

ORIGINAL ARTICLE

# COVID-19 pandemic and its reflection on breast cancer screening in Brazil

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## Abstract

**Introduction:** breast cancer has been the leading cause of death among women in Brazil and worldwide. During the years of social isolation due to COVID-19, health services, including breast cancer screening, were suspended in an attempt to contain the spread of the virus, interfering with the early detection and treatment of breast cancer, effective means of reducing mortality.

**Objective:** to identify how the COVID-19 pandemic has interfered with the therapeutic itinerary for breast cancer in Brazilian regions.

**Method:** this is an observational, ecological study, carried out through secondary analysis of data available on the website of the Department of Informatics of the Unified Health System (DATASUS).

**Results:** information was collected from all screening bilateral mammography exams in women aged 50 to 69 years, positive cases, and therapeutic modalities from 2018 to 2022. The data showed that the pandemic impacted Brazilian regions differently, requiring different strategies and investments to ensure access to health services and minimize the impacts of the pandemic.

**Conclusion:** although the survey did not show statistically significant results, the southeast region stood out in the registration of cases, but shows a drop-in case registered between 2021 and 2022. On the other hand, the northern region had the lowest number of cases in all years.

**Keywords:** Breast neoplasms; Screening programs; Public Health Policies; Health Information Systems; COVID-19.

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## Authors summary

### Why was this study done?

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### What did the researchers do and find?

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### What do these findings mean?

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## INTRODUCTION

Globally, breast cancer is the most frequently diagnosed malignancy and the leading cause of cancer-related death in women<sup>1</sup>. Its concept is to be a heterogeneous group of diseases, with distinct behaviors in which their heterogeneity can be observed through the varied clinical and morphological manifestations, different genetic signatures and consequent differences in therapeutic responses<sup>2</sup>.

Breast cancer is a rare disease in young women, with a higher incidence after the age of 40, affecting the majority of women over the age of 50. Men also develop breast cancer, but it is estimated that the incidence in this group represents only 1% of all cases of the disease<sup>3</sup>.

In Brazil, breast cancer is the leading cause of cancer death in women. The National Cancer Institute (INCA) estimated that, for each year of the 2020/2022 triennium, 66,280 new cases of breast cancer would be diagnosed in Brazil. The breast cancer mortality rate in the country, adjusted for the world population, was 11.84 deaths/100,000 women, in 2020, with the highest rates in the Southeast and South regions, with 12.64 and 12.79 deaths/100,000 women, respectively<sup>2</sup>.

Early detection and treatment are considered the most effective means of reducing mortality from breast cancer and the strategies for early detection are early diagnosis and screening, which are carried out mainly within the scope of Primary Care, observing scientific evidence, national protocols and local regional reality, as set out in the National Policy for Cancer Prevention and Control (PNPCC)<sup>3-5</sup>.

Mammography represents the most important method, both in screening and diagnosing breast cancer, but it has limitations, not allowing the detection of all types of cancer, especially in women with dense breasts and in high-risk women with a mutation in the breast cancer suppressor gene. breast cancer, BRCA1 and BRCA2<sup>6</sup>. The production of mammography in the SUS includes screening mammography, indicated for women aged 50 to 69 years without signs and symptoms of breast cancer, every two years; and diagnostic mammograms, indicated to evaluate suspicious breast lesions at any age, also in men, highlighting that in 2020, 2,572,236 mammograms were performed in the SUS, including 300,447 diagnostic mammograms and 2,271,789 screening mammograms<sup>5</sup>.

During the years of social isolation due to COVID-19 (2020 and 2021), some health services were suspended as a way to contain the spread of the virus, including screening and interfering with the early diagnosis of breast cancer. A WHO survey carried out in 2020 indicated that cancer

treatment had been interrupted in more than 40% of the countries surveyed during the pandemic. The research findings were supported by published studies indicating that delays in diagnosis, interruptions and abandonment of therapy increased significantly<sup>6</sup>.

Therefore, knowing the extent of the interference of the COVID-19 pandemic following the disorganization of breast cancer screening in Brazil and its sociodemographic variables makes it possible to plan strategies to recover screening algorithms and minimize the potential negative impact on cancer prognosis. breast cancer, since early diagnosis plays a prominent role here, being one of the components of the line of care provided for in the National Cancer Prevention and Control Policy (PNPCC).

Therefore, the objective of this research was to identify how the COVID-19 pandemic interfered with the therapeutic itinerary of breast cancer in Brazilian regions.

## METHODS

This is an observational study, of an ecological nature, which was carried out through secondary analysis of data available on the website of the Department of Informatics of the Unified Health System (DATASUS), aiming to evaluate the impact of the restriction and isolation policy imposed by the pandemic. of COVID-19 between 2018 and 2022 in carrying out breast cancer screening exams in all regions of Brazil.

Information recorded in the Unified Health System, available in DATASUS, was collected from all bilateral screening mammography exams in women aged 50 to 69 years, the age recommended by the National Cancer Prevention and Control Policy (PNPCC)<sup>7,8</sup>.

The definition of breast cancer was in accordance with the tenth revision of the International Classification of Diseases (ICD10) in code C50, which corresponds to Malignant breast neoplasm.

