Research Article

Socio-economic Predictors of Annual and Bi-annual Clinical Breast Examination among Women in Northeast Brazil

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Abstract

Introduction: There exist only few Brazilian studies about women's adherence on the clinical breast examination (CBE).

Objectives: This study of women in northeast Brazil addressed socio-economic variables besides physical activity and ancestry and their impact on performance of CBE.

Methods: Data were obtained by interviewing 307 women aged ≥ 40 years old. All interviews were performed in a public health center of Campina Grande, state of Paraíba, Northeast Brazil. Multinomial logistic regression analysis was applied to determine odds ratios (ORs) and confidence intervals (CI) of variables.

Results: Of the 307 women 140 performed CBE never or irregular, whereas 137 and 30 performed it each year, respectively each second year. Women who used exclusively public health service centers had a 2.0- fold (OR = 0.495; 95%CI: 0.28 - 0.74) decreased chance of annual CBE performance, compared to those ones who used public and private services (p = 0.006). In a model of logistic regression analysis, low- income women had a 3.1-fold (OR = 0.321; 95%CI: 0.11 - 0.92) decreased chance to undergo CBE every year (p = 0.009). Unemployed women had a 2.8- fold (OR = 0.360; 95%CI: 0.15 - 0.88) decreased chance of bi- annual CBE performance. Women who informed European ancestry had a 2.8 (95%CI: 1.45 - 5.26) increased chance to perform CBE each year, compared to those ones who informed African or mixed ancestry (p = 0.005). Regular physical activity increased chance of annual CBE performance 1.9 (95%CI: 1.10 - 3.29) times (p = 0.013).

Conclusion: Low income and unemployment decreased chance of regular CBE performance. Compared to African and mixed ancestry, informed European ancestry increased chance of regular CBE performance. Physical activity was also positively associated with regular CBE performance. Present data indicated that even among women sampled in the same public health service center regular CBE performance depended strongly on the socio- economic and ethnic background of women.

Keywords: Breast Cancer; Clinical Breast Examination; Prevention Behaviour

Introduction

According to the World Health Organization (WHO) in 2018 an estimated number of 2,088,849 new breast cancer cases contributed to 11.6% of all cancer deaths worldwide [1]. With a slope of 1.48 per 100,000 women the mortality trend between 1990 and 2015 in Latin America and the Caribbean was higher than in all other regions of the world [2]. In Brazil, with about 210 million inhabitants the largest country of Latin America, it was estimated that 66,280 new breast cancer cases will occur during each of the years

from 2020 to 2022 [3]. Incidence of disease developed different in distinct regions of the country: In the more developed southern regions, including the two largest urban centers São Paulo and Rio de Janeiro, incidence remained stable over the last 15 years [3,4]. This is in contrast to the Northeast region, where the incidence between 2005 and 2020 increased from 27.23 to 44.29 new breast cancer cases per 100,000 women [3,4].

There do not exist Brazilian prospective studies to evaluate the possible success of breast cancer screening methods and their potential to diminish breast cancer mortality by early detection of disease. Previous studies performed in Canada and Japan indicated an increased rate of early- detected breast tumors by the combination of mammography screening with CBE [5,6]. In the Japanese study the combined effect was stronger among women aged between 40 and 59 years compared to older women [5]. Of all 6333 cases in the Canadian study, the primary CBE -detected breast tumors had more aggressive features [6].

Like India and the other BRICS countries, Brazil has not implemented an organized breast cancer- screening program [7]. Mammography screening is performed in an opportunistic setting during the October Rose and depends widely on women's attitudes and possibilities of access. The clinical breast exam (CBE) instead, may stronger depend on women's frequency of visited public health care centers or private gynecologist and recommendations, respectively, performance of CBE by the corresponding medical stuff. According to the Brazilian ministry of health annual CBE is recommended for women aged 40 years or older [3].

As CBE is a low-cost test that has the potential to improve early detection of breast tumors previous studies focused on socio- economic variables that affect the frequency of performance [8-16]. Several Brazilian studies were performed in Southern regions of the country [17-19]. In a recent study performed in two health service centers of the Northeast region 187 out of 396 healthy women did perform CBE never or in an irregular manner [20]. This previous study did not include information about the type of health services used [20]. In the present study we asked in which way the use of private and public health services may affect the frequency of CBE performance and included also other socio- economic variables into the analysis.

