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Breast cancer: evolution of the epidemiological and clinical profile in a referral oncology center in Paraná

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ABSTRACT

Introduction: Breast cancer is the most common malignant neoplasm among women worldwide, and disparities in staging at diagnosis between public and private healthcare systems represent a critical challenge in Brazil. This study aimed to assess the epidemiological and clinical profile of patients diagnosed with breast cancer between 2003 and 2023 at the Instituto Sul Paranaense de Oncologia in Ponta Grossa, Paraná. **Methods:** Data were collected from electronic medical records using a semi-structured spreadsheet, followed by statistical analysis using R software. **Results:** During the study period, 3,118 patients were diagnosed with breast cancer at this institution. The mean age at diagnosis was 56.23 years, with slight variations throughout the analyzed period; the most affected age group was 50 to 64 years (39.32%). Regarding histological type, the most prevalent was invasive ductal carcinoma (81.22%), followed by ductal carcinoma in situ (7.51%) and lobular carcinoma (7.32%). A statistically significant difference was observed in clinical stages at diagnosis between patients treated in the public and private systems, showing that, in advanced stages, such as clinical stage III, 34.91% of patients in the Unified Health System (SUS) were diagnosed at this stage, compared to only 18.66% in the private system. **Conclusions:** The epidemiological profile of the patients was consistent with that described in the literature, and no proportional increase was observed in cases among patients in younger age groups, under 40 years of age. A significant difference was identified in clinical stages at diagnosis between the public and private systems, corroborating previous findings that indicate patients in the public system are frequently diagnosed at more advanced stages, resulting in more unfavorable clinical outcomes.

KEYWORDS: breast cancer; clinical epidemiology; women's health.

INTRODUCTION

Breast cancer is the most common malignant neoplasm among women worldwide; in 2020 alone, there were 2.26 million new cases globally, accounting for 24.5% of all cancers affecting women[1]. In Brazil, excluding cases of non-melanoma skin cancer, breast cancer is the most prevalent among the population, with an estimated 74,000 new cases of the disease each year from 2023 to 2025, representing 10.5% of all cancers[2,3]. Furthermore, the disease is responsible for a significant reduction in these patients' quality of life, mainly due to the side effects of treatment and the psychological effects caused by the disease[4-6].

Early diagnosis of breast cancer is a key factor in improving prognosis and treatment success. Identifying the disease in its early stages not only significantly increases the chances of cure but also allows for less aggressive interventions, with a lower impact on patients' quality of life[7]. Furthermore, early detection reduces treatment costs and decreases the need for complex procedures[8,9].

In this context, factors related to the organization of the healthcare system play a decisive role in the diagnosis of breast cancer. National studies demonstrate that late diagnosis is frequently associated with difficulties in accessing screening, delays in diagnostic investigation, and failures in the integration of the healthcare network, highlighting that the stage at diagnosis reflects not only tumor characteristics but also the efficiency of the healthcare system[10,11].

These limitations translate into significant inequalities in the diagnosis of the disease, especially among patients served by the SUS and those with access to private health insurance. Studies conducted in Brazil, such as AMAZONA III, demonstrate a higher proportion of diagnoses at advanced stages in the public system, reinforcing the impact of inequities in access to care[12].

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Despite the relevance of the topic, there remains a scarcity of regional studies evaluating the temporal evolution of the epidemiological and clinical profile of these patients over extended periods, especially in Southern Brazil. Understanding these variations is fundamental for planning more effective public policies and screening strategies.

Thus, this study aimed to characterize the epidemiological and clinical profile of patients diagnosed with breast cancer between 2003 and 2023 at a leading oncology center in the state of Paraná, with the goal of observing possible changes in these parameters over this period and, particularly, whether there was a shift in the age group of patients diagnosed with this disease.

METHODS

This is a retrospective analytical observational study, with an evaluation of temporal trends. This study was submitted to Plataforma Brasil and approved by the ethics committee of the State University of Ponta Grossa under opinion number 6.812.133. It was authorized by the Center for Studies and Research of the Southern Paraná Institute of Oncology (ISPON).

Data collection was performed using a partially structured electronic form, completed based on information extracted from the medical records of female patients aged 18 years or older diagnosed with breast cancer at the Southern Paraná Institute of Oncology during the period from 2003 to 2023. Initially, 3,308 medical records of patients diagnosed with breast cancer during the study period were identified. A total of 190 cases were excluded based on predefined criteria, such as male patients, cases of recurrence or a second primary tumor, patients under 18 years of age, and medical records with incomplete data regarding clinical staging or type of health coverage. After applying the exclusion criteria, 3,118 patients were included in the final analysis.