Screening data were collected in the Cancer Information System – SISCAN. As for data on treatment, the collection was carried out in the oncological treatment monitoring panel: PAINEL-ONCOLOGIA. These systems are available on the website of the SUS Information Technology Department (DATASUS), which is the official database of data on public health in Brazil, and are available for free access to the user on the website <http://datasus.saude.gov.br/>.

For trend analysis, the Prais-Winsten generalized linear analysis model was used, in which the independent variables (X) were the years in which the procedures were performed and the regions were considered dependent

variables (Y). The calculation of confidence intervals (CI) of the procedures was used - 95%CI= [-1+10bminimum] \*100%; [-1+10bmaximum] \*100%, to check the existence of autocorrelation in the series, the Durbin-Watson test 9,10 was applied.

The confidence level was 95% and the statistical program used was Data Analysis and Statistical Software for Professionals (Stata) version 16.0®. As this study was based on secondary data, not being able to identify the individual and the data being freely and unrestrictedly available on the internet, there was no need for this research project to be sent to the Research Ethics Committee for consideration, according to expressed in Resolution No. 510/2016.

**RESULTS**

In table 1, you can see the annual variation in registered cases, procedures and mammograms performed between 2018 and 2022 by regions of the country. It can be observed that the Southeast stands out from the other regions in every year, having a greater number of cases registered as positive in 2019 (n=12042) and a smaller number in 2022 (n=8207), contrasting with the North region, which presents the lowest number of cases in all years, highlighting the year 2022 with the lowest number of registered cases (n=561).

Regarding procedures performed, the Northeast region shows a significant decrease in segmentectomies, with (n=630) procedures in 2018 to (n=358) procedures in 2022 (p=0.046).

Among the other types of surgeries (radical mastectomy, simple mastectomy and reconstructive surgery), the reduction in simple mastectomy in the South region (n=127) in 2018 to (n=57) in 2022 (p=0.029) and a increase in reconstructive surgeries (n=132) in 2018, to (n=322) in 2022, in the Northeast region (p=0.022).

Still regarding procedures, chemotherapy and radiotherapy did not demonstrate significant differences in any region, but it can be observed that the Southeast region has the highest number of chemotherapies in 2021 (n=7318) and the lowest number in 2022 (n=2931 ) and radiotherapy is the least performed therapy in the North region in 2018 and 2022, presenting the same numbers in these years (n=17).

Regarding bilateral screening mammography, there were no significant results, however, the Southeast region in 2018 (n=1973699) had the highest number of accomplishments, while the North region had, in 2020, the lowest number (n=86176), compared to the other regions between the years studied.

**Table 1:** Annual variation in coverage of registered cases, procedures and mammograms performed between 2018 and 2022 by regions of the country.

Procedures	Number of procedures performed					Linear Regression		
	2018	2019	2020	2021	2022	β	p	r2
Registered cases								
North	801	940	1010	939	561	- 48.10	0.475	0.1814
North East	5041	5854	5266	6064	4289	-129.4	0.635	0.0845
Southeast	10160	12042	10684	11803	8207	-414.5	0.474	0.1818
South	4540	5117	4751	4932	4050	-116.5	0.449	0.2008
Midwest	1379	1514	1391	1449	951	-92.1	0.230	0.2392
Total	22021	25467	23002	20887	18058			
Segmentectomy								
North	179	240	198	205	160	-7.3	0.523	0.1478
North East	630	729	571	475	358	-79.8	0.046	0.7829
Southeast	1767	2341	1808	1763	1556	-100	0.348	0.2910
South	727	744	657	614	720	-14.4	0.487	0.1725
Midwest	266	333	238	254	214	-18.3	0.238	0.4188
Total	3569	4387	3472	3311	3008			
Radical mastectomy								
North	53	66	30	33	20	-9.9	0.076	0.7035
North East	226	229	182	166	178	-15.9	0.061	0.7416
Southeast	434	462	356	253	325	-42.7	0.103	0.6422
South	113	58	68	86	60	-7.8	0.350	0.2886
Midwest	66	63	47	47	78	.8	0.879	0.0091
Total	892	878	683	585	661			
Simple mastectomy								
North	92	59	41	49	52	-9	0.170	0.5188

**Continuation - Table 1:** Annual variation in coverage of registered cases, procedures and mammograms performed between 2018 and 2022 by regions of the country.