Methods

Study population

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 the participants, who were recruited from the Dr. Francisco Pinto de Oliveira public health service center located in Campina Grande, State of Paraíba, Brazil. This health service center offers ambulant treatment, including also vaccination, but no stationary treatment. The power sample calculation for the catchment area of the health care center indicated a minimum sample size of 96. Campina Grande is situated inland, about 120 km away from João Pessoa, the state capital on the Atlantic coast. With about 400,000 inhabitants, it is the second largest urban center of Paraíba. The state of Paraíba has like other regions of Northeast Brazil, a mixed population background, of African, European and Indigenous ancestry. The project was explained either individually or to small groups of two to five. The selection of eligible women and the interviews were carried out in the morning, in the waiting room of the health service center. Women were eligible if they were 40 years or older and if they did not have any type of breast cancer or any other chronic disease. The aim was to interview all eligible women in the waiting room during one morning with only one restriction: Data collection from more than two women who were related was avoided by including only one individual from each family. Most of the interviewed women accompanied children who had to be vaccinated while others had viral infections with symptoms of coughing, sneezing or gastro-intestinal nature.

Sampling was performed between May and December of 2019. This study period also included the "October Rose" month in which women were invited to participate in the public breast cancer-screening program. Communication with women and subsequent sampling were facilitated by public advertisements in favor of the public screening programs, which occurred during this month.

Sampling and questionnaires

Data about socio-demographic characteristics, CBE, and the sources of information about the prevention of breast cancer were obtained through face-to-face interviews with 307 women. All interviews were conducted by one of the authors using a questionnaire to which participants had to respond verbally. Data about

their knowledge of risk factors and symptoms of breast cancer were obtained by their completion of a second, self-administered questionnaire. The questionnaires were based on ones that had been developed and applied in previous studies [20,21].

Of all 307 women, 118 never attended CBE, whereas 22 attended it occasionally. These 140 (45.6% of the study group) women were defined as the group of "Never or irregular" CBE attendees. The basic education level was defined as ≤ 8 years of basic school education. Middle and high education levels were defined as between 8 - 12 years and above 12 years, respectively. Minimum wage and multiples thereof were used to define income. This is a popular and well-known method used to define economic level among low- and middle-class subjects. Minimum wage or less was defined as "low" income, whereas income equivalent to two and more times the minimum wage was defined as "high" income. The minimum wage in 2019 was R$998.00/month (US$237.60/month; 23rd January 2020). A regular work out of the own household was defined as employment. Information about ancestry was obtained by self-classification. Women choose between European, African or any type of mixed ancestry. Women were asked if a first-degree relative had breast or any other type of cancer. Participation in regular physical activity was defined as engaging in mild to moderate and/or vigorous physical activity at the recommended levels of ≥ 150 minutes and ≥ 75 minutes per week, respectively [22]. When asked about the type of physical activity they engaged in, most women mentioned daily walks. Furthermore, hydrogymnastics and gymnastics in an academy were also often cited.

Knowledge about risk factors and symptoms of breast cancer

To assess their knowledge of risk factors, preventive behaviors, and symptoms of breast cancer, women were encouraged to tick a box for each factor they recognized out of the 33 potential risk factors, seven prevention behaviors and 22. Risk factors were related to lifestyle, reproduction, and family history. To enhance the assessment of participants' knowledge of risk factors and to lower the incidence of ticking boxes without reflection, 16 additional non-risk factors were included in the questionnaire among the 17 true risk factors. Similarly, among the nine true symptoms, 13 non-symptoms were additionally included. This method was successfully applied in a previous study [21].

Regarding the questions related to knowledge, each factor correctly identified was assigned a score of 1 (known), while a factor

incorrectly identified was assigned a score of 0 (unknown). The total score for each participant was determined as the sum of factors and correctly identified knowledge. The maximum possible score was 62. The mean and median scores were 37.69 (SD = 4.58) and 38.00, respectively. The minimum and maximum scores obtained were 21 and 53, respectively. Quartiles were used to categorize knowledge; ≤ 34 points (25% quartile) was defined as "low"; > 34 and ≤ 38 (50% quartile) was defined as "basic"; > 38 and ≤ 41 points (75% quartile) was defined as "middle" and > 41 points (100% quartile) was defined as "high".

