	0.013
Only public	Ref.				
Marital status					
No stable union	0.861	0.485 - 1.528	0.656	0.359 - 1.198	0.314
Stable union	Ref.				
Ethnic origin					
Mixed ancestry	1.544	0.822 - 2.899	1.740	0.910 - 3.324	0.229
European ancestry	Ref.				
Family history of cancer					
No	0.759	0.429 - 1.344	0.510*	0.279 - 0.933	0.064
Yes	Ref.				
Family history of breast cancer					
No	1.131	0.529 – 2.419	0.867	0.402 – 1.872	0.662
Yes	Ref.				

Table 3: Odds ratios (OR) and confidence intervals (95%CI) of socio–economic variables on performance of clinical breast examination (CBE) of women (N= 396). Non-performance (N= 64) served as reference group in univariate logistic regression analysis.

$p \leq 0.050$

In an age-adjusted model of logistic regression, educational level and treatment option remained significant variables (p = 0.026; 0.031), whereas employment status had borderline significance (p = 0.066, Table 4): Women with low educational level had a 1.96 (OR = 0.510; 95% CI: 0.279 -0.933) lower chance of performing regular CBE, than did women with high educational level (Table 4). Women who used not only public health care providers performed CBE sometimes and regularly 2.474 (95% CI: 1.087 -5.628) and 2.84 (95% CI: 1.218 -6.617) times more often, respectively, than did women who used exclusively public health care providers (Table 4).

	Some times		**Regular**		
	OR	**95%CI**	**OR**	**95%CI**	**P**
Education					
Low	0.215	0.027 - 1.705	0.118*	0.015 - 0.933	0.026
Middle	0.316	0.037 - 2.683	0.263	0.031 - 2.207	
High	Ref.				
Occupation status					
Not occupied	0.419*	0.192 - 0.912	0.554	0.248 - 1.241	0.066
Occupied	Ref.				
Treatment opportunity					
Not only public	2.474*	1.087 - 5.628	2.839*	1.218 - 6.617	0.031
Only public	Ref.				

Table 4: Odds ratios (OR) and confidence intervals (95%CI) in an age-adjusted model of logistic regression. Non-performance of CBE served as reference.

$*p \leq 0.050$

Discussion

Women at public health care centers were characterized by low educational level, low income respectively, low levels of employment. As low-income women's access to journals and books is limited, it was not surprising that the main source of information regarding early detection of breast cancer was television. A further important source of information was flyers in health care centers. Only a few women obtained information regarding early detection of breast cancer directly during conversations with physicians. Compared with information regarding CBE, information regarding mammography was better propagated. The month of October ("Outubro rosa", "pink October) is marked by advertisements that favor mammography screening programs. Television and flyers in public health care centers are the main media of advertisement, possibly explaining why women had more information regarding mammography. This highlights the importance of television as a source of information.

Univariate analysis identified employment status as a significant variable, whereas income and family history of cancer had borderline significance. Women who were not employed had lower odds of performing CBE sometimes or regularly. In an Indian intervention study, employment was positively associated with CBE in univariate analysis, but was not significant on multivariate analysis [9]. Other studies from Brazil, India, and Iran failed to show a positive association between employment and CBE performance [13,14,27]. This was in contrast to income, a variable that was decisive in various studies. In agreement with our results, previous Brazilian studies showed that high-income women performed CBE more frequently than did low-income women [26-28]. However, unlike our results, in all three Brazilian studies, income remained a significant variable in multivariate models [26-28]. Similarly, in a Malaysian study, high income was positively associated with CBE performance [11]. Other studies, by contrast, associated low income with an increased chance of CBE performance [8,9,13]. Finally, several studies failed to show an association of income with CBE performance [10,12,14,15].

In univariate analysis of data in the present study, women who had a close relative with cancer performed regular CBE about two times more often than did women without a close relative with cancer. This agrees with a recent study from the US that revealed a positive association between CBE performance by Korean women and the presence of a close relative with cancer in their family [16]. Results of the present study indicated that family history, independent of the type of cancer, can have an impact on women's prevention behaviors. However, if analyses of studies with comparable data were based solely on family history of breast cancer, results would be different: Studies from Brazil, Malaysia, and Iran failed to reveal an increased chance of CBE performance by women with family history of breast cancer [11,14,26]. As in the present study, this result may be due to a lower number of women with family history of breast cancer, and could change if all types of cancer were included into the analysis.

Education and treatment opportunity were both variables that contributed significantly to the regression model. Our data suggested that higher educational level was positively associated with CBE performance. This is in agreement with a Brazilian and an Iranian study [15,27,28]. Another Brazilian study, by contrast, revealed no association between education and CBE performance [26]. Similarly, previous studies from Malaysia, India, and Iran showed no association between education and CBE performance [11,12,14]. Additionally, studies from the Philippines, Nigeria, India, and the US gave findings contrary to ours, i.e., that lower educational level increased the chance of CBE performance [8-10,13,16]. This strong variability may indicate that the impact of education on performance of CBE depends highly on the social context in particular populations. Despite the significant association between income and treatment opportunity, the latter variable contributed better to heterogeneity of data during regression modeling. Income remained only a significant variable in univariate analysis. Our results suggested that women who used both public and private health care providers had a higher chance of performing CBE sometimes or regularly. This could mean that women in the private sector had more opportunities to perform CBE. The reason could be that physicians in the private health sector have more often an education favoring performance of CBE. It could also mean that communication varies, and that physicians in private health care settings encourage women more often to perform CBE.

A limitation of this study was that we may only speculate as to the reasons why women who used exclusively public health care providers performed CBE less often compared with women who used attended private clinics. Participants in the study were randomly selected. However, a selection bias that favors a certain socioeconomic background cannot be excluded. Results of our study cannot necessarily be generalized to other regions of the country,

particularly as income was a decisive variable in several previous Brazilian studies.

Conclusions

In summary, women in this study obtained clearly less information regarding CBE then they did regarding mammography screening. Less than one quarter of all women reported having received information regarding early detection of breast cancer directly by communication with a physician. Furthermore, low educational level and exclusive use of public health care providers were associated with a decreased chance of CBE performance. As CBE could help to improve early detection of breast cancer, it should be more strongly propagated in public health campaigns. Such governmental health campaigns in favor of CBE should focus on women with low educational levels who use public health care providers. Future studies should clarify why women who use private health providers perform CBE more often. Also helpful would be detailed comparisons between private and public health care services, including communication skills of physicians, education of physicians, and their recommendations for early detection of breast cancer.

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