Staging was defined according to the American Joint Committee on Cancer (AJCC) TNM system in effect at the time of diagnosis, considering clinical staging (0–IV).

The data were categorized and statistically analyzed using R software[13]. The χ^2 test was used to compare the distributions of age groups between patients covered by the Unified Health System (SUS) and those covered by private health insurance.

Descriptive and inferential statistics were used to analyze the distribution of patients according to type of health coverage (SUS *vs.* supplementary health coverage, including private care). Categorical variables, including age groups and clinical stage at diagnosis, were compared between groups using Pearson's χ^2 test, considering the overall distribution of the categories.

The following variables were included: age at diagnosis, type of health coverage (distinguishing between SUS patients and those with supplementary or private health coverage), initial clinical stage, and morphological description of the carcinoma.

The temporal trend analysis was performed using the Joinpoint Regression Program (National Cancer Institute), considering the annual proportion of patients diagnosed at advanced stages (III and IV), given their clinical relevance[14] .

To characterize the age of the women with breast cancer who were treated, the patients were grouped into four age groups: <40, 40–49, 50–64, and ≥65 years. These age groups were then divided according to health coverage, distinguishing between patients treated by the SUS and those treated by private healthcare. In addition, the clinical stages of the disease were also included in this table and compared between the two groups. Medical records that did not specify the type of health coverage and initial clinical stage were excluded from the comparison.

RESULTS

After data analysis, 3,118 patients diagnosed during the study period were found to meet the inclusion criteria. Among the total number of patients evaluated, the distribution by age revealed that the majority of patients were in the older age groups. The age group <40 years accounted for 10.74% of patients, while 24.44% were 40–49 years old. Among those aged 50–64, the percentage was the highest, at 39.32% of individuals, followed by the group ≥65 years old, which represented 24.5% of patients. Regarding the stage at diagnosis, stage II was the most common (35.77%), followed by stages III (28.13%), I (18.20%), IV (10.45%), and 0 (7.45%) (Table 1).

When comparing patients treated in the private sector (n=1,283) and the SUS (n=1,567) in terms of age, some differences were observed. The mean age of patients in both groups was very similar, at 56.3 years in the private sector and 56.02 years in the

Table 1. Epidemiological data of the patients analyzed.

Patients	Private (n=1,283) n (%)	SUS (n=1,567) n (%)	Total (n=3,118) n (%)	p-value
Mean age	56.30	56.02	56.23	<0.001
Age				
<40	151 (11.77)	153 (9.76)	335 (10.74)	
40–49	336 (26.19)	360 (22.97)	762 (24.44)	
50–64	445 (34.68)	695 (44.35)	1,226 (39.32)	
>65	351 (27.36)	359 (22.91)	795 (24.5)	
Clinical stage				
0	143 (11.26)	68 (4.36)	229 (7.45)	<0.001
I	329 (26.06)	204 (13.07)	559 (18.20)	
II	485 (38.27)	551 (35.30)	1,099 (35.77)	
III	237 (18.66)	544 (34.91)	864 (28.13)	
IV	73 (5.75)	193 (12.36)	321 (10.45)	

SUS: Unified Health System.
Source: The authors.

SUS, despite a statistically significant difference (p<0.001), likely influenced by the large sample size, with no significant clinical relevance. The distribution by age group differed between the groups (p<0.001), with a higher proportion of patients aged 50–64 in the SUS and a higher proportion of patients in the other age groups in the private system (Table 1).

Considering the age categorization based on mammographic screening strategies (<40, 40–49, 50–69, and ≥70 years), a significant difference in distribution was observed between the groups. There was a higher proportion of patients in the 50–69 age group in the SUS, while the private system had a higher proportion in the <40, 40–49, and ≥70 age groups (Table 2).

Table 2. Distribution of patients by age groups based on mammographic screening strategies, by type of health coverage.

Patients	Private (n=1,283) n (%)	SUS (n=1,567) n (%)	Total (n=3,118) n (%)	p-value
Mean age	56.30	56.02	56.23	<0.001
Age				
<40	151 (11.77)	153 (9.76)	335 (10.74)	
40–49	336 (26.19)	360 (22.97)	762 (24.44)	
50–69	557 (43.41)	851 (54.31)	1,226 (39.32)	
>70	239 (18.63)	359 (12.95)	795 (24.5)	

SUS: Unified Health System.
Source: The authors.

