ORIGINAL ARTICLE

Breast cancer assistance in Paraíba during the COVID-19 pandemic: A retrospective cohort study

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Abstract

Objectives: to evaluate changes in breast cancer care among women assisted at a public hospital in Paraíba, Brazil, during the COVID-19 pandemic.

Methods: retrospective cohort of women using the Sistema Único de Saúde (SUS) (Brazilian Public Health Service) at Hospital Napoleão Laureano (PB), and were diagnosed with in situ or invasive ductal carcinoma in the pre-pandemic (2017–2018) and pandemic (2020) periods. Sociodemographic, clinical and care-related data were collected. Differences between periods were assessed using chi-square or Fisher's exact test for categorical variables and Student's t or Mann-Whitney tests, for continuous variables ($p<0.05$).

Results: among 218 women included, 114 were treated before the pandemic and 104 during. Most cases were palpable tumors and invasive carcinoma. Mastectomy was the predominant procedure, with immediate reconstruction in 24.8%. The interval between histopathological diagnosis and the first consultation with a specialist increased during the pandemic ($p=0.04$), and few women outside the capital could access the service (RR=0.63; 95%CI= 0.4–0.9; $p=0.01$). Delays on the appointment and abandonment of treatment were also higher during the pandemic, whereas immediate breast reconstruction decreased.

Conclusion: the pandemic hindered breast cancer care, increasing delays, interruptions of treatment, and reducing immediate reconstructions. These findings highlight the vulnerability of patients dependent of the public health services during health crises.

Key words *Neoplasias da mama, SARS-CoV-2, Pandemia, Diagnóstico tardio, Tempo para o tratamento*

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Introduction

Breast cancer is the most common type of cancer among the female population, representing the fifth cause of death from cancer in general and the most frequent cause of cancer-related death in women.[1] Early detection, along with treatment at initial stages, constitutes the best strategy in reducing mortality of the disease.

Currently, mammography is the imaging technique of choice for breast cancer screening and it has been well-established that mammography screening is effective for women 50 to 74 years of age.[2-4] On the other hand, studies have drawn attention to the importance of including the 40-49 year age group in screening programs, with some publications showing a reduction of up to 25% in breast cancer mortality in this age group.[5-7]

Delay in diagnosing and treating breast cancer results in more advanced stages at the first presentation and correlates with a reduction in survival.[8] In addition to the widely acknowledged psychological, socioeconomic and cultural barriers, a new obstacle appeared at the end of 2019, Covid-19. The spread of SARS-CoV-2 led to unprecedented disruptions in the healthcare systems.[9,10]

Lockdown policies, suspension of non-urgent services, and recommendations from professionals caused widespread interruption of breast cancer screening and postponement of routine consultations and elective surgeries. Although short-term delays in screening were initially considered unlikely to affect mortality, several studies subsequently reported reductions in imaging, diagnostic procedures, and oncological surgeries, particularly in low- and middle-income countries.[11,12]

Many countries postponed elective cancer surgeries to reallocate healthcare resources to treat patients affected by the pandemic.[13] Brazil was no exception. Despite being guided by a *Sistema Único de Saúde* (SUS) (Brazilian Public Health System), the country faced shocking inequalities to access specialized cancer care, especially in the North and Northeast regions.[1] In these settings, restrictions in transportation, reallocation of hospital resources, and fear of Covid-19 worsen the pre-existing delays. Paraíba (PB), a State with significant socioeconomic vulnerability, relies heavily on a single referral center, which manages over 70% of cancer cases in SUS.[2] To understand how the pandemic affected the diagnosis and treatment in such contexts is essential to inform emergency preparedness and strengthening oncological care.

In this regard, the objective of this study was to determine changes in the diagnosis and treatment of breast cancer among women treated at a public referral hospital in Paraíba during the Covid-19 pandemic, comparing indicators from the pre-pandemic and pandemic periods.

