# RESEARCH ARTICLE

# Factors that Affect Performance of Clinical Breast Examination and Mammography Screening among Brazilian Women

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## Abstract

**Background:** In the Brazilian health system, community health facilities consist of multidisciplinary teams that focus on family health, whereas health centers treat mainly illnesses of registered patients. In the present study we compared socio-economic factors and performance of mammography screening (MS) and clinical breast exam (CBE), respectively, among women who used both types of public health service centers. **Methods:** The present study included 180 women aged ≥40 years, who used different health service centers within the same municipal district. Of all 180 women, 110 (41.1%) and 70 (38.9%) used a health center and a community health facility. Logistic regression analysis was performed to calculate odds ratios (ORs) and confidence intervals (CIs) of variables. **Results:** Regression modeling indicated that women who used the community health facility, performed annual MS 9.52 (OR= 0.105; 95%CI: 0.03-0.36) times more often (p <0.001). In this model retirement and gynecological service use ≤ each second year, increased annual MS performance 8.16 (95%CI: 1.55- 54.32) and 7.78 (95%CI: 2.54- 23.79) times (p <0.001; p <0.001). Among 113 (62.8%) women who reported strong fear of MS, the chance of its performance was 35.71 (OR= 0.028; 95%CI: 0.02- 0.32) times decreased (p= 0.05). In a second model use of gynecological service ≤ each second year, increased chance of annual CBE performance 7.92 (95%CI: 3.25- 19.29) times (p <0.001). Women who used the community health facility performed annual and bi-annual CBE 2.90 (OR= 0.345; 95%CI: 0.14- 0.86) and 2.97 (OR= 0.337; 95%CI: 0.12- 0.92) times more often, compared to women who used the health center (p =0.030). **Conclusions**: Performance of MS and CBE varied both considerable among women who used different types of health service centers. Gynecological service use, fear and socioeconomic variables, additionally influenced regular performance of MS and CBE.

**Keywords:** Breast cancer- Risk reduction behavior- Mammography- Gynecological examination- Health service center.

## Introduction

According to the World Health Organization (WHO) in the year 2018, 18.1 million people around the world had cancer and 9.6 million died from the disease (WHO, 2020). It is expected that the world wide global burden of cancer will double to about 29-37 million until 2040, with a main increase in low and middle income countries, where gains against infectious diseases and other condition have led to an increased life expectation (WHO, 2020). With about 2.1 million new cases and a contribution of 24.2% to all cancers in 2018, breast cancer (BC) was the most common cancer world wide (WHO, 2020). Poor prognosis and high mortality rates of BC patients in low and middle income countries, were associated with presentation at advanced stage (III and IV), of disease (Caplan, 2014; Unger-Saldaña, 2014; Unger-Saldaña, 2019).

Brazil, the largest country in Latin America, has about 215 million inhabitants (IGBE, 2023). BC is currently contributing to 30.10% of all neoplasms among Brazilian women and for the time from 2023 to 2025 all together 73,610 new cases were predicted (INCA, 2023). In southern, southeastern and midwestern Brazil, including the two largest urban centres of the country, namely, São Paulo and Rio de Janeiro, incidence of BC has stabilized over the last 10 years (INCA, 2023). This is in sharp contrast to the northeastern region, where the incidence between 2005 and 2023 increased from 27.23 to 52.20 new BC cases per 100,000 women (INCA, 2005; INCA, 2023).

In previous studies, performed in Northeast Brazil, many BC patients presented disease at advanced stage (Andrade et al., 2014; Almeida et al., 2015). In a recent study, 145 (51.2%) out of 283 patients of two reference centres of BC treatment in the state of Paraíba, Northeast Brazil, presented disease at advanced stage (Stage III and IV; Gomes et al., 2022). Access barriers to health service institutions and treatment delays within the health system, were discussed as causal factors of these findings (Oliveira

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et al., 2019; Andrade et al., 2021). Other studies associated high staged tumors and increased mortality rates of BC in Brazil with late detection by non-adherence to the ongoing MS program (Schneider et al., 2013; Silva et al., 2013). The attendance to MS also was lower in the Northeast region, compared to southern regions of the country (Filha et al., 2013; Barbosa et al., 2019).

However, prospective Brazilian studies to evaluate the ongoing program of BC prevention are so far missing. Brazil has since 2003 a public program for early detection of BC. As data are not registered and participating women are not invited to adhere on MS, this is an opportunistic and not an organized screening program. The campaign is propagated in television, radio and other media during each year. In this campaign MS is mainly performed in the month of October during the "Outubro Rosa". Regarding the age threshold and interval for MS, the ministry of health recommends biannual mammography for women aged 50 to 69 years, whereas the Brazilian Society of Mastology recommends annual MS starting at an age of 40 years (Urban et al., 2017; INCA, 2020). Therefore, recommendations regarding starting age and interval of MS are conflicting for individual women. CBE is mainly performed when women visit public health service units and gynecological services. The Brazilian ministry of health recommends annual CBE for women aged 40 years or older (INCA, 2020).