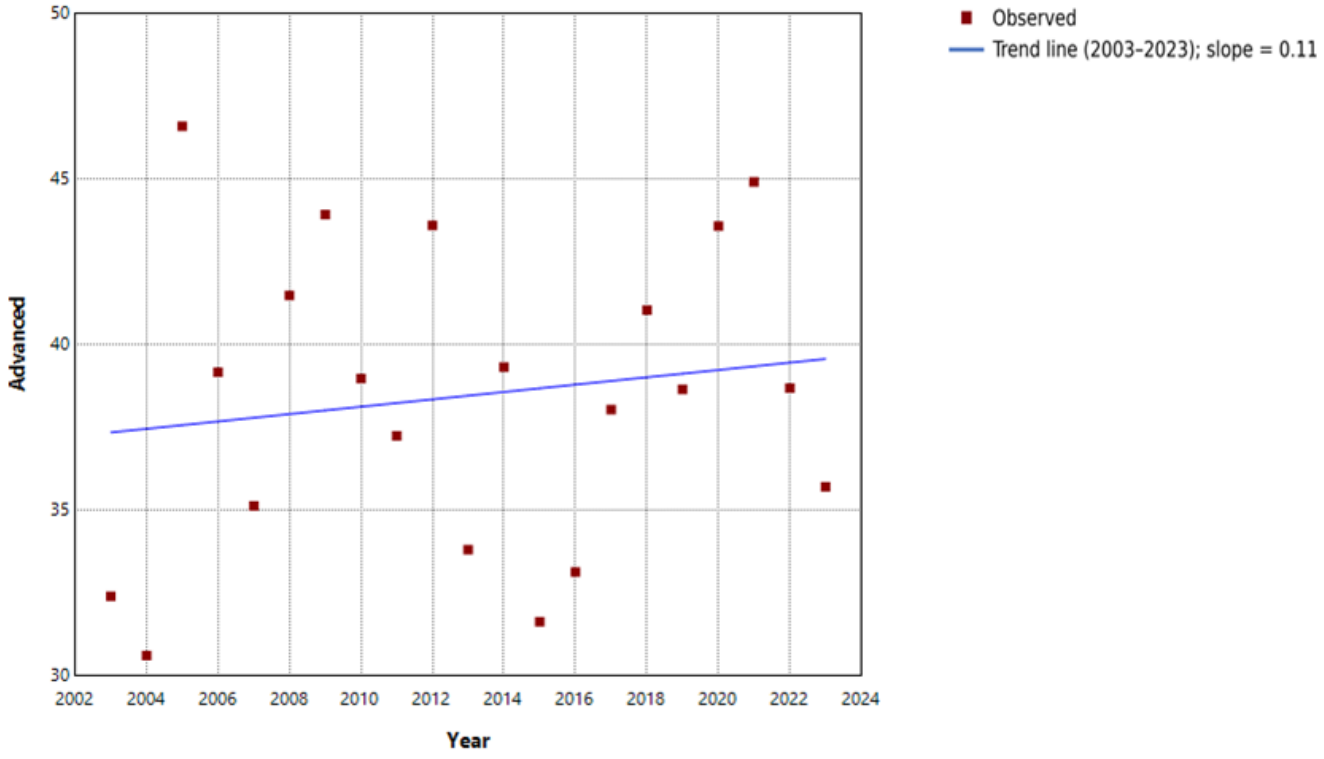
The distribution of clinical stages over the period remained relatively stable, with stage II predominating at diagnosis (Table 1). The temporal trend analysis using Joinpoint regression, considering the proportion of patients in advanced stages (III and IV), showed no significant variation over the study period (annual percentage change [APC]=0.11; p>0.05) (Figure 1).

A significant difference was observed in the distribution of clinical stages at diagnosis between the groups (p<0.001). Patients treated in the private system had a higher proportion of diagnoses at early stages (0 and I), while those treated in the SUS had a higher proportion of diagnoses at advanced stages (III and IV) (Figure 2).

