EPIDEMIOLOGICAL PROFILE OF YOUNG WOMEN DIAGNOSED WITH BREAST CANCER TREATED AT A MASTOLOGY SERVICE IN THE FEDERAL DISTRICT

PERFIL EPIDEMIOLÓGICO DE MULHERES JOVENS COM DIAGNÓSTICO DE CÂNCER DE MAMA ATENDIDAS EM SERVIÇO DE MASTOLOGIA DO DISTRITO FEDERAL

PERFIL EPIDEMIOLÓGICO DE MUJERES JÓVENES CON DIAGNÓSTICO DE CÁNCER DE MAMA ATENDIDAS EN UN SERVICIO DE MASTOLOGÍA DEL DISTRITO FEDERAL

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ABSTRACT

Breast cancer remains one of the main public health challenges in Brazil, especially given the controversies related to the age of initiation of mammoFigureic screening. Although the guidelines of the Unified Health System (SUS) recommend population screening only from the age of 50, recent epidemiological evidence points to a significant incidence of the disease in younger women. In this context, the present study aimed to analyze the epidemiological, clinical, and diagnostic profile of women with breast cancer treated at a public mastology referral service in the Federal District, with an emphasis on the population under 50 years of age, contributing to the debate on the anticipation of screening to the age of 40. This is an observational, retrospective, cross-sectional, and descriptive study based on a review of medical records of patients treated at the mastology outpatient clinic of the Taguatinga Regional Hospital between January and December 2024. 171 cases of breast cancer were identified in women under 50 years of age, predominantly in the 40-49 age group. A high proportion of diagnoses at advanced stages, a high frequency of lymph node involvement,

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and a predominance of biologically aggressive tumor subtypes were observed, resulting in more invasive therapeutic approaches. The findings highlight a gap between the current screening policy and the observed epidemiological reality, reinforcing the need for a critical review of national guidelines and the implementation of organized early detection strategies starting at age 40.

Keywords: Breast Cancer. Young Women. Public Health Policies. Screening.

RESUMO

O câncer de mama permanece como um dos principais desafios da saúde pública no Brasil, especialmente diante das controvérsias relacionadas à idade de início do rastreamento mamográfico. Embora as diretrizes do Sistema Único de Saúde recomendem o rastreamento populacional apenas a partir dos 50 anos, evidências epidemiológicas recentes apontam para uma incidência significativa da doença em mulheres mais jovens. Nesse contexto, o presente estudo teve como objetivo analisar o perfil epidemiológico, clínico e diagnóstico de mulheres com câncer de mama atendidas em um serviço público de mastologia de referência no Distrito Federal, com ênfase na população com menos de 50 anos, contribuindo para o debate sobre a antecipação do rastreamento para os 40 anos. Trata-se de um estudo observacional, retrospectivo, transversal e descritivo, baseado na revisão de prontuários médicos de pacientes atendidas no ambulatório de mastologia do Hospital Regional de Taguatinga entre janeiro e dezembro de 2024. Foram identificados 171 casos de câncer de mama em mulheres com idade inferior a 50 anos, com predominância na faixa etária de 40 a 49 anos. Observou- se elevada proporção de diagnósticos em estágios avançados, alta frequência de comprometimento linfonodal e predominância de subtipos tumorais biologicamente agressivos, resultando em abordagens terapêuticas mais invasivas. Conclui-se que os achados evidenciam uma lacuna entre a política de rastreamento vigente e a realidade epidemiológica observada, reforçando a necessidade de revisão crítica das diretrizes nacionais e da implementação de estratégias organizadas de detecção precoce a partir dos 40 anos.

Palavras-chave: Câncer de Mama. Mulheres Jovens. Políticas Públicas de Saúde. Rastreamento.