Methods

A retrospective cohort study was conducted to describe changes in breast cancer diagnosis and treatment among women using SUS in the State of Paraíba. The site selected for the study was *Hospital Napoleão Laureano*, the main cancer referral hospital in the State, responsible for assisting 2.2% of all cancer patients in Paraíba, both from the public and private network, but predominantly a public sector.[2] The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: Guidelines for Reporting Observational Studies was followed.[14]

The records of eligible patients were selected in accordance with the following inclusion criteria: women with the following diagnosis: ICD-10 D05.1 (intraductal carcinoma *in situ* of breast / ductal carcinoma *in situ* – DCIS) and/or ICD-10 C50 (malignant neoplasm of the breast, encompasses all invasive breast carcinoma, whether of ductal, lobular, or another specified site within the breast, including any stage and any histological type), who were SUS patients . The exclusion criteria consisted of incomplete or missing medical records. Records were excluded if diagnosis or treatment was incomplete or performed primarily at another institution, resulting in missing or insufficient information.

The study analyzed medical records from the period of November 2017 and October 2018 (pre-pandemic period) and between January and December 2020 (pandemic period). The year 2019 was excluded because cases were diagnosed before the pandemic, but treatments continued into the pandemic, hindering a clear distinction between the intervals analyzed.

The variables analyzed were collected from the medical records and consisted of: *biological, sociodemographic and lifestyle characteristics and comorbidities* (age, weight, height, body mass index [BMI], classification of weight, skin color/ethnicity, schooling, place of residence, smoking and alcohol consumption); *reproductive characteristics* (menarche, menopausal status, number of pregnancies, number of deliveries, breastfeeding, use of hormonal contraception, use of hormone therapy); *clinical characteristics* (main complaint, findings in clinical examination, lesion size at clinical examination, diagnosis staging , diagnostic modality, imaging findings, histopathology findings, postoperative staging, molecular subtype and treatment modalities) and *characteristics of the care provided following the diagnosis hypothesis/ indicators of the pandemic impact* (time between detection of suspicious findings in imaging exams and the beginning of treatment - and its partial time intervals, the percentage of missed appointments of patients returning later than previously scheduled, and the percentage of patients who abandoned treatment).

Descriptive and statistics included frequencies, means and standard deviations for normally distributed variables, and medians and interquartile ranges (IQR) for asymmetrical distributions. Differences between time periods were evaluated using chi-square or Fisher's exact test for categorical variables and Student's *t* or Mann-Whitney tests for continuous variables, according to distribution. Relative risks (RR) and 95% confidence intervals (95%CI) were estimated. Analyses were performed by using Epi Info 3.5.4, with $p<0.05$ considered statistically significant.

This study was approved by the Research Ethics Committee at the *Instituto de Medicina Integral Prof. Fernando Figueira* (IMIP), Brazil (protocol no. 5.574.350/2022), in accordance with national standards and the principles of the Declaration of Helsinki. Written informed consent was obtained from the participants before data collection. When contact could not be established after multiple attempts, the requirement for informed consent was waived by the Ethics Committee, with strict adherence to national regulations regarding data confidentiality and secrecy.

Results

A total of 218 women met the inclusion criteria, 114 in the pre-pandemic period and 104 during the pandemic (Figure 1).

The median age was similar between the groups (54 *vs*. 53.5 years). Most women were mixed colored skin, overweight or obese, and had low schooling levels, with no relevant differences across periods (Table 1).

Clinical presentation was predominantly palpable breast lump, and most tumors were invasive carcinomas, mainly invasive ductal carcinoma, stage II, and luminal subtype. Surgical treatment consisted mostly of mastectomy, with immediate reconstruction performed in 24.8% of the overall cases. (data not shown in Table).

When comparing the periods, significant differences emerged in access and care. Women living outside the State capital and its metropolitan region were less likely to access the referral hospital during the pandemic (RR=0.63; 95%CI=0.4–0.9; p=0.01). The interval between histopathological diagnosis and the first consultation with a specialist increased from a median of 27 days pre-pandemic to 35 days in the pandemic (p=0.049). Other diagnostic intervals showed no significant differences (Table 2).

Although staging at diagnosis did not differ significantly between groups, immediate breast reconstruction decreased markedly during the pandemic (33.3% *vs*. 15.6%; RR=0.46; 95%CI=0.2–0.8; p=0.009) (Table 3).

Indicators of care continuity were adversely affected. Abandonment of treatment increased from 1.8% to 10.6% during the pandemic (RR=6.02; 95%CI= 1.3–6.5;

Figure 1

Flowchart on recruitment and follow-up on the participants of the study.