Brazilian health centers focus on vaccination and the treatment of illnesses of registered patients. Community health facilities in contrast, have a strong emphasis on family health. The "Estratégia Saúde da Família" (Family Health Strategy), is today the main primary healthcare model in Brazil. It emphasizes health care in community health facilities and at home to a defined local population. Services are provided by family health teams composed of four to twelve full-time community health workers, one physician, one nurse and one nurse aide (Bastos et al., 2017). Family health workers visit the families of their region and invite people to use services of their community health facility. Stuff of community health facilities in general form personal bonds with their clientele. Each team is responsible for up to 1000 families, or 3500–4500 people (Bastos et al., 2017).

Few studies analyzed the association between frequency of health care center use and MS adherence (Novaes et al., 2006; Souza et al., 2017; Lima-Costa et al., 2007). In two studies about CBE adherence, including 396 and 307 healthy women, both performed in Campina Grande-Paraíba, data were obtained from a health center and a community health facility (Alves et al., 2019; Soares et al., 2021). In both studies 63.4% and 45.60% of women performed CBE irregular or never, indicating remarkable difference among women of both health service centers (Alves et al., 2019; Soares et al., 2021). This raised the question in which way the choice and frequency of health care service use affected regular CBE performance.

In a recent review article including 22 Brazilian studies about MS adherence, no one addressed the question of fear and risk perception on MS adherence (Moreira et al., 2021). In the study of Vieira and colleagues (2015) estimated risk was determined as a relation between perceived comparative and real risk. Women who overestimated BC risk, surprisingly, had a decreased chance of regular MS performance (Viera et al., 2015). This raised the question in which way fear of BC and/or MS influence women's decision of regular MS performance.

Based on these previous studies we hypothesized that recommendation and performance of CBE may depend also on the frequency and type of health service use (Alves et al., 2019; Alves et al., 2020; Soares et al., 2021). MS performance instead, may stronger depend on women's individual attitudes towards disease and recognized advantages of early detection. Fear may be an important factor for regular MS performance. Therefore following questions were addressed in the present study: 1. Exist differences between women who use a health care centers and a community health facility, regarding regular performance of MS and CBE? 2. Is there an association between the frequency of health service use, respectively gynecological service use and regular performance of MS and CBE? 3. Recommendation of MS and CBE increase chance of their performance? 4. Does fear of BC and MS influence women's adherence on its regular performance?

## Materials and Methods

*Study population*

The study was performed in Campina Grande, the second largest urban centre of the state Paraíba. Campina Grande is situated in the inland about 120 km far away from the states capital, João Pessoa at the Atlantic coast.

Data of women were obtained from two public health service centers: Of all 180 female participants in this study, 110 (61.11%) were recruited in the public health service center "Dr. Francisco Pinto de Oliveira", situated in the centre of Campina Grande. We refer to it as „health center". Furthermore, 70 (38.90%) women were recruited in the „Unidade Básica Nossa Senhora Aparecida", situated about three km away from the health service centre. We refer to the latter one as "community health facility ". Both public health service centres offered CBE, but did not offer MS to women. Furthermore, both public health service centers offered also gynecological exam, but during data sampling it was not distinguished between public and private gynecological service use of women.

Sampling was performed between March and November of 2021. All interviews were performed by the authors of the study. The project was explained to individual women, or small groups of two to five women who were personally asked to participate. Women were eligible if aged 40 years or older and did not have any type of breast cancer or any other chronic disease. Data collection from more than two women who were related, such as mother-daughter pairs, or two sisters was avoided by the inclusion of only one individual from each family.

*Data sampling*

A modified version of a questionnaire developed in previous studies was used for sampling (Freitas and Weller, 2019). Women who performed CBE each six month (N = 6) and each year (N = 96) were summarized as the group „each year" (N = 102). Women who performed

CBE never, sometimes, or only once were summarized as the group „not regular" (N = 40). In the same way, women who performed MS never, or sometimes were summarized as the group „not regular" (N = 41). Low education level was defined as ≤ 8 years of basic school education. The middle and high education level was defined as 8 - 12 years, respectively > 12 years of school education. Employment was defined as regular work outside of the household. Minimum wage or less was defined as "low" income, whereas incomes equivalent to two and more times the minimum wage was defined as "high" income. The minimum wage in 2021 was R$1100.00/month (US$217.8/month; 1st January 2021). Ethnic origin was like all other data based on self information. We refer in the text to women who informed a European background as „European" and to women who informed an African, Indigenous, or mixed background as „Other one".

Women were asked about their risk to develop BC compared with women of the same age. The comparative risk was measured on a five-point Likert scale from „much lower" to „much higher". Fear of developing BC and of mammography, were measured both on four-point Likert scales ranging from „very strong" to „not at all". According to a previous Brazilian study, a revised Champion's Health Believe Model scale was applied to measure susceptibility, benefits and barriers of MS (Moreira et al., 2020).

*Statistical analysis*

All statistical analysis was performed using SPSS STATISTICS™ software (SPPS; IBM company; version 28). Fisher's exact test and Chi-Square ($\chi^2$) tests were applied to compare categorized variables. The t-test was applied to compare the continuous variable of age. Variables significant at p< 0.2 in the univariate analyses were entered into the regression modeling: Then, variables in the regression model with significance level less than ≤ 0.05 were retained in the model. Backward selection was used to select significant variables in the model. The final model was tested for fitness using the likelihood ratio test. Results were presented as adjusted odd ratios (OR), 95% confidence intervals (95%CI) and p-values.