RESUMEN

El cáncer de mama sigue siendo uno de los principales desafíos de salud pública en Brasil, especialmente dadas las controversias relacionadas con la edad de inicio del cribado mamográfico. Si bien las directrices del Sistema Único de Salud (SUS) recomiendan el cribado poblacional solo a partir de los 50 años, la evidencia epidemiológica reciente apunta a una incidencia significativa de la enfermedad en mujeres más jóvenes. En este contexto, el presente estudio tuvo como objetivo analizar el perfil epidemiológico, clínico y diagnóstico de las mujeres con cáncer de mama atendidas en un servicio público de referencia de mastología en el Distrito Federal, con énfasis en la población menor de 50 años, contribuyendo al debate sobre la anticipación del cribado hasta los 40 años. Se trata de un estudio observacional, retrospectivo, transversal y descriptivo basado en una revisión de las historias clínicas de pacientes atendidas en la consulta externa de mastología del Hospital Regional de Taguatinga entre enero y diciembre de 2024. Se identificaron 171 casos de cáncer de mama en mujeres menores de 50 años, predominantemente en el grupo de edad de 40 a 49 años. Se observó una alta proporción de diagnósticos en estadios avanzados, una alta frecuencia de afectación ganglionar y un predominio de subtipos tumorales biológicamente agresivos, lo que resultó en enfoques terapéuticos más invasivos. Los hallazgos resaltan una brecha entre la política actual de cribado y la realidad epidemiológica observada, lo que refuerza la necesidad de una revisión crítica de las directrices nacionales

y la implementación de estrategias organizadas de detección temprana a partir de los 40 años.

Palabras clave: Cáncer de Mama. Mujeres Jóvenes. Políticas de Salud Pública. Cribado.

1 INTRODUCTION

Breast cancer is one of the main contemporary public health challenges, both globally and nationally. It is the most common malignant neoplasm among women and the main cause of female cancer mortality in Brazil, imposing a significant social, economic, and care impact (INSTITUTO NACIONAL DE CÂNCER, 2022).

For the 2023–2025 triennium, 73,610 new cases are estimated annually in the country, with particularly high incidence rates in certain regions, such as the Federal District, where the coefficients exceed the national average (INSTITUTO NACIONAL DE CÂNCER, 2022).

In this context, early detection plays a central role in reducing mortality and improving clinical outcomes, since diagnosis in the early stages enables less invasive interventions and longer survival. MammoFigurey screening is widely recognized as the main population-based strategy to achieve this goal, and has been systematically adopted in several countries (REN et al., 2022). However, the definition of the ideal age for the start of screening remains the subject of intense debate, especially in the Brazilian scenario.

In Brazil, Technical Note No. 626/2025-CGCAN/DECAN/SAES/MS established the standardization of access to mammoFigurey in the Unified Health System, maintaining the recommendation of biennial population screening for women aged 50 to 74 years and ensuring access to the exam for women aged 40 to 49 years through individualized clinical evaluation. Despite this advance, systematic screening remains formally directed to the older age group. In contrast, leading Brazilian medical societies, such as the Brazilian College of Radiology and Diagnostic Imaging, the Brazilian Society of Mastology, and the Brazilian Federation of Gynecology and Obstetrics Associations, recommend annual screening from the age of 40 for all women, based on contemporary clinical and epidemiological evidence (URBAN et al., 2023).

The relevance of this debate is amplified by data that indicate an increasing incidence of breast cancer in younger women. In Brazil, a significant portion of diagnoses occur before the age of 50, which suggests that a screening policy restricted to older age groups may result in late diagnosis for a significant contingent of the female population. At the same time, there is a trend in the international scenario to revise traditional guidelines, with emphasis on the recent update of the U.S. Preventive Services Task Force, which began to recommend screening from the age of 40, in response to the increase in incidence in this age group and the mortality disparities observed (U.S. PREVENTIVE SERVICES TASK FORCE, 2024).

Given this scenario, it is essential to produce evidence contextualized to the Brazilian reality, especially in regions of high incidence, which subsidizes the review and improvement of current screening strategies. In this context, the present study analyzes data from a public reference mastology service in the Federal District, articulating them with national epidemiological information and international guidelines, with the objective of characterizing the epidemiological profile of young women diagnosed with breast cancer and contributing to the discussion on the anticipation of the age of initiation of screening in Brazil, in addition to offering subsidies for the planning of public policies aimed at the diagnosis, treatment and follow-up of this population.