Statistical analysis

All statistical analyses were performed using the SPSS STATISTICS™ software (SPPS; IBM company; version 24). The t-test was applied to compare continuous variables. ANOVA was used to compare more than two groups of continuous variables. Pearson's chi-square (χ^2) test was used to analyze categorical variables. To quantify associations among variables and CBE attendance, nominal logistic regression analysis was applied. Data of women who did not attend CBE served as the reference group. Results were presented as adjusted odd ratios (OR), 95% confidence interval (CI) and p-value of likelihood ratio tests. Significant univariate regression analysis variables were used for regression modeling with multiple adjusted variables. Variables with significance levels less than 0.2 in the univariate analysis were included in 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.

Results

Of all 172 women aged between 40 and 49 years, 90 (52.3%) performed CBE never or irregularly, whereas of the 91 and 44 women aged between 50 and 59 years, respectively ≥ 60 years, a majority of 42 (46.2%) and 29 (65.9%) women performed it annually (p = 0.016; Table 1). Descriptive statistical analysis indicated furthermore that the variables education level, income, employment status, ancestry, family history of cancer, physical activity, the type of health service used and the frequency of health service visit were heterogeneously distributed among women who performed CBE never or irregularly, respectively, annually and bi- annually (Table 1).

	Never or Irregular	Each year	Each second years	p- value
Age				
Mean age	47.9 (SD= 7.6)	51.4 (SD= 9.4)	51.3 (SD= 7.8)	0.018
40 - 49 years	90 (52.3%)	66 (38.4%)	16 (9.3%)	0.016
50 - 59 years	39 (42.9%)	42 (46.2%)	10 (11.0%)	
≥60 years	11 (25.0%)	29 (65.9%)	4 (9.1%)	
Education level				
Basic	79 (54.5%)	51 (35.2%)	15 (10.3%)	0.023
Middle	47 (39.2%)	61 (50.8%)	12 (10.0%)	
High	14 (33.3%)	25 (59.5%)	3 (7.1%)	
Income				
Low	120 (53.1%)	84 (37.2%)	22 (9.7%)	< 0.001
Middle	14 (25.5%)	36 (65.5%)	5 (9.1%)	
High	6 (23.1%)	17 (65.4%)	3 (11.5%)	
Employment				
No	99 (52.7%)	75 (39.9%)	14 (7.4%)	0.005
Yes	41 (34.5%)	62 (52.1%)	16 (13.4%)	
Ancestry				
European	21 (26.9%)	47 (60.3%)	10 (12.8%)	0.001
Other one	119 (52.0%)	90 (39.3%)	20 (8.7%)	
Civil state				
No stable union	59 (43.1%)	64 (46.7%)	14 (10.2%)	0.725
Stable union	81 (47.6%)	73 (42.9%)	16 (9.4%)	
Religion				
Catholic	86 (45.7%)	88 (46.8%)	14 (7.4%)	0.202
Not catholic	54 (45.4%)	49 (41.2%)	16 (13.4%)	
Family history of breast cancer				
Yes	37 (46.3%)	30 (37.5%)	13 (16.3%)	0.053
No	103 (45.4%)	107 (47.1%)	17 (7.5%)	
Family history of cancer				
Yes	72 (39.8%)	87 (48.1%)	22 (12.2%)	0.030
No	68 (54.0%)	50 (39.7%)	8 (6.3%)	
Physical activity				
Yes	45 (35.7%)	73 (57.9%)	8 (6.3%)	<0.001
No	95 (52.5%)	64 (35.4%)	22 (12.2%)	
Type of health service used				
Only public	90 (53.6%)	62 (36.9%)	16 (9.5%)	0.006
Public and private	50 (36.0%)	75 (54.0%)	14 (10.1%)	
Frequency of health service visit				
≤ 6 month	103 (53.9%)	73 (38.2%)	15 (7.9%)	0.001
Annually	37 (31.9%)	64 (55.2%)	15 (12.9%)	

Table 1: Socio economic characteristics, family history of cancer and information about health service use of women, who performed CBE never, or irregular (N = 140), during each year (N = 137) respectively, each second year (N = 30).