## Results

Mean age of all 180 women was 55.33 (SD= 8.91) years. Performance of MS was different among age groups: Of all 41 (22.8%) women who did not regular perform MS, 27 (50.0%), nine (13.4%) and five (8.5%) were aged from 40 to 49 years, 50 to 59 years, respectively ≥60 years (p <0.001; Table 1). Employment, reception of retirement and consumption of alcohol also varied among age groups (p <0.001; p <0.001; p = 0.011; Table 1).

Mean age of women in the health center and community health facility was 55.31 (SD = 9.4) and 55.34 (SD = 8.6) years (p = 0.987). European origin was informed by 57 (51.8%) and six (8.6%) women of the health center and the community health facility (p <0.001; Table 2). Regular performance of MS and CBE during each year and each second year, was more common among

women who used the community health facility (p <0.001; p = 0.047; Table 2). The frequency of visits was increased among women who used the community health facility, compared to those ones who used the health center (p <0.001; Table 2). Furthermore, recommendation of MS and CBE also was more common in the community health facility, if compared with the health center (p <0.001; p <0.071; Table 2). Of all 148 women who had received recommendation of MS by health care stuff, 134 (90.5%) performed it regular (p <0.001). Of all 146 women who had received recommendation to perform CBE, 138 (94.6%) performed it regular (p <0.001).

Regression analysis of single socio-economic variables was summarized in Table 3. Regular MS performance was positively associated with employment, reception of retirement, European origin, high frequency of health service use and of gynecological service use (p = 0.020; p <0.001; p = 0.024; p <0.001; Table 3). Women who used the community health facility performed annual MS 4.83 (OR= 0.207; 95%CI: 0.87- 0.49) times more often, compared to those ones, who used the health center (p <0.001; Table 3). Fear of mammography decreased chance of annual MS performance (p = 0.003; Table 3). Data of fear of BC and the Champion's Health Believe Model were not heterogeneously associated with MS performance (p = 0.794; p = 0.641; p = 0.386; p = 0.365; Table 3). Women who informed European origin had a decreased chance of regular CBE performance (p = 0.003; Table 3). Frequency of gynecological service use ≤ each second year, also increased chance of regular CBE performance during each year (p <0.001; Table 4). Women who used the community health facility performed annual CBE 2.57 (OR= 0.398; 95%CI: 0.17- 0.92) times more often, compared to those ones, who used the health center (p <0.001).

To identify independent variables, regression modeling was performed (Table 4). In a model of adjusted variables women aged between 40 and 49 years had a 6.17 (OR= 0.162; 95%CI: 0.03- 0.77) times and 11.11 (OR= 0.090; 95%CI: 0.02- 0.50) times decreased chance of annual and bi-annual MS performance compared to women who were >60 years old (p = <0.001; Table 4). Reception of retirement increased chance of annual MS performance 8.16 (95%CI: 1.55- 54.32) times (Table 4). Women who used gynecological service ≤ each second year had a 7.78-fold (95%CI: 2.54- 23.79) increased chance of annual MS performance (p = <0.001; Table 4). In this model also the use of the health center decreased chance of annual MS performance 9.5 (OR= 0.105; 95%CI: 0.03- 0.36) times, compared to the use of the community health facility (p = <0.001; Table 4). Finally fear of mammography decreased chance of annual MS performance (p= 0.050; Table 4).

In a second model the use of gynecological services ≤ each second year had a 7.92-fold (95%CI: 3.25- 19.29) increased chance of annual CBE performance (p = <0.001; Table 4). Women who used the community health facility performed annual and bi-annual CBE 2.90 (OR= 0.345; 95%CI: 0.14- 0.86) and 2.97 (OR= 0.337; 95%CI: 0.12- 0.92) times more often, compared to women who used the health center (p =0.030).

Table 1. Performance of MS and CBE, Socioeconomic Characteristics and Attitudes to MS are Shown for All Women (N= 180) and Three Different Age Groups

