Does Pink October really impact breast cancer screening?

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ABSTRACT

Objective: This study aims to evaluate the impact of the Pink October Campaign on the increase in mammographic screening in Brazil.

Study design: Ecological observational study, based on retrospective data.

Methods: Brazilian national screening database (DATASUS/SISMAMA/Information System on Breast Cancer) was used as a data source and is publicly available for download and analysis. We report screening numbers and outcome rates from January 2017 to December 2021 comparing statistically (ANOVA test, post-Tukey test), age groups, regions of Brazil, and the four quarters of the year.

Results: During the study period, the average number of exams performed monthly over the five years was 137,400.117. An increase in the number of mammograms performed in October was identified, as well as in the two following months, respectively 33%, 39%, and 22%, with statistical significance (p = 0.000) in relation to the three quarters of the year. In addition, in the other months, we found values below the monthly average. Statistical difference was not found in the increase in mammograms considering age groups (p = 0.5) and different regions of the country (p = 0.6).

Conclusions: This study showed an increase in mammographic screening in the three months following the Pink October Campaign, so we should intensify similar actions throughout the year and not just in October.

1. Introduction

Breast cancer (BC) is the leading cause of cancer in most countries, accounting for 11.7% of all cancer cases and with an estimated 2.3 million new cases a year [1].

There is plenty of evidence that BC’s early diagnosis initiatives save far more lives and are much more cost-effective than treatment in the late stages. From the perception of countries like Brazil, the efficacy and adherence to breast cancer screening (BCS) is still a problematic issue from the public health policy perspective [2]. Brazilian mortality rates are increasing with striking variations between geographic regions, and several factors may account for the disparities, including delays in diagnosis due to low education levels, low adherence to screening programs, and gaps in their implementation [3,4].

According to the Brazilian National Cancer Institute (INCA), it is estimated that Brazil will have around 620,000 new cases of cancer in the 2020–2021 biennium. Among those, the most prevalent types are prostate (65,840 cases) and breast (66,280 cases) [5].

In this scenario, campaigns were created to reduce the impact of different cancer types on the population. The “Pink October” campaign has become one of the most publicized in Brazil, its aim is to share free information about breast cancer in the form of lectures, promoting awareness of the disease throughout society and not only in the female population. Thus, bringing in public and private resources for greater access to diagnostic services, and performance of mammography exams, thus contributing to the reduction of mortality. With the increase of institutions linked to the cause and the growing exposure and popularity of campaigns, it is expected greater awareness of the population and an increase in the number of breast exams.

The first initiative of the Pink October Campaign in Brazil took place...
in 2002 when a group of women who wanted to bring the movement to the country got private support to light up the Mausoleum of the Constitutionalist Soldier, known as the Obelisk of Ibirapuera, in Sao Paulo. In October 2008, several entities related to breast cancer lit up monuments and buildings in their respective cities in pink, an initiative that has been repeated annually since then. Since 2010, INCA has participated in the movement, promoting spaces for discussion about breast cancer, disseminating, and making its informative materials available to professionals and society [6]. Over the years, the campaign gained support, and other institutions like the Brazilian Society of Mastology (SBM), Association of Gynecology Federations and Obstetrics (FEBRASGO), and Brazilian College of Radiology (CBR) began to promote events and informative materials in different media.

Some studies discuss the implementation and effectiveness of these projects, especially regarding the real impact in reducing the incidence and mortality of breast cancer and generating demand that is not the focus of these exams. On the other hand, awareness campaigns regarding the incidence of the disease (as well as its main characteristics, clinical signs, diagnosis, and treatment) can be useful for a large portion of the population [4]. Therefore, this study’s aim was to assess how much impact the Pink October Campaign has on the increase in mammographic screening in Brazil considering age groups and the differences between Brazilian regions.