Data indicated a direct association between performance of CBE and mammography screening: The chance of women who performed annual CBE also to perform annual mammography screening was about 8.3-fold (95%CI: 4.53 - 15.16) increased compared to those women who performed CBE never or irregularly; Furthermore, those women who performed the CBE in each second year had also a 4.8- fold (95%CI: 1.86 - 12.3) increased chance of bi-annual mammography screening, but a decreased chance to perform it annually (p < 0.005).

Basic education level, low income and unemployment decreased chance of regular CBE performance in univariate regression analysis (Table 2). In contrast to African or mixed ancestry, European ancestry was associated with a 3.0 (95%CI: 1.65 - 5.30) and 2.8 (95%CI: 1.16 - 6.90) times increased chance of annual and bi-annual CBE performance (p < 0.001; Table 2). Compared to women with European ancestry, the chance of women with African or mixed ancestry to have a low or middle income was 3.2-fold (95%CI: 1.39 - 7.29) and 4.0- fold (95%CI: 1.45 - 11.0) higher than having a high income (p = 0.015). Similar, African and mixed ancestry was associated with a 2.4- fold (95%CI: 1.1 - 5.0) increased chance of low educational level (p = 0,076). Family history of cancer and physical activity also significantly increased chance of CBE performance, whereas family history of breast cancer had borderline significance in univariate analysis (Table 2).

	N (%)	OR$_{CRUDE}$ (95%CI)		P
		Each year (N = 137)	Each second year (N = 30)	
Education level				
Basic	145 (47.2%)	0.362* (0.17 - 0.76)	0.886 (0.23 - 3.47)	0.022
Middle	120 (39.1%)	0.727 (0.34 - 1.55)	1.191 (0.29 - 4.83)	
High	42 (13.7%)	Ref.		
Income				
Low	226 (73.6%)	0.247* (0.09 - 0.65)	0.367 (0.09 - 1.58)	<0.001
Middle	55 (17.9%)	0.908 (0.30 - 2.77)	0.714 (0.13 - 4.00)	
High	26 (8.5%)	Ref.		
Employment				
No	188 (61.2%)	0.501* (0.31 - 0.82)	0.362* (0.16 - 0.81)	0.005
Yes	119 (38.8%)	Ref.		
Ancestry				
European	78 (25.4%)	2.959* (1.65 - 5.30)	2.833* (1.16 - 6.90)	<0.001
Other one	229 (74.6%)	Ref.		
Civil state				
No stable union	137 (44.6%)	1.204 (0.75 - 1.94)	1.201 (0.54 - 2.65)	0.725
Stable union	170 (55.4%)	Ref.		
Religion				
Catholic	188 (61.2%)	1.128 (0.69 - 1.84)	0.549 (0.25 - 1.22)	0.209
Not catholic	119 (38.8%)	Ref.		
Family history of breast cancer				
Yes	80 (26.1%)	0.781 (0.45 - 1.36)	2.129 (0.94 - 4.80)	0.065
No	227 (73.9%)	Ref.		

Family history of cancer				
Yes	181 (59.0%)	1.643* (1.02 - 2.66)	2.597* (1.08 - 6.23)	0.028
No	126 (41.0%)	Ref.		
Physical activity				
Yes	126 (41.0%)	2.408*(1.48 - 3.92)	0.768 (0.32 - 1.86)	<0.001
No	181 (59.0%)	Ref.		
Type of health service used				
Only public	168 (54.7%)	0.495* (0.28 - 0.74)	0.635 (0.29 - 1.4)	0.006
Public and private	139 (45.3%)	Ref.		
Frequency of health service visit				
≤6 month	191 (62.2%)	0.410* (0.25 - 0.68)	0.359* (0.16 - 0.81)	0.001
Annually	116 (37.8%)	Ref.		
Smoking				
Yes	21 (6.8%)	0.825 (0.33 - 2.06)	0.404 (0.05 - 3.26)	0.625
No	286 (93.2%)	Ref.		
Consumption of alcohol				
Yes	47 (15.3%)	1.695 (0.87 - 3.29)	1.113 (0.35 - 3.58)	0.275
No	260 (84.7%)	Ref.		
Knowledge about risk factors and symptoms of disease				
Low	77 (25.1%)	1.360 (0.66 - 2.79)	2.476 (0.59 - 10.35)	0.339
Basic	92 (30.0%)	0.711 (0.36 - 1.42)	1.660 (0.41 - 6.67)	
Middle	81 (26.4%)	0.762 (0.38 - 1.55)	2.222 (0.56 - 8.85)	
High	57 (18.6%)	Ref.		