| | All (N= 180) | 40- 49 years (N= 54) | 50- 59 years (N= 67) | ≥60 years (N= 59) | P |
|---|---|---|---|---|---|
| Performance of MS | | | | | |
| Not regular | 41 (22.8%) | 27 (50.0%) | 9 (13.4%) | 5 (8.5%) | <0.001 |
| Each year | 102 (56.7%) | 23 (42.6%) | 41 (61.2%) | 38 (64.4%) | |
| Each second year | 37 (20.6%) | 4 (7.4%) | 17 (25.4%) | 16 (27.1%) | |
| Performance of CBE | | | | | |
| Not regular | 40 (22.2%) | 15 (27.8%) | 10 (14.9%) | 15 (25.4%) | 0.429. |
| Each year | 102 (56.7%) | 30 (55.6%) | 41 (61.2%) | 31 (52.5% | |
| Each second year | 38 (21.1%) | 9 (16.7%) | 16 (23.9%) | 13 (22.0%) | |
| Marital status | | | | | |
| No stable union | 100 (55.6%) | 25 (46.3%) | 40 (59.7%) | 35 (59.3%) | 0.262. |
| Stable union | 80 (44.4%) | 29 (53.7%) | 27 (40.3%) | 24 (40.7%) | |
| Education | | | | | |
| Low | 111 (61.7%) | 28 (51.9%) | 39 (58.2%) | 44 (74.6%) | 0.132. |
| Middle | 58 (32.2%) | 21 (38.9%) | 24 (35.8%) | 13 (22.0%) | |
| High | 11 (6.1%) | 5 (9.3%) | 4 (6.0%) | 2 (3.4%) | |
| Employment | | | | | |
| Employed | 61 (33.9%) | 30 (55.6%) | 26 (38.8%) | 5 (8.5%) | <0.001 |
| Not employed | 119 (66.1%) | 24 (44.4%) | 41 (61.2%) | 54 (91.5%) | |
| Income | | | | | |
| Low | 117 (65.0%) | 32 (59.3%) | 49 (73.1%) | 36 (61.0%) | 0.523. |
| Middle | 40 (22.2%) | 14 (25.9%) | 11 (16.4%) | 15 (25.4%) | |
| High | 23 (12.8%) | 8 (14.8%) | 7 (10.4%) | 8 (13.6%) | |
| Receives retirement | | | | | |
| Yes | 55 (30.6%) | 3 (5.6%) | 13 (19.4%) | 39 (66.1%) | <0.001 |
| No | 125 (69.4%) | 51 (94.4%) | 54 (80.6%) | 20 (33.9%) | |
| Religion | | | | | |
| Catholic | 104 (57.8%) | 31 (57.4%) | 38 (56.7%) | 35 (59.3%) | 0.955. |
| Not catholic | 76 (42.2%) | 23 (42.6%) | 29 (43.3%) | 24 (40.7%) | |
| Ethnic origin | | | | | |
| European | 63 (35.0%) | 13 (24.1%) | 23 (34.3%) | 27 (45.8%) | 0.054. |
| Other one | 117 (65.0%) | 41 (75.9%) | 44 (65.7%) | 32 (54.2%) | |
| Physical activity | | | | | |
| Yes | 77 (42.8%) | 28 (51.9%) | 28 (41.8%) | 21 (35.6%) | 0.214. |
| No | 103 (57.2%) | 26 (48.1%) | 39 (58.2%) | 38 (64.4%) | |
| Consumption of alcohol | | | | | |
| Yes | 30 (16.7%) | 15 (27.8%) | 11 (16.4%) | 4 (6.8%) | 0.011. |
| No | 150 (83.3%) | 39 (72.2%) | 56 (83.6%) | 55 (93.2%) | |
| Smoking | | | | | |
| Yes | 18 (10.0%) | 5 (9.3%) | 7 (10.4%) | 6 (10.2%) | 0.975. |
| No | 162 (90.0%) | 49 (90.7%) | 60 (89.6%) | 53 (89.8%) | |
| Mammography helps to avoid BC? | | | | | |
| Yes | 65 (36.1%) | 17 (31.5%) | 26 (38.8%) | 22 (37.3%) | 0.540. |
| No | 99 (55.0%) | 31 (57.4%) | 38 (56.7%) | 30 (50.8%) | |
| Don't know | 16 (8.9%) | 6 (11.1%) | 3 (4.5%) | 7 (11.9%) | |
| Mammography helps to detect BC early? | | | | | |
| Yes | 173 (96.1%) | 51 (94.4%) | 65 (97.0%) | 57 (96.6%) | 0.526. |
| No | 1 (0.6%) | - | 1 (1.5%) | - | |
| Don't know | 6 (3.3%) | 3 (5.6%) | 1 (1.5%) | 2 (3.4%) | |

Table 1. Continued

|  | All | 40- 49 years | 50- 59 years | ≥60 years | P |
|---|---|---|---|---|---|
|  | (N= 180) | (N= 54) | (N= 67) | (N= 59) |  |
| Mammography diminishes the risk to die because of BC? |  |  |  |  |  |
| Yes | 152 (84.4%) | 44 (81.5%) | 58 (86.6%) | 50 (84.7%) | 0.794. |
| No | 20 (11.1%) | 6 (11.1%) | 7 (10.4%) | 7 (11.9%) |  |
| Don't know | 8 (4.4%) | 4 (7.4%) | 2 (3.0%) | 2 (3.4%) |  |
| At what age should you start mammography? |  |  |  |  |  |
| <40 years | 70 (38.9%) | 22 (40.7%) | 26 (38.8%) | 22 (37.3%) | 0.743. |
| 40 years | 95 (52.8%) | 29 (53.7%) | 36 (53.7%) | 30 (50.8%) |  |
| 41- 49 years | 6 (3.3%) | - | 3 (4.5%) | 3 (5.1%) |  |
| 50 years | 5 (2.8%) | 1 (1.9%) | 1 (1.5%) | 3 (5.1%) |  |
| Don't know | 4 (2.2%) | 2 (3.7%) | 1 (1.5%) | 1 (1.7%) |  |