Procedures	Number of procedures performed					Linear Regression		
	2018	2019	2020	2021	2022	$\beta$	p	r <sup>2</sup>
North East	220	194	115	155	240	.1	0.996	0.0000
Southeast	321	371	239	212	302	-19.7	0.405	0.2374
South	127	117	66	52	57	-20.5	0.029	0.8380
Midwest	51	49	24	47	55	.6	0.901	0.0060
Total	811	790	485	515	706			
Reconstructive surgery								
North	27	35	19	18	54	3.7	0.509	0.1568
North East	132	192	176	235	322	42.3	0.022	0.8634
Southeast	828	870	421	388	533	-107.2	0.147	0.5578
South	261	263	151	122	203	-25.7	0.246	0.4081
Midwest	90	134	71	62	83	-8.6	0.405	0.2378
Total	1338	1494	838	825	825			
Chemotherapy								
North	306	447	586	643	242	6.8	0.921	0.0039
North East	2512	3517	3484	4034	1703	-110.1	0.764	0.0348
Southeast	4469	6788	6809	7318	2931	-254.6	0.730	0.0456
South	2166	3037	3162	3135	1393	-144.8	0.632	0.0861
Midwest	587	881	892	935	419	-28.2	0.752	0.0383
Total	10040	14670	14670	16665	7688			
Radiotherapy								
North	17	30	25	36	17	.6	0.854	0.0131
North East	121	357	341	252	133	-8.1	0.854	0.0132
Southeast	417	683	673	599	220	-47.8	0.526	0.1457
South	170	284	304	306	143	-3.2	0.918	0.0041
Midwest	54	70	86	105	27	-1.9	0.872	0.0101
Total	779	1424	1429	1298	540			
Mammography screening								
North	108392	109765	86176	103492	127027	3099.7	0.582	0.1122
North East	868610	877607	498938	794687	886278	-4758.4	0.942	0.0021
Southeast	1973699	1917336	1125510	1476370	1850650	-68706.4	0.622	0.0908
South	786237	771831	449853	584876	725541	-30834.7	0.576	0.1153
Midwest	121690	159774	84787	143306	187695	11554.2	0.425	0.2203
Total	3952628	3941313	2124264	4097731	3765191			

Source : 2023 Survey Data.

Table 2 presents the analysis of the percentage difference in procedures performed between the pre-pandemic (2019-2020) and pandemic (2020-2021) periods. The Southeast region shows a greater percentage difference in positive cases (-11.3%) between 2019-2020, while between 2020-2021 the North region leads this percentage (-7.0%).

In relation to segmentectomy, the Central-West region shows the highest percentage of difference (-28.5%) between 2019-2020, although all regions showed a drop in segmentectomy in this period. Between 2020-2021 (pandemic period), the Northeast region has the largest percentage difference (-16.8%).

Among the types of surgeries (simple mastectomy, radical mastectomy and reconstructive surgery), there is a very robust percentage difference in simple mastectomies in the Central-West region in the years 2019-2020 (-51%) and in the years 2020-2021 there was the smallest percentage difference (95.8%).

In bilateral screening mammography, the largest percentage difference between 2019-2020 was in the Central-West region (-46.9%), while between the years 2020-2021 there was the smallest percentage difference in the same region (69%).

**Table 2:**Percentage difference between procedures performed in the pre -pandemic and pandemic periods.

Procedures	Number of procedures performed		Percentage difference 2019 - 2020 (%)	Number of procedures performed		Percentage difference 2020 - 2021 (%)
	2019	2020		2020	2021	
<b>Positive cases</b>						
North	940	1010	7.4	1010	939	-7
North East	5854	5266	-10	5266	6064	15.2
Southeast	12042	10684	-11.3	10684	11803	10.5
South	5117	4751	-7.2	4751	4932	3.8
Midwest	1514	1391	-8.1	1391	1449	4.2
<b>Segmentectomy</b>						
North	240	198	-17.5	198	205	3.5
North East	729	571	-21.7	571	475	-16.8
Southeast	2341	1808	-22.8	1808	1763	-2.5
South	744	657	-11.7	657	614	-6.5
Midwest	333	238	-28.5	238	254	6.7
<b>Radical mastectomy</b>						
North	66	30	-54.5	30	33	10
North East	229	182	-20.5	182	166	-8.8
Southeast	462	356	-22.9	356	253	-28.9
South	58	68	17.2	68	86	26.5
Midwest	63	47	-25.4	47	47	0
<b>Simple mastectomy</b>						
North	59	41	-30.5	41	49	19.5
North East	194	115	-40.7	115	155	34.8
Southeast	371	239	-35.6	239	212	-11.3
South	117	66	-43.6	66	52	-21.2
Midwest	49	24	-51	24	47	95.8
<b>Reconstructive surgery</b>						
North	35	19	-45.7	19	18	-5.3
North East	192	176	-8.3	176	235	33.5
Southeast	870	421	-51.6	421	388	-7.8
South	263	151	-42.6	151	122	-19.2
Midwest	134	71	-47	71	62	-12.7
<b>Chemotherapy</b>						

**Continuation - Table 2:**Percentage difference between procedures performed in the pre -pandemic and pandemic periods.

Procedures	Number of procedures performed		Percentage difference 2019 - 2020 (%)	Number of procedures performed		Percentage difference 2020 - 2021 (%)
	2019	2020		2020	2021	
North	447	586	31.1	586	643	9.7
North East	3517	3484	-0.9	3484	4034	15.8
Southeast	6788	6809	0.3	6809	7318	7.5
South	3037	3162	4.1	3162	3135	-0.9
Midwest	881	892	1.2	892	935	4.8
<b>Radiotherapy</b>						
North	30	25	-16.7	25	36	44
North East	357	341	-4.5	341	252	-26.1
Southeast	683	673	-1.5	673	599	-11
South	284	304	7	304	306	0.7
Midwest	70	86	22.9	86	105	22.1
<b>Mammography screening</b>						
North	109765	86176	-21.5	86176	103492	20.1
North East	877607	498938	-43.1	498938	794687	59.3
Southeast	1917336	1125510	-41.3	1125510	1476370	31.2
South	771831	449853	-41.7	449853	584876	30
Midwest	159774	84787	-46.9	84787	143306	69

Source : 2023 Survey Data.