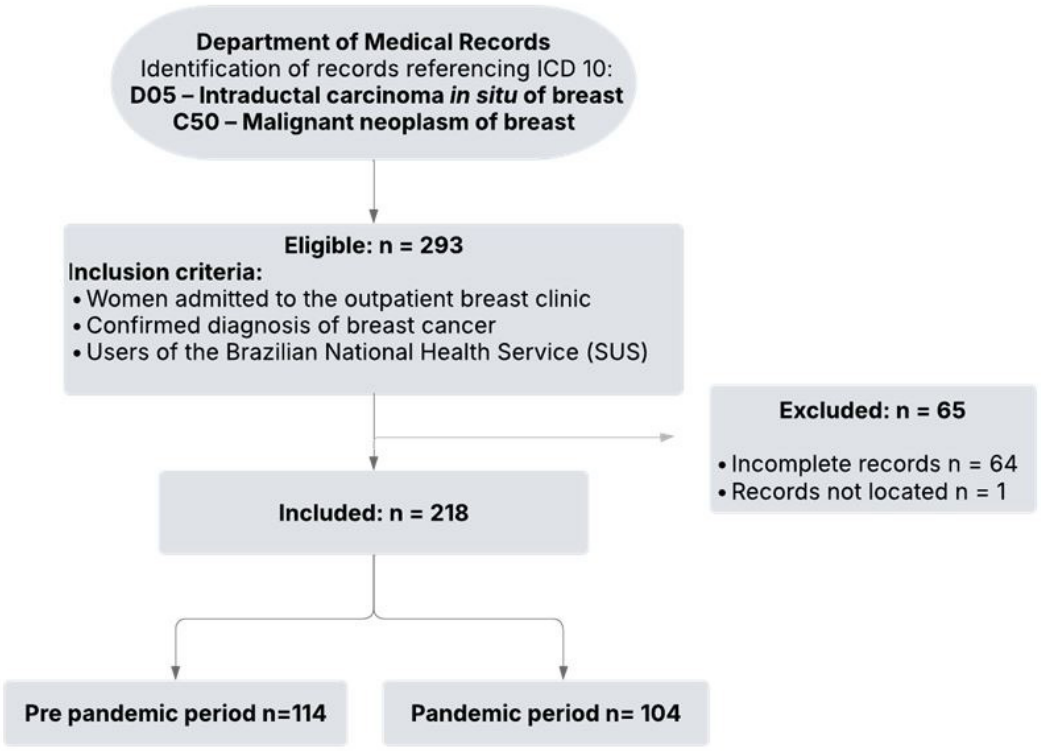

Table 1

Biological, sociodemographic and lifestyle characteristics of women with breast cancer treated in the Sistema Único de Saúde (SUS) (Brazilian Public Health System). Paraíba, Brazil, 2017-2018 and 2020.

Characteristic	Interval	Median (IQR)
Age (years)	25 - 93	54 (45 - 65)
Weight (kg)	41 - 114	68 (59.4 - 75.5)
Height (m)	1.33 - 1.75	1.55 (1.50 - 1.60)
Body mass index (kg/m^2)	Interval	$\bar{x} \pm SD$
	18.4 - 42.9	28.4 ± 4.8
Classification of weight (n=82)	n	%
Underweight	2	2.4
Adequate weight	17	20.7
Overweight	30	36.6
Obese	33	40.2
Skin color/ethnicity (n=202)		
White	29	13.7
Black	2	0.9
Mixed	181	85.4
Schooling (n=209)		
None	27	12.9
Incomplete elementary school	81	38.8
Completed elementary school	23	11.0
Completed high school	54	25.8
Completed Higher Education	24	11.5
Place of residence (n=216)		
João Pessoa (State Capital City)	98	45.4
Greater metropolitan region	37	17.1
Other locations in the State	79	36.6
Other States	2	0.9
Smoking (n=84)		
Yes	10	11.9
No	74	88.1
Alcohol consumption (n=77)		
Yes	3	3.9
No	74	96.1

IQR= Interquartile range. Source: *Hospital Napoleão Laureano.*

p=0.006). The occurrence of delays recorded at any point during treatment were more frequent during the pandemic period. (8.8% *vs*. 41.3%; RR=4.71; 95%CI=2.4–8.8; *p*<0.0001). Postponed surgeries (0.9% *vs*. 17.3%; RR=19.7; *p*<0.0001) and delays due to lack of material or medication (0.9% *vs*. 8.7%; RR=9.86; *p*=0.006) were also significantly higher during the pandemic (Table 4).