Table 2. Comparison of Variables between Both Health Service Centres where Data Sampling was Performed

|  | Health centre | CHF1 |  |
|---|---|---|---|
|  | N= 110 | N= 70 | P |
| Mean age | 55.34 (SD= 8.60) | 55.31 (SD= 9.44) |  |
|  | N (%) | N (%) |  |
| Age |  |  |  |
| 40- 49 years | 32 (29.1%) | 22 (31.4%) | 0.932. |
| 50- 59 years | 41 (37.3%) | 26 (37.1%) |  |
| ≥60 years | 37 (33.6%) | 22 (31.4%) |  |
| Ethnic origin |  |  |  |
| European | 57 (51.8%) | 6 (8.6%) | <0.001 |
| Other one | 53 (48.2%) | 64 (91.4%) |  |
| Performance of MS |  |  |  |
| Not regular | 33 (30.0%) | 8 (11.4%) | <0.001 |
| Each year | 47 (42.7%) | 55 (78.6%) |  |
| Each second year | 30 (27.3%) | 7 (10.0%) |  |
| Performance of CBE |  |  |  |
| Not regular | 31 (28.2%) | 9 (12.9%) | 0.047. |
| Each year | 59 (53.6%) | 43 (61.4%) |  |
| Each second year | 20 (18.2%) | 18 (25.7%) |  |
| Recommendation of MS |  |  |  |
| Yes | 78 (70.9%) | 70 (100.0%) | <0.001 |
| No | 32 (29.1%) | - |  |
| Recommendation of CBE |  |  |  |
| Yes | 85 (77.3%) | 61 (87.1%) | 0.071. |
| No | 25 (22.7%) | 9 (12.9%) |  |
| Frequency of health service use |  |  |  |
| Each month | 8 (7.3%) | 24 (34.3%) | <0.001 |
| Each three month | 11 (10.0%) | 16 (22.9%) |  |
| Each six month | 27 (24.5%) | 11 (15.7%) |  |
| ≥ each year | 64 (58.2%) | 19 (27.1%) |  |
| Frequency of gynecologist service use |  |  |  |
| ≤ each second year | 74 (67.3%) | 45 (64.3%) | 0.399. |
| > each second year | 36 (32.7%) | 25 (35.7%) |  |

CHF1, Community health facility.

## Discussion

The comparison of two different types of health care centers revealed remarkable differences regarding recommendation and prevention behavior of women who used these services: First, women who used the community health facility reported more often to receive recommendation of MS and CBE by health care stuff, compared to those women who used the health center. Second, women who used the community health facility also performed CBE and MS more often, compared to those women who used the health center.

To the best of our knowledge this is the first Brazilian study, that revealed clear differences of BC prevention behavior among women who used different types of health service centers. Women who used the community health facility performed regular MS and CBE more often, compared to those ones who used the health center. The finding that women who used the community health facility also performed MS more often was unexpected and surprising, as both types of health service centers did not offer this exam. Community health facilities in general attend lower number of patients and offer a smaller number of health services. This increases the chance of personal contact between health care stuff and patients. Personal contact and lower number of offered services may increase the chance of CBE recommendation and performance. Visits of families by family health workers and invitation to use services of the community health facility, may on one hand increase the frequency of health service use and on the other hand also support trust of women in the health service. Together, this may facilitate performance of CBE. Communication and personal bonds between family health workers and the clientele may decrease women's fear of MS and increase their readiness to perform also regular MS. Present results indicate an important role of MS recommendation by the health care stuff of health service centers. Personal contact and recommendation may be important for women's choice to perform MS.

Of all 180 women 22.2% and 22.8% did perform CBE and MS not regular. Previous studies in contrast, conducted in the same urban centre of Paraíba, identified 63.4% and 45.60% of women, who performed CBE

Table 3. Odds Ratios (OR) and Confidence Intervals (CI) of Single Variables are Presented for Women who underWent Regular MS (N = 139) and CBE (N= 140). Women who did not perform regular MS (N = 41) and CBE (N= 40) served as reference group.