Table 3 presents the prevalence of interventions carried out in registered cases according to the regions of the country in 2020. There was a prevalence of chemotherapy, radiotherapy, radical and simple mastectomy procedures in the North region (p=0.001); in the Northeast region, there was prevalence only in chemotherapy and radiotherapy procedures; in the Southeast region there was a prevalence in chemotherapy, radiotherapy, radical and simple mastectomy procedures (p=0.001); in the South region there was a prevalence only of chemotherapy and radiotherapy

procedures (p=0.001) and in the Central-West region, there was a prevalence of chemotherapy, radiotherapy, radical and simple mastectomy procedures (p=0.001).

Figure 1 presents the trend analysis of the rates of procedures of (a) Chemotherapy, (b) Radiotherapy, (c) Reconstructive surgery, (d) Simple mastectomy, (e) Positive cases, (f) Segmentectomy and (g) Mastectomy radical, carried out across Brazilian regions between 2018 and 2022.

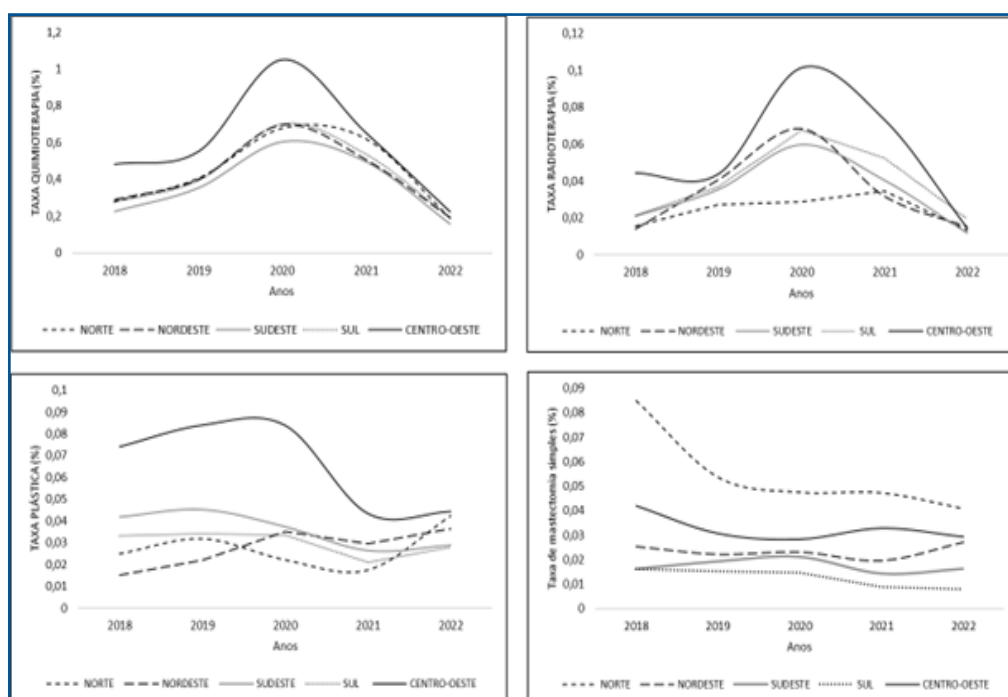
**Table 3:** Study of treatments and procedures carried out in registered cases that received some intervention according to Brazilian regions in 2020.

Regions	Intervention	p	PR
<b>North</b>			
Treatment	n		
Radiotherapy	17	<0,001	1
Chemotherapy	306		11,12
<b>Mastectomy</b>			
Simple	125	<0,001	1
Radical	2224		8,48
<b>North East</b>			
Treatment			
Radiotherapy	1204	<0,001	1
Chemotherapy	15250		5,38