Table 2

Indicators of diagnostic and treatment time intervals in women with breast cancer before and during the COVID-19 pandemic. Paraíba, Brazil, 2017-2018 and 2020.

Indicators/ Time in days	Pre-pandemic	Pandemic	*p*
	Median (IQR)	Median (IQR)	
From finding suspicious imaging to histopathological diagnosis	52 (22 – 100)	43 (17 – 87)	0.24
From histopathological diagnosis to 1st appointment with specialist	27 (15 – 50)	35 (22 – 66)	0.049
From histopathological diagnosis to initiate treatment	66 (38 – 103)	68 (49 – 112)	0.18
From 1st appointment with specialist to initiate treatment.	40 (20 – 80)	40 (23 – 77)	0.82

IQR= Interquartile range. Source: *Hospital Napoleão Laureano*, 2022

Table 3

Indicators of changes in breast cancer diagnosis and treatment based on the participants' characteristics. Paraíba, Brazil, 2017-2018 and 2020.

Indicators	Pre-pandemic		Pandemic		RR	95%CI	*p*
	Median	IQR	Median	IQR			
Age	54	46 - 65	53.5	45 - 65			0.7
	n	%	n	%			
Place of residence							
Other location in the State	51	45.5	30	28.8	0.63	0.4 – 0.9	0.01
Capital and greater metropolitan region	61	54.5	74	71.2	1.00		
Subclinical lesion at diagnosis							
Yes	28	24.6	18	17.5	0.71	0.4 – 1.2	0.2
No	86	75.4	85	82.5	1.00		
Clinical stage at diagnosis							
0-II	82	71.9	71	68.3	0.94	0.7 – 1.1	0.5
III-IV	32	28.1	33	31.7	1.00		
Carcinoma in situ or invasive carcinoma at diagnosis							
In situ	16	14.0	7	6.7	0.47	0.2 – 1.1	0.07
Invasive	98	86.0	97	93.3	1.00		
Surgical approach							
Quadrantectomy	26	23.6	15	16.3	0.68	0.3 – 1.2	0.1
Mastectomy	84	76.4	77	83.7	1.00		
Immediate breast reconstruction							
Yes	28	33.3	12	15.6	0.46	0.2 – 0.8	0.009
No	56	66.7	65	84.4	1.00		
Reasons for not performing reconstruction							
Patient did not want it	13	23.2	7	10.8			
No indication for the procedure	17	30.4	15	23.1			
Pandemic	-	-	13	20			
Another reason	1	1.8	-	-			
Lack of prosthesis	-	-	1	1.5			
Reason not recorded	25	44.6	29	44.6			

Source: *Hospital Napoleão Laureano*, 2022.

Table 4

Indicators of delays in treatment in patients with breast cancer before and during the COVID-19 pandemic. Paraíba, Brazil, 2017-2018 and 2020.

Indicators	Pre-pandemic		Pandemic		RR	95%CI	*p*
	n	%	n	%			
Abandonment of treatment							
Yes	2	1.8	11	10.6	6.02	1.3 - 6.5	0.006*
No	112	98.2	93	89.4	1.00		
Delay in attendance for treatment							
Yes	7	6.1	12	11.5	1.87	0.7 - 4.5	0.15
No	107	93.9	92	88.5	1.00		
Causes of delay in returning							
No reason given	7	100	6	50.0			
Fear of the pandemic	-	-	4	33.3			
Patient had Sars-Cov-2	-	-	2	16.7			
Delay reported in records at some time during treatment							
Yes	10	8.8	43	41.3	4.71	2.4 - 8.8	<0.0001
No	104	91.2	61	58.7	1.00		
Delay due to postponed surgery							
Yes	1	0.9	18	17.3	19.7	2.6 - 145	<0.0001*
No	113	99.1	86	82.7	1.00		
Delay due to lack of material / medication							
Yes	1	0.9	9	8.7	9.86	1.2 - 76	0.006*
No	113	99.1	95	91.3			

*Fisher's exact test. Source: *Hospital Napoleão Laureano*, 2022.

Discussion

This study compared the diagnosis and treatment of breast cancer before and during the Covid-19 pandemic in Paraíba and showed that the most relevant disruptions occurred in access to specialized care and in continuity of the treatment. Delays, particularly due to postponed surgeries and lack of medication, became substantially more frequent, and immediate breast reconstruction decreased markedly. Fear of Covid-19 was a frequent reason for missing appointments, and reduced attendance among women living outside the metropolitan region highlighted how travel restrictions and service concentration intensified existing barriers.