| | | MS | | | CBE | | |
|---|---|---|---|---|---|---|---|
| | | Each year (N= 102) | Each second year (N= 37) | P | Each year (N= 102) | Each second year (N= 38) | P |
| | N (%) | OR (95%CI) | OR (95%CI) | | OR (95%CI) | OR (95%CI) | |
| Age | | | | | | | |
| 40- 49 years | 54 (30.0%) | 0.112* (0.04-0.33) | 0.046* (0.01- 0.20) | <0001 | 0.968 (0.40-2.32) | 0.692 (0.23- 2.10) | 0.406 |
| 50- 59 years | 67 (37.2%) | 0.599 (0.18- 1.95) | 0.590 (0.16- 2.14) | | 1.984 (0.79- 5.01) | 1.856 (0.62- 5.46) | |
| >60 years | 59 (32.8%) | Ref. | | | Ref. | | |
| Marital status | | | | | | | |
| No stable union | 100 (55.6%) | 0.649 (0.31 -1.37) | 0.679 (0.27 -1.68) | 0.507 | 0.560 (0.26- 1.19) | 0.740 (0.30- 1.85) | 0.298 |
| Stable union | 80 (44.4%) | Ref. | | | Ref. | | |
| Education level | | | | | | | |
| Low | 111 (61.7%) | 1.632 (0.36- 7.34) | 0.720 (0.13- 3.99) | 0.432 | 0.556 (0.11- 2.79) | 1.778 (0.15- 20.86) | 0.691 |
| Middle | 58 (32.2%) | 1.338 (0.28- 6.5) | 1.231 (0.21- 7.15) | | 0.773 (0.14- 4.20) | 2.364 (0.19- 29.71) | |
| High | 11 (6.1%) | Ref. | | | Ref. | | |
| Employment | | | | | | | |
| Employed | 61 (33.9%) | 0.343* (0.16- 0.73) | 0.516 (0.21- 1.28) | 0.020 | 0.929 (0.43- 2.00) | 0.966 (0.38- 2.46) | 0.981 |
| Not employed | 119 (66.1%) | Ref. | | | Ref. | | |
| Income | | | | | | | |
| Low | 117 (65.0%) | 1.988 (0.68- 5.78) | 0.980 (0.29- 3.37) | 0.568 | 1.426 (0.51- 4.01) | 1.556 (0.41- 6.00) | 0.674 |
| Middle | 40 (22.2%) | 1.633 (0.47- 5.66) | 1.296 (0.32- 5.33) | | 2.333 (0.64- 8.49) | 2.917 (0.59- 14.33) | |
| High | 23 (12.8%) | Ref. | | | Ref. | | |
| Receives retirement | | | | | | | |
| Yes | 55 (30.6%) | 12.071* (2.76- 52.8) | 11.870* (2.47- 56.98) | <0.001 | 0.811 (0.37- 1.76) | 0.663 (0.25- 1.75) | 0.706 |
| No | 125 (69.4%) | Ref. | | | Ref. | | |
| Religion | | | | | | | |
| Catholic | 104 (57.8%) | 1.307 (0.63- 2.71) | 1.76 (0.71- 4.37) | 0.474 | 1.429 (0.69- 3.00) | 1.714 (0.69- 4.24) | 0.476 |
| Not catholic | 76 (42.2%) | Ref. | | | Ref. | | |
| Ethnic origin | | | | | | | |
| European | 63 (35.0%) | 1.247 (0.56- 2.80) | 3.209* (1.25- 8.27) | 0.024 | 0.409* (0.19- 0.86) | 0.185* (0.07- 0.52) | 0.003 |
| Other one | 117 (65.0%) | Ref. | | | Ref. | | |
| Physical activity | | | | | | | |
| Yes | 77 (42.8%) | 1.667 (0.79- 3.51) | 0.832 (0.33- 2.12) | 0.141 | 1.622 (0.77- 3.41) | 0.400 (0.15- 1.09) | 0.003 |
| No | 103 (57.2%) | Ref. | | | Ref. | | |
| Consumption of alcohol | | | | | | | |
| Yes | 30 (16.7%) | 0.711 (0.28- 1.83) | 0.962 (0.31- 2.98) | 0.722 | 1.214 (0.44- 3.32) | 1.062 (0.31- 3.64) | 0.917 |
| No | 150 (83.3%) | Ref. | | | Ref. | | |
| Smoking | | | | | | | |
| Yes | 18 (10.0%) | 0.895 (0.26- 3.09) | 1.445 (0.36- 5.85) | 0.731 | 0.677 (0.21- 2.16) | 0.824 (0.20- 3.330 | 0.805 |
| No | 162 (90.0%) | Ref. | | | Ref. | | |
| Family history of cancer | | | | | | | |
| Yes | 92 (51.1%) | 0.737 (0.35- 1.53) | 0.540 (0.22- 1.38) | 0.401 | 1.040 (0.50- 2.16) | 1.111 (0.46- 2.70) | 0.937 |
| No | 88 (48.9%) | Ref. | | | Ref. | | |
| Frequency of health service use | | | | | | | |
| Each month | 32 (17.8%) | 6.000* (1.65- 21.84) | 1.588 (0.29- 8.80) | 0.009 | 1.680 (0.62- 4.55) | 1.486 (0.42- 5.25) | 0.086 |
| Each three month | 27 (15.0%) | 3.462 (0.91- 13.13) | 4.765* (1.13- 20.12) | | 2.321 (0.70- 7.76) | 3.467 (0.89- 13.48) | |
| Each six month | 38 (21.1%) | 1.904 (0.74- 4.91) | 1.588 (0.50- 5.03) | | 5.365* (1.48- 19.52) | 5.200* (1.22- 22.23) | |
| ≥ each year | 83 (46.1%) | Ref. | | | Ref. | | |
| Frequency of gynecologist service use | | | | | | | |
| ≤ each second year | 119 (66.1%) | 2.688* (1.24- 5.82) | 0.665 (0.27- 1.63) | <0.001 | 7.500* (3.16- 17.80) | 0.310* (0.12- 0.82) | <0.001 |
| > each second year | 61 (33.9%) | Ref. | | | Ref. | | |