2. Methodology

This is an ecological observational study, based on retrospective data on the Brazilian Ministry of Health’s mammography screening program. The National Breast Cancer Screening Bank (DATASUS/SISMAMA/Information System on Breast Cancer) was used as a source, it is a public department that aims to provide the Brazilian health system with the necessary information for the proper planning, operation, and control of health actions. SISMAMA records requests for breast cyto/histopathological exams, mammography, results of all requested exams, and monitoring of altered exams, thus generating data that support monitoring and evaluation. In addition, this data is publicly available for download and analysis.

It is worth mentioning that in Brazil the performance of mammograms is totally opportunistic, the woman needs to seek the public health system to carry it out, making campaigns extremely necessary to reach mainly the underprivileged population.

Therefore, for this research, we used the number of exams and results rates from January 2017 to December 2021, including this period because it presents the availability in the information system about the number of exams performed per month.

The descriptive analysis was performed by calculating the monthly averages in the studied period (2017 to 2021), calculating the averages by region, and the average of mammograms per month. To analyze the regions and the age groups, we used the calculation of the percentage that each month represents against the average of the region or age group. This way, we find the increase or decrease in exams each month by region and age group.

Key inclusion criteria for the study considered: complete report of the number of mammograms for the study (missing data were excluded); age as a filter (50 to 69 years old); and only mammograms performed for screening purposes were selected for the study. The number of mammograms performed in the aforementioned period and the distribution by Brazilian regions were evaluated.

The main hypothesis from the study was that the number of mammograms performed was different in October and subsequent months. That said, we provided several analyses comparing the number of mammograms through the years.

For the statistical analysis, the information was tabulated and analyzed with the KS test to verify the normality of the sample and later performed the Anova test with Tukey’s post-test.

3. Results

From 2017 to 2021, 13,040,117 were performed in all age groups, of which 325,207 (2.5%) were classified as diagnostic mammograms, thus being excluded from this analysis. Mammograms performed for screening totaled 12,714,810 (97.5%) and 4,470,785 (37%) were performed in the age group not compatible with the screening program of the Ministry of Health, excluded for not being in the inclusion criteria of this research. Therefore, according to the study’s inclusion criteria, from 2017 to 2021, a total of 8,244,025 (63%) mammograms were included for analysis (Fig. 1).

During the study period, we found an increase in the number of mammograms performed in October as well as in the two following months. Table 1 shows the number of exams performed monthly in the period from 2017 to 2021. The average number of exams performed monthly during the five years was 137,400, where we observed an increase of 33% in October, 39% in November, and 22% in December. When comparing the fourth quarter of the year (October, November, December) to the first quarter (January, February, March), second quarter (April, May, June), and third quarter of the year (July, August, September), we found statistical significance respectively ($p = 0.000$; $p = 0.002$ and $p = 0.004$). In the other months of the year, we found all with values below the monthly average. Fig. 2 clearly demonstrates the increase in the number of mammograms in the last three months of the year.

There was an important increase in mammographic screening during the study period, considering the years 2017, 2018, and 2019, we have an increase of 14.6%. In 2020, the year of the COVID-19 pandemic, there was a 60.4% reduction and in 2021 there was already a reestablishment of exams, with values like 2017.

Table 2 shows the average number of exams performed monthly during the study period in each region of Brazil. The average number of mammograms is higher in the southeast region and lower in the north region, depending on the population concentration of these regions, however, when statistically analyzing the regions, we did not obtain significant differences ($p = 0.06$). The relationship between the monthly average and the average for the region shows that in all regions we have an increase in the number of exams carried out in October, November, and December, reaching an increase of 53.1% in October in the northeast and the smallest increase of 23.3% in the southeast, with significant differences in all regions when compared to the first three quarters ($p \leq 0.05$). We still notice that in some months we have a 26.4% reduction in May in the northern region.

Table 3 shows the average number of exams performed monthly...
addition, a reduction of 22.8% was identified in April for the age group from 65 to 69 years old.