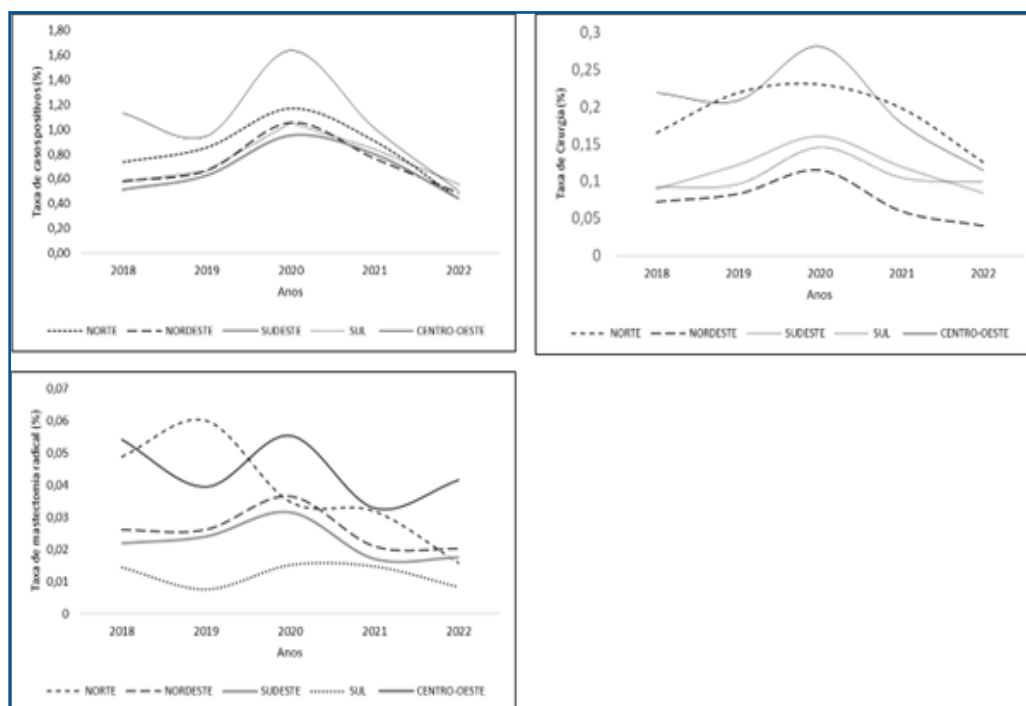
**Continuation - Table 3:** Study of treatments and procedures carried out in registered cases that received some intervention according to Brazilian regions in 2020.

Regions	Intervention	p	PR
Mastectomy			
Simple	924	0,622	1
Radical	981		1,02
Southeast			
Treatment			
Radiotherapy	2592	<b>&lt;0,001</b>	1
Chemotherapy	28315		5,08
Mastectomy			
Simple	1445	<b>&lt;0,001</b>	1
Radical	1830		1,22
South			
Treatment			
Radiotherapy	1207	<b>&lt;0,001</b>	1
Chemotherapy	12893		4,79
Mastectomy			
Simple	419	0,148	1
Radical	385		0,9
Midwest			
Treatment			
Radiotherapy	342	<b>&lt;0,001</b>	1
Chemotherapy	3714		4,83
Mastectomy			
Simple	226	<b>0,005</b>	1
Radical	301		1,27

Source : 2023 Survey Data.



**Figure 1a:** Trend analysis of procedure rates (a) Chemotherapy, (b) Radiotherapy, (c) Plastic surgery, (d) Simple mastectomy, (e) positive cases, (f) Surgeries and (g) Mastectomy, performed between Brazilian regions between 2018 and 2022.



**Figure 1b:** Trend analysis of procedure rates (a) Chemotherapy, (b) Radiotherapy, (c) Plastic surgery, (d) Simple mastectomy, (e) positive cases, (f) Surgeries and (g) Mastectomy, performed between Brazilian regions between 2018 and 2022. Source : 2023 Survey Data.

The Central-West region always had the highest rates of chemotherapy in the period studied (2018-2020), exceeding 1%, contrary to what can be observed in the Southeast region, which always showed the lowest treatment rates. All regions, however, showed a sharp increase in the rate of chemotherapy in 2020, decreasing until 2022, approaching the rates at the beginning of the period.

With regard to the radiotherapy rate (b), the Central-West region, again, maintained the highest rate, while the North region presented the lowest rate, when compared to the other regions. Similarly to what happened with chemotherapy rates, radiotherapy rates tended to increase in 2020 in almost all regions of the country. Only the North region did not follow the trend, having its highest radiotherapy rates only in 2021.

Regarding the rate of reconstructive surgery (c), the Central-West region had remained above the other regions with a maximum rate of 0.09% in 2020, showing from then on, a sharp decrease until 2021, where it demonstrated stabilization, maintaining the rate around 0.05% by 2022. The Northeast region had the lowest rates of reconstructive surgery in relation to the other regions of the country in 2018 and 2019. However, it surpassed all regions in 2021, with the exception of the Southeast and continues in an increasing rate trend, unlike the Southeast region which has seen decreases in its rates since 2020, reaching a slight recovery in 2022. In terms of reconstructive surgery, there is also emphasis on the North region, which had the lowest rate of all regions in 2021 (0.02%), quickly rising to the highest rate in the country in 2022 (0.04%), with the exception of the Central-West.

When it comes to simple mastectomy (d), the North region has always had the highest rates when compared to

other regions of the country. As of 2019, however, there has been a drop in the simple mastectomy rate in this region, from a percentage of 0.09% to 0.04% in 2022. All other regions maintained their rates without significant variations in the period between 2018 and 2022, with the Southeast region as the second highest rate (below the North region) with rates fluctuating between 0.03% and 0.04%.

Still in relation to figure 1, regarding the rate of positive cases (e), all regions, with the exception of the Central-West, followed an increasing trend and with very similar rates in 2018 and 2019. In 2020, it is possible to observe an exuberant increase in rates in the Central-West and that Simple Mastectomy 226 0.005 1 Radical 301 1.27 the other regions continued to follow the growing trend and with similar rates. From 2020 onwards, however, all regions showed a drop in the rates of positive cases and continued to decrease over the last two years studied, until they were practically equal in 2022, with rates around 0.40-0.50%.