Table 2: Regression analysis of each single variable is shown as odds ratio (OR_{CRUDE}) and confidence interval (95%CI) for women who performed CBE each year (N = 137) and each second year (N = 30). Women who did not perform CBE (N = 140) served as reference group. *p < 0.050.

Women who used exclusively public health services had a 2.0 (OR = 0.495; 95%CI: 0.28 - 0.74) times decreased chance of annual CBE performance, compared to those ones who used public and private services (p = 0.006; Table 2). Paradoxically those women, who visited a health service in a six- month period, or more frequently, had a 2.4-fold (OR = 0.410; 95%CI: 0.25 - 0.68) and 2.8-fold (OR = 0.359; 95%CI: 0.16 - 0.81) decreased chance of annual and bi-annual CBE performance compared to those ones who visited it annually (p = 0.001; Table 2). The frequency of health service visit was not age dependent (p = 0.306). Instead, exactly those women who used exclusively public health services, had 1.7- fold (95%CI: 1.07 - 2.71) increased chance to visit a health service in a six- month period, or more frequently (p = 0.025).

To identify independent variables a model of multivariate logistic regression analysis was formed (Table 3). In this model low income decreased the chance of annual CBE performance 3.1 (OR = 0.321; 95%CI: 0.11 - 0.92) times (p = 0.009; Table 3). Having no employment, decreased women's chance bi-annual CBE performance 2.8 (OR = 0.360; 95%CI: 0.15 - 0.88) times (p = 0.048; Table 3). European ancestry was associated with a 2.8-fold (95%CI: 1.45 - 5.26) increased chance of annual CBE performance compared to women with an African or mixed background (p = 0.005; Table 3). Family history had a weak significant contribution to the model (p = 0.046; Table 3). Women who performed physical activity had a 1.9 (95%CI: 1.10 - 3.29) times increased chance of annual CBE performance (p = 0.013; Table 3).

		Each year (N = 137)	Each second year (N = 30)	
	N (%)	OR$_{ADJUSTED}$ (95%CI)		P
Income				
Low	226 (73.6%)	0.321* (0.11 - 0.92)	0.670 (0.14 - 3.33)	0.009
Middle	55 (17.9%)	0.991 (0.30 - 3.32)	0.970 (0.15 - 6.24)	
High	26 (8.5%)	Ref.		
Employment				
No	188 (61.2%)	0.613 (0.35 - 1.01)	0.360* (0.15- 0.88)	0.048
Yes	119 (38.8%)	Ref.		
Ancestry				
European	78 (25.4%)	2.761* (1.45 - 5.26)	2.414 (0.93- 6.28)	0.005
Other one	229 (74.6%)	Ref.		
Physical activity				
Yes	126 (41.0%)	1.901* (1.10 - 3.29)	0.650 (0.25 - 1.66)	0.013
No	181 (59.0%)	Ref.		

Table 3: A model of logistic regression analysis adjusted for age, family history of breast cancer and the frequency of health service visit. Odds ratios (OR$_{ADJUSTED}$) and confidence intervals (95%CI) are shown for women who performed CBE each year (N = 137) and each second year (N = 30). Women who did not perform CBE, or performed it irregularly (N = 140), served as reference group.

*p < 0.050.

Discussion and Conclusion

The present study identified income, employment status and family history of breast cancer as independent variables that were associated with women's adherence on regular CBE performance. In the final model also ancestry and physical activity contributed to this model. To the best of our knowledge this is the first Brazilian study that attributed an important role of physical activity on CBE adherence.