Table 2
- Monthly mammography rates by year.

| Month/Year | 2017       | 2018       | 2019       | 2020       | Total       | Average   | P-Value |
|------------|------------|------------|------------|------------|-------------|-----------|---------|
|             | 2017       | 2018       | 2019       | 2020       | Total       | Average   | P-Value |
| First quarter | January 109.701 | 142.296 | 149.194 | 152.720 | 119.461 | 673.372 | 134.674 | 0.000* |
|             | February 103.360 | 121.026 | 151.136 | 142.730 | 118.747 | 636.999 | 127.400 |             |
|             | March 127.813 | 143.576 | 143.773 | 134.458 | 119.773 | 669.393 | 133.879 |             |
|             | April 116.222 | 141.704 | 153.265 | 36.920 | 99.971 | 548.082 | 109.616 | 0.002* |
| Second quarter | May 143.702 | 141.455 | 154.093 | 27.062 | 114.437 | 580.749 | 116.150 |             |
|             | June 137.224 | 132.066 | 139.076 | 36.709 | 117.110 | 562.185 | 112.457 |             |
|             | July 138.328 | 131.838 | 146.590 | 47.186 | 128.587 | 592.592 | 118.506 | 0.004* |
|             | August 147.742 | 149.006 | 152.198 | 57.146 | 142.078 | 647.207 | 129.441 |             |
| Third quarter | September 137.653 | 131.204 | 156.636 | 78.279 | 143.435 | 647.207 | 129.441 |             |
|             | October 172.347 | 186.753 | 212.465 | 140.046 | 182.790 | 894.401 | 178.880 |             |
|             | November 180.167 | 197.101 | 198.356 | 169.014 | 208.779 | 953.417 | 190.683 |             |
|             | December 172.445 | 160.459 | 177.170 | 146.332 | 181.115 | 837.521 | 167.504 |             |
|             | Average 140.559 | 148.207 | 161.163 | 97.384 | 139.690 | 140.559 | 137.400 |             |
|             | TOTAL 1.686.704 | 1.778.484 | 1.933.952 | 1.168.602 | 1.676.283 | 8.244.025 | 1.648.805 |             |

Source: DATASUS - SISCAN accessed on 02/02/2022.

Fig. 2. - Distribution graph of mammograms performed from 2017 to 2021. Source: DATASUS - SISCAN accessed on 02/02/2022.

during the study period in age groups. We observed an increase of 28 to 31% in October in the age groups with the continuity of increases in November and December, highlighting an increase of 44% in December for the age group from 60 to 69 years old; showing statistical significance when comparing the fourth trimester to the first three trimesters (p ≤ 0.05), however, we did not find a statistically significant difference in the increase in mammograms between age groups (p = 0.5). In addition, a reduction of 22.8% was identified in April for the age group from 65 to 69 years old.

Table 2
- Monthly average by region, relation between monthly average with annual average by region.

| Region     | NORTH Average¹ | %² | MIDWEST Average¹ | %² | NORTH EAST Average¹ | %² | SOUTH Average¹ | %² | SOUTHEAST Average¹ | %² |
|------------|----------------|----|-----------------|----|---------------------|----|-----------------|----|---------------------|----|
| January    | 3946           | 1.5| 7658            | 2.9| 37352               | 7.0| 32701           | 3.6 | 53017               | 3.6 |
| February   | 3537           | 3.6| 8075            | 2.4| 39903               | 2.7| 30719           | 2.6 | 51571               | 0.8 |
| March      | 4026           | 3.6| 8480            | 7.6| 39803               | 2.7| 30179           | 2.6 | 51571               | 0.8 |
| April      | 3094           | 20.4| 6833            | 13.3| 31282               | 22.1| 26564           | 15.8| 41842               | 18.2 |
| May        | 2861           | 26.4| 6444            | 15.7| 32920               | 18.1| 28873           | 8.5 | 44852               | 12.3 |
| June       | 3063           | 21.2| 6296            | 20.1| 30799               | 23.4| 27436           | 13.0| 44843               | 12.3 |
| July       | 3497           | 10.0| 6858            | 13.0| 34013               | 15.4| 27621           | 12.5| 46517               | 9.1 |
| August     | 3934           | 1.2| 7613            | 3.4| 38503               | 4.2| 29284           | 7.2 | 50300               | 1.7 |
| September  | 3618           | 6.9| 7306            | 7.3| 39514               | 1.7| 29808           | 5.5 | 49196               | 3.8 |
| October    | 5437           | 39.9| 9636            | 22.2| 61516               | 53.1| 39219           | 24.3| 63073               | 23.3 |
| November   | 5742           | 47.7| 11314           | 43.5| 61613               | 53.3| 43736           | 38.6| 68280               | 33.5 |
| December   | 5250           | 35.1| 10153           | 28.8| 48818               | 21.5| 40147           | 27.2| 63136               | 23.4 |
| Average    | 3.887          | 7.883| 40.182         |    | 31.550             | 51.161|             |    |             |