There was a marked reduction in breast cancer care during the pandemic.[15,16] A concern finding in the present study was the reduced attendance of women living outside the State capital or metropolitan region. This likely reflects on mobility barriers and the concentration of oncology services in a single referral center, which already posed challenges before the pandemic but became more pronounced with travel restrictions.

There was no significant difference in time between suspicious imaging findings and histopathological diagnosis. Although initial diagnostic intervals remained stable, meeting legally mandated deadlines continues to be challenging. Brazilian laws require diagnostic confirmation within 30 days and treatment initiation within 60 days, but delays were already common before the pandemic.[17,18] In this study, the median time from diagnosis to treatment initiation slightly exceeded 60 days in both periods, indicating that the system operated under structural strain even before COVID-19.

The pandemic intensified pre-existing vulnerabilities in the Northeast of Brazil, where services for specialist are concentrated in capitals and where socioeconomic disadvantages and long traveling distances limit access to oncological care.[19,20] These structural barriers likely contributed to abandonment of treatment and the marked reduction in immediate breast reconstruction seen in this

study, a pattern also reported in European centers during periods of restricted surgical capacity.[21,22]

A study conducted in Brazil in 2019 to evaluate the structure of public healthcare services in the country showed that specialized care centers within SUS are few and concentrated in the capitals, resulting in insufficient coverage for the rural populations. The distance and cost of traveling aggravate these disparities.[19] According to the *Instituto Brasileiro de Geografia e Estatística* (IBGE) (Brazilian Institute of Geography and Statistics), nearly half of the poverty in the country is concentrated in the Northeast.[20] This vulnerability was amplified by the pandemic at all healthcare levels.

Treatment delays were markedly more frequent during the pandemic, consistent with international evidence showing increased oncologic risk with postponed surgery. Shortages on surgical materials and hospital overload during Covid-19 waves also disrupted care. The combined effects of delays, uncertainty and fear contributed to missed appointments and heightened psychosocial distress, as reported worldwide.[23,24]

Abandonment of treatment increased more than sixfold during the pandemic, a pattern also described in other oncological settings during Covid-19. In this study, fear of infection and logistical restrictions were frequent reasons for missing appointments, suggesting that psychological distress acted together with structural barriers to disrupt care continuity f.[24,25]

This study has limitations. Its retrospective design depended on the completeness of medical records, which led to the exclusion of cases with insufficient information and limited the analysis of some clinical variables. The assessment was restricted to a single public referral center, which may not capture the full heterogeneity of breast cancer care in the State. In addition, the study periods did not allow evaluation of long-term outcomes or of the cumulative effect of screening interruptions on stage at diagnosis. Finally, it was not possible to follow women who abandoned the treatment, restricting conclusions regarding downstream clinical consequences.

The study also has strengths. It analyzed a comprehensive cohort of women assisted at SUS, using standardized data extraction across two well-defined periods. By situating the findings within a region characterized by socioeconomic vulnerability and high dependence on a single oncological center, the study provides contextually relevant insight into how Covid-19 pandemic disrupted care in settings where structural barriers were already present. The inclusion of detailed time-interval indicators adds precision to the evaluation of diagnostic and therapeutic delays.

In Conclusion, the COVID-19 pandemic exacerbated pre-existing vulnerabilities in breast cancer care in Paraíba, leading to reduced access for women living outside the metropolitan area, increased delays, greater abandonment of treatment and a substantial decline in immediate breast reconstruction. Although initial diagnostic intervals remained relatively stable, care continuity was significantly affected. These findings underscore the need for strategies that strengthen referral networks, decentralize diagnostic capacity and protect oncological services during public health emergencies, particularly in regions where access is structurally constrained.

Authors' contribution

Ramalho TC: conceptualization, data curation, investigation, formal analysis, writing—original draft.

Katz L: conceptualization, methodology, supervision, writing—review and editing.

Ramalho IC: data curation, investigation, validation, writing—review and editing.

Carneiro da Cunha ACM: research, visualization, writing – review and editing.

Amorim MMR: conceptualization, methodology, project management, supervision, writing – review and editing.

All authors approved the final version of the article and declare no conflict of the interest.

Data availability

All datasets supporting the result of this study are included in the article.

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