The rates of surgeries such as quadrantectomy, represented in Figure 1 by Segmentectomy Rate (f), followed the growing national trend when, after 2020, they showed a drop in all regions. If compared to the other regions of the country, once again, the Central-West region has the most pronounced rate fluctuation in this type of intervention, going from 0.3% in 2020 to 0.1% in 2022. The Northeast region has always had low segmentectomy rates (the lowest among all regions - around 0.05%), having declined since 2020, not recovering the curve until 2022.

The rate of radical mastectomy (g) suffered the greatest variations in the North region in the period 2018-2022. From 2019 onwards, the mastectomy rate in the North region progressively declined, going from 0.06% (the highest in the country in 2019), to 0.01% in 2022.



The South region continued to have the lowest rates for this procedure since 2018, followed by the Southeast and Northeast regions. These three regions (South, Southeast and Northeast) showed an increase in the radical mastectomy rate in 2020, returning to the percentages at the beginning of the study in 2022. The Central-West region had its radical mastectomy rate reduced from 2018-2019, showing the highest rate in the country in 2020, declining in 2021 and rising again in 2022, following the trend of a higher rate of radical mastectomy among regions in Brazil.

## DISCUSSION

This study did not show a significant impact on the incidence of new cases of breast cancer in Brazil between 2018 and 2022, but it can be observed that the Southeast region stands out in the registration of cases in all years, however, it shows a drop in cases recorded between 2021 and 2022. On the other hand, the North region has the lowest number of cases in all years, but also shows a drop in 2022. Although it was not possible to identify significant results, this information is relevant for monitoring and improvement of public policies for the prevention and treatment of breast cancer.

One study evaluated the short-term effects of the pandemic on breast screening and imaging. They analyzed data from the Breast Cancer Surveillance Consortium and compared biopsy recommendations and breast cancers diagnosed before and during the pandemic in relation to detection method and patient characteristics. The study showed that there was a marked reduction in biopsy recommendations in April 2020 compared to April 2019. Additionally, 24% fewer breast cancer cases were detected from March to September 2020 compared to the same period in 2019. These results corroborate the results of this research in comparison with the North region and the general trend of registered cases, indicating that the pandemic negatively affected the diagnosis and screening of breast cancer<sup>11</sup>.

A recent Dutch study found a 67% decrease in screen-detected cancers, while screen-undetected tumors decreased by just 7%. Similarly, although the number of symptomatic cancers initially declined in spring 2020, volumes of screen-missing cancers quickly recovered and surpassed 2019 numbers in June and July 2020. The results suggest that the pandemic had a significant impact on breast imaging screening and diagnosis and cancer detection<sup>12</sup>.

According to the Brazilian study, there was a reduction in breast cancer screening coverage during the period from 2013 to 2021, with an annual percentage change rate of -1.78% in the period from 2013 to 2019 and -5.85% in the period from 2013 to 2021. Furthermore, compared to 2019, screening coverage decreased by 41% in 2020 and 21% in 2021<sup>13</sup>.

The COVID-19 pandemic has placed significant pressure on healthcare services, including those responsible for caring for cancer patients. The main challenge was to find a delicate balance between the risk of virus transmission between vulnerable cancer patients and valuable healthcare professionals, ensuring the preservation of human and material resources, as well as alleviating facility overload, without compromising the

quality of treatment. oncology<sup>14</sup>.

Breast cancer patients and their doctors have had to carefully weigh the risks of contracting the virus with the benefits of cancer treatments. This has led to significant changes in the approach to treatment, such as delays in surgery, use of neoadjuvant therapy, and reduced number of in-person visits. The pandemic has required oncologists to adapt to ensure patient safety while providing the best possible breast cancer treatment<sup>15</sup>.

During the pandemic, healthcare professionals have had to adjust their treatment and management recommendations to ensure patient safety while avoiding the risk of infection. Many practices adopted telehealth visits for non-emergent cases and follow-up appointments, while others followed guidelines that prioritized exams and imaging according to medical necessity and with limited capacity. These changes are even more impactful in cancer patients, who may be more susceptible to infection and disease progression. Many of them use medical treatments that can result in immunosuppression, increasing the risk of morbidity and mortality from infections, such as COVID-19. To minimize the risk of adverse events and treatment delays, physicians need to strike a balance between the management of malignancies and infection control<sup>16-20</sup>.

Early diagnosis of breast cancer is essential to allow less invasive treatments and increase the chances of a cure. Effective screening programs are needed to detect cancer at an early stage, allowing breast conservation and avoiding more invasive procedures. However, during the pandemic, late screening may lead to an increase in mastectomy rates due to the diagnosis of palpable cancers at advanced stages, where breast conservation is not an option<sup>20,14</sup>.

Due to the need to minimize the spread of COVID-19, several countries have adopted social distancing measures and transportation limitations. Compliance with these measures, along with the fear of contracting the disease, caused many women to postpone or cancel medical appointments and breast cancer screening exams, even in cases with symptoms. As a result, there was a significant decrease in the number of patients referred and overall diagnoses of breast cancer<sup>21-24</sup>.

Many screening programs around the world have been temporarily suspended and primary care consultations, diagnostic imaging, and breast biopsies have been reduced in response to increased clinical demand and shortages of human and material resources. Furthermore, the population eligible for screening has been reluctant to participate. These factors contributed to the reduction in screening capacity around the world<sup>12,25-27</sup>.