In a previous study also performed in Northeast Brazil, 64 (16.2%) and 187 (47.2%) out of 396 women performed CBE never and sometimes [20]. In the present study these numbers were lower: Of all 307 women 118 (38.4%) performed CBE never and 22 (7.2%) performed it sometimes. Furthermore, in the previous study of Alves and colleagues (2019) the compared categories of women were different: Socio-demographic variables of all women who performed CBE regularly, annually *or* bi- annually were compared with those ones who performed it sometimes and never [20]. Sampling was partially performed in a public hospital among wom-

en who visited patients, whereas the present sample embraced exclusively women who were interviewed in the same public health service center [20]. These findings indicate remarkable differences regarding CBE performance among women sampled in different health service centers. Additionally, present data also indicated that the frequency of regular CBE performance was higher among women who used both, public and private health services compared to those ones who used exclusively public ones.

Low income decreased chance of women's regular CBE performance. In agreement with this finding several previous studies performed in Malaysia and Brazil also associated low income with decreased chance of CBE performance [11,17-19]. Other studies in contrast, performed in India and the Philippines, associated low income with an increased chance of CBE performance [8,9,13]. Income as a decisive variable may highly depend on the context of other socio- demographic parameters. In a previous study performed in Northeast Brazil low education was an independent variable, but not income [20]. In the present study women with a low education level also had a decreased chance of CBE perfor-

mance in univariate analysis. However, in the present study group income was more heterogeneously distributed among categories of CBE performance than education levels and consequently, also turned out to be more important.

Women who were employed had an increased chance of regular CBE performance compared to those ones who worked exclusively at home. In the final model of Alves and colleagues (2019) employment had borderline significance [20]. In another previous Brazilian study employment was not significantly associated with CBE performance [18]. Similar, in previous studies from India and Iran positive employment status also did not significantly contribute to women's adherence on regular CBE performance [9,13,14]. It remained unclear why in the present study group employment status represented a decisive variable.

Women who informed European ancestry had an increased chance of regular CBE performance compared to those ones who informed African or mixed ancestry. This finding was in agreement with previous Brazilian studies [17,18]. In the present study group informed African or mixed ancestry was also associated with low income and low educational level, compared to the group of women who informed European ancestry. Findings of the present and previous Brazilian studies point to differences of CBE adherence among women with a distinct ethnic background.

In the final model also physical activity was positively associated with regular CBE performance. This is the first Brazilian study that associated physical activity with regular CBE performance. Previous Brazilian database studies associated regular performance of physical activity with adherence on mammography screening [23,24]. Similar, studies performed in Lithuania and the USA revealed that the chances of ever attending mammography screening and attending it at minimum once within two years were higher among women who regularly performed physical activity [25,26]. Physical exercise is one attribute of a healthy lifestyle and may also be associated with other factors like avoiding smoking, alcohol abuse, and unhealthy dietary habits. This attitude may be positively associated with breast cancer prevention and therefore also increase chance of regular CBE. Present data indicated that regular performance of CBE was positively associated with regular mammography screening. As mammography screening in contrast to the CBE, is performed spontaneously, without any invitation this could mean that regular CBE performance positively influences women's choice to perform regular mammography screening. Alternatively, women's choice to adhere on mammography screening also could be influenced by recommendations of the medical stuff of the health service center that performs CBE.

It can also not be excluded that women who informed annual and bi- annual performance of CBE, erroneously also informed regular mammography screening for the same time intervals. Recall bias among the interviewed women cannot be excluded. As all 307 interviewed women visited the same health service center, the sample of the present study may neither be representative for women who use other health service centers nor for those ones who use private gynecologist. As women's performance of CBE depends highly on the medical stuff of the health service center, its frequency can reveal remarkable differences between different institutions. Another important limitation was that data it did not include information about women's health beliefs.

The present study indicated that low income and unemployment reduced chance of CBE performance. Women who informed European ancestry had an increased chance of regular CBE performance, indicating behavioral differences between ethnic groups. Physical activity also increased chance of CBE performance. In contrast to the other well- established predictors of regular CBE performance, physical activity so far was not identified in Brazilian literature as an important predictive factor. Future studies of women in northeast Brazil should include information about health beliefs and how these are associated with women's willingness to physical activity. More detailed information about CBE performance by medical stuff of the used health service center and recommendations about mammography screening should also be included.

Acknowledgements

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