Table 3. Continued

|  |  | MS | | P | CBE | | P |
|---|---|---|---|---|---|---|---|
|  |  | Each year (N= 102) | Each second year (N= 37) |  | Each year (N= 102) | Each second year (N= 38) |  |
|  | N (%) | OR (95%CI) | OR (95%CI) |  | OR (95%CI) | OR (95%CI) |  |
| Health service used |  |  |  |  |  |  |  |
| Health center | 110 (61.1%) | 0.207* (0.87- 0.492) | 1.039 (0.34- 3.21) | <0.001 | 0.398* (0.17- 0.92) | 0.323* (0.12- 0.86) | 0.040 |
| CHF1 | 70 (38.9%) | Ref. |  |  | Ref. |  |  |
| Type of health service used |  |  |  |  |  |  |  |
| Public | 110 (61.1%) | 1.299 (0.62- 2.73) | 0.833 (0.34- 2.04) | 0.488 | 0.915 (0.43- 1.93) | 1.636 (0.64- 4.21) | 0.347 |
| Public and private | 70 (38.9%) | Ref. |  |  | Ref. |  |  |
| Fear of mammography |  |  |  |  |  |  |  |
| Very strong | 9 (5.0%) | 0.155* (0.03- 0.70) | 0.159 (0.02- 1.45) | 0.003 |  |  |  |
| Strong | 15 (8.3%) | 0.086* (0.02- 0.34) | 0.264 (0.064- 1.09) |  |  |  |  |
| A little bit | 15 (8.3%) | 0.452 (0.12- 1.68) | 0.793 (0.18- 3.52) |  |  |  |  |
| Not at all | 141 (78.3%) | Ref. |  |  |  |  |  |
| Fear to develop BC |  |  |  |  |  |  |  |
| Very strong | 113 (62,8%) | 1.042 (0.34- 3.23) | 0.833 (0.24- 3.10) | 0.794 |  |  |  |
| Strong | 32 (17.8%) | 0.615 (0.17- 2.26) | 0.500 (0.11- 2.38) |  |  |  |  |
| A little bit | 11 (6.1%) | 1.538 (0.24- 9.90) | 0.417 (0.03- 6.06) |  |  |  |  |
| Not at all | 24 (13.3%) | Ref. |  |  |  |  |  |
| Champion's Health Believe Model |  |  |  |  |  |  |  |
|  | Mean |  |  |  |  |  |  |
| Susceptibility | 6.41 (3.03) | 0.973 (0.86- 1.10) | 1.032 (0.89- 1.19) | 0.641 |  |  |  |
| Benefits | 6.34 (1.92) | 1.020 (0.84- 1.24) | 1.156 (0.92- 1.46) | 0.386 |  |  |  |
| Barriers | 3.95 (2.74) | 0.912 (0.80- 1.04) | 0.925 (0.79- 1.08) | 0.365 |  |  |  |

*p <0.050; Abbreviation: CHF1, community health facility.

Table 4. Odds Ratios (OR) and Confidence Intervals (CI) of Variables are Presented in Two Models of Multivariate Analysis for Women (N= 180) who underwent regular mammography screening (N= 139) and CBE (N= 140). Women who did not perform MS (N = 41), respectively CBE (N= 40), served as reference groups.

|  |  | Mammography screening | | P | Clinical breast examination | | P |
|---|---|---|---|---|---|---|---|
|  |  | Each year (N= 102) | Each second year (N= 37) |  | Each year (N= 102) | Each second year (N= 38) |  |
|  | N (%) | OR (95%CI) | OR (95%CI) |  | OR1 (95%CI) | OR1 (95%CI) |  |
| Age |  |  |  |  |  |  |  |
| 40- 49 years | 54 (30.0%) | 0.162* (0.03- 0.77) | 0.090* (0.02- 0.50) | <0.001. |  |  |  |
| 50- 59 years | 67 (37.2%) | 1.471 (0.34- 6.44) | 1.033 (0.24- 4.51) |  |  |  |  |
| >60 years | 59 (32.8%) | Ref. |  |  |  |  |  |
| Receives retirement |  |  |  |  |  |  |  |
| Yes | 55 (30.6%) | 8.161* (1.55- 54.32) | 5.018 (0.81- 30.98) | 0.020. |  |  |  |
| No | 125 (69.4%) | Ref. |  |  |  |  |  |
| Frequency of gynecologist service use |  |  |  |  |  |  |  |
| ≤ each second year | 119 (66.1%) | 7.780* (2.54- 23.79) | 1.232 (0.41- 3.74) | <0.001 | 8.666* (3.48- 21.59) | 0.357* (0.13- 0.97) | <0.001 |
| > each second year | 61 (33.9%) | Ref. |  |  | Ref. |  |  |
| Health service used |  |  |  |  |  |  |  |
| Health service centre | 110 (61.1%) | 0.105* (0.03- 0.36) | 0.745 (0.18- 3.12) | <0.001 | 0.345* (0.14- 0.86) | 0.337* (0.12- 0.92) | 0.030 |
| CHF2 | 70 (38.9%) | Ref. |  |  | Ref. |  |  |
| Fear of mammography |  |  |  |  |  |  |  |
| Very strong | 113 (62,8%) | 0.028* (0.02- 0.32) | 0.127 (0.09- 1.89) | 0.050. |  |  |  |
| Strong | 32 (17.8%) | 0.146* (0.03- 0.87) | 0.354 (0.06- 2.21) |  |  |  |  |
| A little bit | 11 (6.1%) | 0.155* (0.03- 0.92) | 0.542 (0.10- 2.81) |  |  |  |  |
| Not at all | 24 (13.3%) | Ref. |  |  |  |  |  |

*p <0.050; [1]Adjusted for age; Abbreviation: CHF2, Community health facility.

irregular or never, respectively 52.27% who performed MS irregular or never (Alves et al., 2019; Alves et al., 2020; Soares et al., 2021). In the present study group and also in these previous studies, regular performance of MS and CBE was more frequent among women aged ≥50 years (Alves et al., 2019; Alves et al., 2020; Soares et al., 2021). As BC risk is increasing with age and MS is recommended by public health authorities, for women aged ≥50 years, differences of regular MS performance among women of studies are not surprising: In the previous studies 57.8% and 43.9% of women were ≥50 years old, compared to 70.0% of all 180 women in the present study group (Alves et al., 2019; Alves et al., 2020; Soares et al., 2021). Performance of CBE in contrast, was in the present study not positively associated with any specific age group. This may be mainly due to the fact that CBE is recommended at the ongoing age of 40 years by public health authorities and may be also explainable by the direct performance of CBE.