In addition to the registrations of new cases, procedures for already diagnosed cases were also affected, such as segmentectomy. Segmentectomy is a surgical procedure used to treat early-stage breast cancer, which involves removing a part of the breast affected by the disease. During the COVID-19 pandemic, segmentectomies were affected by the interruption or reduction of non-emergency activities in health services across the country. This may have delayed breast cancer treatment, leading to a worse prognosis for the disease. Furthermore, the overload of health systems may also have reduced the availability of

resources and medical staff to perform the surgery<sup>25,28</sup>.

The results of this study show that the Northeast region was the most affected by this procedure during the pandemic period. In this context, the challenge of avoiding undertreatment and offering safe and timely therapeutic options, without compromising results, has been a complex task. Several therapeutic modifications were developed in response to new conditions, and were quickly incorporated into guidelines and recommendations for the management of breast cancer, especially in the clinical setting during the pandemic. Such changes were mainly characterized by a shift from surgical therapies and hospitalizations to conservative and home treatments. Notably, the era of the COVID-19 pandemic has been marked by the widespread use of neoadjuvant hormonal therapy as a cost-effective first-line treatment for hormone receptor (HR)-positive tumors, both in early-stage breast cancer and in locally advanced or same DCIS<sup>29</sup>.

Several studies have also reported a reduction in the number of breast cancer surgeries in different countries, mainly low- and middle-income countries. In China, studies observed a significant drop in the proportion of patients undergoing surgery, from 16.4% to 2.6%<sup>30</sup>. In Pakistan, there was a 35.5% reduction in breast cancer surgeries, and patients were divided into groups according to the priority of surgery. Researchers documented that surgical procedures were divided into elective, semi-elective, orange emergency and red emergency groups, depending on priority and whether surgery could be replaced by other treatment approaches<sup>31</sup>. In Turkey, several studies also reported a drop in the number of breast cancer surgeries during the early stages of the pandemic, but the number of surgeries increased shortly after the initial reduction, documenting an increase during the inter-pandemic period to pre-pandemic levels<sup>32</sup>.

Still on the procedures, between radical mastectomy, simple mastectomy and reconstructive surgery, it was possible to observe in this study that simple mastectomy in the South region showed a significant drop and reconstructive surgery in the Northeast region was also affected. There has been a significant change in the surgical approach to the treatment of breast cancer. Minimal, breast-conserving surgeries were preferred over extensive procedures to minimize the risk of major complications, patient revisits, unnecessary and prolonged hospitalizations<sup>33,34</sup>. When mastectomy was indicated, immediate breast reconstruction was not the preferred option. Instead, delayed reconstruction was adopted in many cases to reduce surgical time and the risk of complications. The axillary surgical approach does not appear to have been significantly affected, although technical questions have been raised regarding the location and timing of COVID-19 vaccination or the feasibility of dual-tracer sentinel lymph node (SL) mapping, suggesting possible alternatives<sup>35,36</sup>.

The present study corroborates the findings of researchers, who found lower rates of mastectomies for cases of breast cancer during the study period in the South, Southeast and Central-West regions, being 4%, 4.5% and 6.98%, respectively, similar results were found in North America, Europe and Asia, which was associated with

patients' access to specialized oncological surgery services and other oncological therapy resources<sup>37,38</sup>.

Scholars in Türkiye considered the administration of neoadjuvant systemic therapy until conditions were improved for surgical treatment. To minimize treatment delays during the pandemic, researchers have suggested that multidisciplinary treatment should triage patients and schedule surgical procedures to optimize the allocation of limited resources for urgent cases. However, some scholars have suggested that complex reconstructive surgeries should be postponed in areas where the pandemic is not well controlled due to prolonged hospital stays for complex reconstructive surgeries and possible complications<sup>39</sup>.

Although there is a current trend toward less invasive procedures, data from a systematic review indicate a decrease in segmentectomy rates and an increase in mastectomy rates. The slight increase in mastectomy rates may be attributed to limited resources for chemotherapy or radiotherapy<sup>40</sup>.

Regarding treatments, such as radiotherapy, chemotherapy and screening mammography, it was not possible to observe any significant results. During the pandemic, carrying out these procedures has been a challenge, but priority measures have been implemented by health authorities. Efficiency in the use of available resources, prioritizing the most beneficial treatments and minimizing the risk of infection are essential. Patient and staff screening, telemedicine services, adjustments to treatment schedules and regimens, oral or subcutaneous medications, and maintenance therapy are some of the measures taken to reduce exposure to COVID-19. However, even with these measures, the pandemic has negatively affected all aspects of cancer treatment, from screening and diagnosis to palliative care<sup>41</sup>.

Analyzing the prevalence of treatments (chemotherapy and radiotherapy) and procedures (simple mastectomy and radical mastectomy) in the regions of Brazil, we observed the prevalence of most procedures and treatments in all regions, with the exception of radical and simple mastectomy in the Northeast region and in the South.