Source: DATASUS - SISCAN accessed on 02/02/2022.

¹ Relation of the region’s monthly average with the annual average for the period 2017–2021.
² Average of the region in the period 2017–2021.
³ Monthly average in the period 2017–2021.

4. Discussion

Preventive health behaviors help to reduce the suffering and costs associated with diseases [7]. The promotion of these behaviors requires effective communication at a population level, and this efficiency requires awareness of diseases and clear descriptions of preventive health behaviors. Therefore, breast cancer screening, with its delicate balance between potential benefits and harms, demands that the periodicity and target population recommendations be respected [8,9].

In the present study, we found a high number of mammograms performed as screening in patients outside the age group recommended by INCA (50 to 69 years) [10]. Of the number of the total tests classified as screening, 35% of the tests were performed in age groups other than those recommended by INCA, it is believed that this is due to a divergent recommendation in Brazil by the Brazilian Society of Mastology (SBM), Association of Gynecology Federations and Obstetrics (FEBRASGO), and from the Brazilian College of Radiology (CBR), which recommend screening between 40 and 75 years. Other studies have already demonstrated this over-screening, explained by the important role of these societies in promoting the Pink October campaign, while INCA, lately, takes little part on it [10–13].

A systematic review that evaluated evidence regarding the harms and benefits of breast cancer screening showed that mammography for women aged 50 to 69 years results in a decrease in breast cancer mortality, but not in the mortality from all types of cancer nor from all-cause mortality. For women younger than 50 years and older than 69 years, the conclusions are not consistent regarding the reduction of mortality,
with no impact of screening on all causes of reported mortality [14].

The increase in the number of mammograms performed in Brazil in October due to the Pink October campaigns shows that breast cancer awareness and health education are necessary and must be encouraged not only by medical societies but by all the media and the federal government [13]. We can therefore observe that in Brazil, the Pink October campaign has an impact on the demand for breast exams from October to December, with an increase of up to 39%. Unfortunately, it is observed in this study that they are ephemeral measures since in the other nine months of the year the average number of exams decreases by up to 20%.

Despite not showing statistical significance, the evaluation of the regions of Brazil regarding the impact of the Pink October campaign on mammographic screening found an increase in all regions, but especially in the northeast (53.3%) and north region (47.7%). Tracking and research studies on Google Trends also show these regions with greater searches during Pink October. These facts could be related to the lack of access to health care systems in these regions and the increased supply of exams during these campaigns [15].

Another important evidence observed in relation to campaigns, such as Pink October, is the population’s awareness of the need for breast exams. There was a 14.6% increase over the years from 2017 to 2019, considering age groups and different regions of the country. Significant difference was found in the increase in mammograms considering age groups and different regions of the country.

Declaration of competing interest

1. Marcelo Antonini, author responsible for the manuscript “PINK OCTOBER REALLY IMPACT BREAST CANCER SCREENING IN BRAZIL?”, declare that none of the authors of this study has any type of interest described below, or others that configure the so-called Conflict of Interest. I declare that the submitted manuscript did not receive any financial support, neither I nor other authors.

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