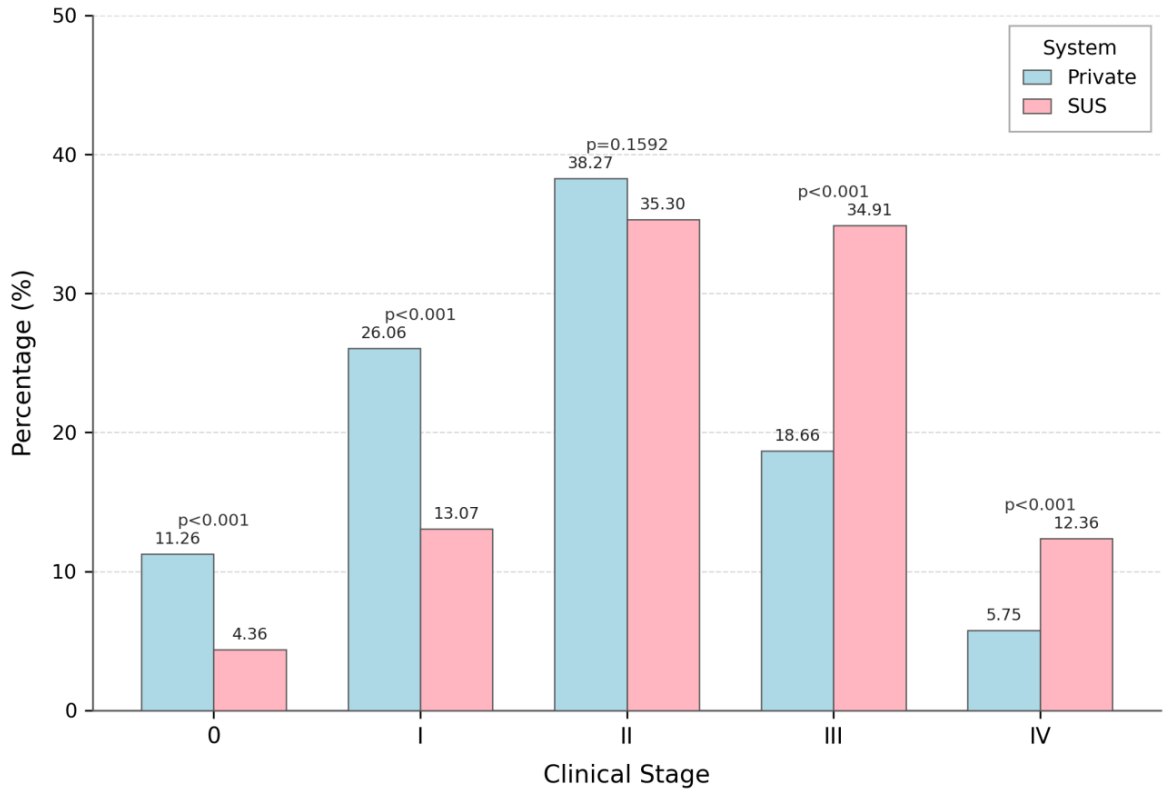
The most common histological type was non-special invasive ductal carcinoma, affecting 2,530 patients (81.22%). Next were ductal carcinoma *in situ*, with 234 patients (7.51%), and lobular carcinoma, with 228 patients (7.32%). The remaining histological types had lower incidences: mucinous carcinoma (0.93%), medullary carcinoma (0.42%), sarcoma (0.29%), Paget's disease (0.26%), metaplastic carcinoma (0.22%), and other types (1.86%) (Table 3).

DISCUSSION

The diagnosis of breast cancer in early stages is associated with a better prognosis and a higher probability of curative treatment, in addition to allowing for less aggressive therapeutic approaches with lower functional and economic impact. In the



Source: The authors.
Figure 1. Temporal trend of advanced stages of breast cancer (III–IV) at diagnosis (2003–2023).



Source: The authors.

Figure 2. Graph showing the proportions of clinical stages at diagnosis in the public and private healthcare systems.

Table 3. Morphological description.

Morphological/Description	Patients n (%)
Non-special type invasive ductal carcinoma	2,530 (81.22)
Ductal carcinoma *in situ*	234 (7.51)
Lobular	228 (7.32)
Mucinous	29 (0.93)
Medullary	13 (0.42)
Sarcoma	9 (0.29)
Paget's disease	8 (0.26)
Metaplasia	7 (0.22)
Other	57 (1.82)

Source: The authors.

present study, conducted at a regional referral oncology center that serves patients through both the SUS and private health insurance, a high proportion of diagnoses at non-early stages was observed throughout the analyzed period, with no consistent trend toward reduction over the years. This finding suggests that, despite advances in screening strategies and expanded access to healthcare services, significant challenges in the early detection of the disease persist. Late identification of breast cancer is associated with greater therapeutic complexity, higher healthcare costs, and worse clinical outcomes, reinforcing the need to strengthen population-based screening strategies and ensure timely access to diagnosis, especially in the context of public health[15].

In high-income countries, such as the United States, a higher proportion of diagnoses are made at early stages, with localized disease predominating, reflecting greater access to screening and early detection. Similarly, European countries with organized screening programs show a significant increase in the detection of tumors at early stages, especially *in situ* and stage I, associated with a reduction in advanced cases, reflecting the impact of mammographic screening on early detection. In contrast, in middle-income countries, such as Brazil, challenges related to access and diagnostic opportunities persist, contributing to a higher frequency of advanced stages at diagnosis[15-17] .