Studies looked at how the COVID-19 pandemic affected rates of mammography and breast cancer operations, the study demonstrated that during 2020, mammography rates were impacted more than the number of breast cancer operations, this analysis focused on the changes that occurred at the beginning of the COVID-19 pandemic with changes in delays in care centered on March 2020<sup>42</sup>.

Chemotherapy services have been affected by health protocol measures implemented to prevent transmission of the COVID-19 virus to patients and healthcare professionals. These changes are similar to those observed in Rome, Italy, where the COVID-19 outbreak altered the allocation of medical resources and affected breast cancer patients' decision-making regarding treatment<sup>43</sup>.

Despite the pressures associated with the COVID-19 pandemic, breast cancer surgery can be performed safely and integrated into a rigorous protocol to reduce exposure and transmission of the virus. To minimize delays in treatment during the pandemic, scholars have proposed

that multidisciplinary treatment triage patients and schedule surgical procedures to optimize the allocation of limited resources in urgent cases. However, some scholars have recommended postponing complex reconstructive surgeries in areas where the pandemic is not well controlled, due to the prolonged hospital stay for these procedures and possible complications<sup>44,45</sup>.

The pandemic has also had a significant impact on the mental health of cancer patients, leading to a feeling of isolation and reduced social support. It is essential to understand how the pandemic affected breast cancer treatment, including surgery scheduling, chemotherapy and radiotherapy administration, as breast cancer is a widespread condition in the population<sup>46</sup>.

According to research carried out, many patients express concerns regarding delays in treatment, which can lead to increased depression and anxiety in individuals diagnosed with cancer, a fact that corroborates our findings. The influence of psychological factors cannot be neglected on the evolution of the disease. Furthermore, emotions such as anxiety and depression have an impact on the diagnosis and treatment of breast cancer patients<sup>47</sup>.

According to researchers, cancer symptoms, treatment effectiveness, potential for recurrence, health outcomes, and inadequate information can create uncertainty in cancer patients. The COVID-19 pandemic has further aggravated the situation, as there is concern about the potentially serious impact of COVID-19 on cancer patients and its negative psychological effects, such as loneliness and isolation. It is important to consider the needs of cancer patients at the same level as those receiving care for COVID-19 and other illnesses, as uncertainty and emotional distress can have negative effects on clinical outcomes<sup>48</sup>.

In summary, breast cancer is one of the leading causes of cancer death in women in Brazil, and the COVID-19 pandemic has brought significant challenges to the treatment and management of this disease. The implementation of safety protocols in oncology health

services and the adoption of telemedicine technologies were some of the measures taken to ensure continuity of treatment and minimize the risk of exposure to the virus.

It is important to remember that the pandemic has had significant psychological impacts on breast cancer patients, exacerbating feelings of uncertainty and anxiety regarding the future and treatment. It is essential that oncology health services consider these psychosocial needs of patients more than ever and offer adequate support, aiming to improve the mental health of this population. Also, raising awareness and educating women about the importance of self-examination and early detection of breast cancer should be encouraged and continued, considering that these actions can contribute to minimizing the effects of the pandemic on the course of breast cancer.

Due to the nature of the data, which were obtained from secondary sources, the analysis was restricted to data provided by DATASUS, which represents a limitation of this study. It is possible that there is underreporting of registered cancer cases.

## ■ CONCLUSION

The impact of the COVID-19 pandemic on breast cancer treatment in Brazil is significant, with variations between regions and the procedures adopted by hospitals. The pandemic has affected the diagnosis, treatment and monitoring of patients, which can lead to serious consequences for the health and quality of life of these individuals. Therefore, it is necessary that measures be taken to minimize these impacts, such as adopting effective safety protocols and investing in resources to guarantee access to health services.

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## Resumo

**Introdução:** o câncer de mama tem sido a principal causa de morte entre mulheres no Brasil e no mundo. Durante os anos de isolamento social devido à COVID-19, serviços de saúde, incluindo o rastreamento do câncer de mama, foram suspensos na tentativa de conter a disseminação do vírus, interferindo na detecção e tratamento precoce do câncer de mama, meios efetivos para redução de mortalidade.

**Objetivo:** identificar como a pandemia de COVID-19 interferiu no itinerário terapêutico do câncer de mama nas regiões brasileiras.

**Método:** trata-se de um estudo observacional, de caráter ecológico, realizado através de análise secundária de dados disponíveis no site do Departamento de Informática do Sistema Único de Saúde (DATASUS).

**Resultado:** foram coletadas informações da realização de todos os exames de mamografia bilateral de rastreamento em mulheres de 50 a 69 anos de idade, casos positivos e modalidades terapêuticas no período de 2018 a 2022. Os dados mostraram que a pandemia impactou de forma diferente as regiões brasileiras exigindo estratégias e investimentos diversos para garantir o acesso aos serviços de saúde e minimizar os impactos da pandemia.

**Conclusão:** apesar da pesquisa não apresentar resultados estatisticamente significantes, a região sudeste se destacou no registro de casos, mas apresenta uma queda de casos registrados entre 2021 e 2022. Em contrapartida, a região norte apresentou os menores números de casos em todos os anos.

**Palavras-chave:** Neoplasias de mama; Programas de rastreamento; Políticas Públicas de Saúde; Sistemas de Informação em Saúde; COVID-19.

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