Data of income and education level were not heterogeneously distributed among groups of women who performed MS and CBE regular, respectively, not regular. This finding was surprising, as most studies identified income and/or education level as important variables for MS and CBE adherence: Studies from India and the Philippines associated low income with an increased chance of CBE performance (Pisani et al., 2006; Dinshaw et al., 2007; Frie et al., 2013). A study from Malaysia in contrast, associated high income with regular CBE performance (Parsa et al., 2010). Brazilian studies also revealed a positive association between high income and regular CBE performance (Lima-Costa et al., 2007; Amorim et al., 2008; Borges et al., 2016). Among both studies conducted in Paraíba, one associated high income and the other one high educational level with regular performance of CBE (Alves et al., 2019; Soares et al., 2021).

In the case of MS, studies performed in China, the Lebanon, the USA and Switzerland, revealed that high educational level increased chance of regular performance (Gang et al., 2013; Elias et al., 2016; Narayan et al., 2017; Sandoval et al., 2017). Furthermore, previous Brazilian studies associated higher educational levels with regular MS performance (Sclowitz et al., 2005; Silva et al., 2013; Vieira et al., 2015; Souza et al., 2017; Oliveira et al., 2018). A study conducted in Paraíba, also identified high educational level as a predictor of regular MS performance (Alves et al., 2020). In a community of Rio Grande do Norte, high income instead of high education level, increased chance of regular MS performance (Freitas et al., 2016).

The high percentage of older women, may have contributed in the present study group to the homogeneous data distribution of income and education level. The fact that women of the present study group who were ≥60 years old performed regular MS more often than younger ones may explain why regular MS performance was positively associated with reception of retirement, but negatively with employment. All three previous studies of younger women conducted in Paraíba, in contrast, associated employment with regular MS and CBE performance (Alves et al., 2019; Alves et al., 2020; Soares et al., 2021).

Fear of MS, but interestingly not of BC itself, was negatively associated with MS performance. This underlines the need to explain advantages of MS better to women. In the present study group susceptibility, benefits and barriers of the Champion's Health Believe Model, were not associated with regular MS performance. A recent study performed in the Northeastern state of Ceará in contrast, indicated that the model predicted adherence of women to regular MS performance (Moreira et al., 2021).

In a model of independent variables, age, reception of retirement and high frequency of gynecologist service use, were positively associated with MS performance. Similar, as in previous Brazilian studies present data indicated that principally MS performance is strongly age dependent (Barbosa et al., 2013; Alves et al., 2020). Furthermore, use of the community health facility, instead of the health center, also increased chance of regular MS performance. Fear of mammography instead, was negatively associated with regular MS performance. In a second model of CBE, its performance was dependent on gynecologist service use ≤ each second year and use of the community health facility. In both models entered frequency of gynecological service, but not frequency of health service use. It is important to keep in mind that gynecological service has been performed within both health service centers of the study.

An important limitation of the present study was the non-distinction between public and private gynecological service use. Women may have performed gynecological exams also using private services, out of both health service centers. We supposed that in the community health facility personal communication between patients and health care stuff may be more intense, supporting recommendation of MS and CBE. However, communication was not analyzed in this study and compared between both health service centers. A further limitation was the low number of participants. Due to their low number, data were not stratified for age. The identified independent variables may vary among age groups. Present data did not clarify how these variables contribute to the prevention behavior of women who belong to different age groups and have a stronger heterogenous socio-economic background regarding income, education, employment and marital status. A further limitation was that a recalling bias and also a selection bias during sampling of data, also cannot be excluded.

In conclusions, present data underline the importance of the frequency of health service use, respectively gynecological service use, recommendations of the medical stuff of these health services and fear of MS. Present results showed that MS and CBE recommendation and performance can vary considerable between women who use different public health service centers. Recommendation of MS depended strongly on the health service center used and the frequency of gynecological service use. Furthermore, data indicated a positive association between MS recommendation and its performance. CBE performance was also positive associated with recommendation and depended mainly

on the use of gynecological services and the use of the community health facility. These results indicate an important function of medical stuff of health services. Recommendation of MS and CBE by doctors and nurses can increase the chance of regular performance of both and in this way help to perform regular BC screening. Fear of mammography and not of BC was an important variable to prevent regular MS performance. Explanation of benefits of MS by medical stuff could help to overcome fear and increase women's will to adhere on regular MS performance.

Future studies should embrace much more participants, stratify data for age groups and clarify how the identified important variables influence MS and CBE performance of women who belong to different age groups and have a heterogenous socio-economic background. Communication between health care stuff and patients should be further analyzed and compared between different types of health service centers.

## Author Contribution Statement

ADAF and LNSB performed interviews and organized data. MW analyzed data and wrote the manuscript draft. The manuscript was approved by all authors.

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