This scenario can be explained by structural limitations in mammographic screening in Brazil. Recent data show that screening coverage in the SUS remains extremely low, ranging from 1.3 to 15.9% of the target population, even in regions with greater availability of equipment. These findings suggest that low rates of early detection are not related solely to the availability of resources, but also to barriers to access, system organization, and the absence of effective population-based screening strategies. Furthermore, the predominance of larger lesions at diagnosis reinforces the hypothesis of delayed detection, contributing to a higher frequency of advanced stages among patients treated in the public system[18].

After analyzing the data collected throughout the study, it was observed that there was a predominance of women in the 50–64 age group, which reinforced the association between the increased incidence of breast cancer and aging. The study also demonstrated that there was no significant variation during the analyzed period, with the mean age ranging from 53.49 years (2018) to 57.91 years (2021). The overall mean age of 56.23 years over the study period was higher than that found in the study conducted at Erasto Gaertner Hospital in Curitiba (Paraná), which evaluated 5,117 patients diagnosed with the disease between 1990 and 2009 and found a mean age of 54 years[19].

Regarding the age groups affected by the disease, a pattern similar to that described in the AMAZONA III study was observed, which evaluated 2,950 patients in 23 Brazilian states between 2016 and 2018. In general, both studies showed a higher relative proportion of young patients treated in the private system, while the public system has a higher percentage of patients in older age groups. Although there are specific variations in age distributions, the overall trend remains consistent across the studies. The higher proportion of young patients in the private system may reflect differences in access to supplementary health care, since individuals of working age are more likely to have employment-based health insurance plans. This finding suggests the presence of a structural access bias between the systems, which should be considered in the comparative interpretation of the data[12].

A significant difference was also observed in the stage at diagnosis between patients treated in the public and private systems, especially in clinical stage III, in which 18.66% of patients with health insurance were diagnosed, compared to 34.91% of patients treated in the public system (Figure 2). This result is consistent with that observed in the AMAZONA III study, which also demonstrated a higher proportion of diagnoses at advanced stages among patients treated by the SUS, with 33.5% of cases at stage III, compared to 14.7% in the private system[12].

At the population level, Brazilian studies also show a high proportion of diagnoses at advanced stages, with significant regional variation associated with socioeconomic inequalities and the distribution of health services. In this context, regions with fewer healthcare resources and greater social inequality have a higher frequency of late diagnosis, reinforcing that staging at diagnosis is directly related to structural determinants of the healthcare system[20].

These findings suggest that the differences observed between the public and private systems are not limited to individual patient characteristics but primarily reflect the organization and efficiency of the health system, with stage at diagnosis serving as an indirect marker of the quality of early detection.

The most common histological type of breast cancer, as well established in the literature, is invasive ductal carcinoma, which accounts for more than 80% of cases, followed by lobular carcinoma[1]. This pattern was also observed in the present study, in which 81.22% of patients had invasive ductal carcinoma and 7.32% had lobular carcinoma. Furthermore, these results are consistent with data from a study conducted between 2003 and 2011 at the Barretos Cancer Hospital and the Ribeirão Preto Oncology Institute, which revealed that 87.0% of breast cancer cases were of the invasive ductal type, while 7.7% corresponded to the invasive lobular type[21].

One of the limitations of this study was the variability in the nomenclature of the same histological types across all medical records, which hindered the proper classification and grouping of the different histological types. Although different editions of the AJCC were used throughout the study period, the analysis was restricted to anatomical staging (stages 0–IV), which minimized potential classification bias. In future analyses, the inclusion of the molecular profile of the study population would provide data for a better assessment of outcomes in the public and private healthcare systems.

CONCLUSION

The findings of this study demonstrate the persistence of a high proportion of diagnoses at non-early stages over two decades, with no trend toward significant improvement. Furthermore, they highlight significant disparities in staging at diagnosis between the public and private systems, reflecting structural limitations in access to screening and timely diagnosis. These results reinforce the need to strengthen organized screening strategies and improve the integration of the healthcare network, especially within the public health system.

AUTHORS' CONTRIBUTIONS

GWBS: Data curation, Investigation, Methodology, Visualization, Writing – original draft. LRCR: Data curation, Formal analysis, Investigation, Writing – review & editing. FPM: Conceptualization, Funding acquisition, Methodology, Project administration, Supervision, Validation, Writing – review & editing.

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Artificial Intelligence usage: none.

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