2 THEORETICAL FRAMEWORK

Breast cancer is recognized in the scientific literature as a neoplasm of high epidemiological relevance and social impact, whose global burden remains on the rise. It is the most frequently diagnosed cancer among women worldwide, with a significant impact in countries at different levels of development, reflecting structural inequalities in access to prevention, early diagnosis, and timely treatment (SUNG et al., 2021). In Brazil, the disease occupies a central position in the profile of female morbidity and mortality, reinforcing the need for effective public policies aimed at early detection (INSTITUTO NACIONAL DE CÂNCER, 2022).

Early detection of breast cancer involves complementary strategies, which include timely diagnosis of symptomatic cases and population-based screening of asymptomatic women. Among these approaches, mammoFigureic screening has been consolidated as the main public health instrument for reducing specific mortality, especially when implemented in an organized, systematic manner and with wide population coverage (BROEDERS et al., 2012). Evidence from observational studies and systematic reviews demonstrates that structured screening programs are associated with the identification of the disease in early stages, the reduction of the need for aggressive treatments, and the improvement of clinical outcomes (REN et al., 2022).

Despite the recognition of its benefits, mammoFigureic screening remains the subject of debate regarding the definition of the ideal age for its onset. In Brazil, official guidelines from the Ministry of Health adopted a conservative approach, recommending biennial population screening for women between 50 and 74 years of age. This guidance is based, above all, on cost-effectiveness analyses and concern about potential harms associated with overdiagnosis and false positives, such as anxiety, unnecessary procedures, and additional exposure to radiation (MIGOWSKI et al., 2018; MINISTRY OF HEALTH, 2025).

On the other hand, national and international medical societies have advocated the anticipation of screening for women over 40 years of age, based on contemporary epidemiological evidence and technological advances that have increased the accuracy of diagnostic methods. In Brazil, the Brazilian College of Radiology and Diagnostic Imaging, the Brazilian Society of Mastology, and the Brazilian Federation of Gynecology and Obstetrics Associations recommend annual screening from the age of 40, highlighting the increased incidence of the disease in this age group and the potential benefit of early detection (URBAN et al., 2023).

One of the main axes of this controversy lies in the progressive growth in the incidence of breast cancer in women under 50 years of age. Brazilian studies indicate that a significant portion of diagnoses occur in this age group, often associated with tumors with more aggressive biological behavior and diagnosis in more advanced stages, which translates into worse prognosis and greater impact on morbidity and mortality (PINHEIRO et al., 2013; SANTOS et al., 2025). These findings call into question the adequacy of guidelines based predominantly on historical data, which may not fully reflect the current epidemiological reality.

In the international scenario, there is a consistent trend towards revision of mammoFigureic screening policies. The update of the U.S. Preventive Services Task Force recommendations in 2024, by indicating the start of screening from the age of 40 for women at usual risk, exemplifies the incorporation of new evidence on incidence, mortality, and racial and socioeconomic inequalities in public health decision-making processes (U.S. PREVENTIVE SERVICES TASK FORCE, 2024). European and Asian guidelines have also evolved towards greater flexibility and adaptation to local epidemiological characteristics, considering the availability of more accurate diagnostic technologies and organized screening strategies (EUROPA DONNA, 2024).

In Brazil, however, the coexistence of divergent recommendations between government agencies and medical societies has resulted in a fragmented model of access to screening for women between 40 and 49 years of age. Technical Note No. 626/2025 of the Ministry of Health, by stating that the Unified Health System does not restrict access to mammoFigurey for this age group through professional guidance, introduces a relevant ambiguity in the early detection policy. Although formal access is not prohibited, these women remained excluded from an organized and active population screening program, with systematic calling, monitoring of indicators, and institutional guarantee of access.

This approach configures an essentially passive policy, in which the initiative for screening is transferred to the patient and the health professional, without the support of

structured strategies that ensure equity and population effectiveness. In practice, this model tends to favor women with a higher level of information, better access to health services, and regular medical follow-up, while maintaining significant barriers for those in situations of greater social vulnerability. The literature is consistent in pointing out that screening programs based exclusively on spontaneous demand have a lower impact on reducing mortality when compared to organized models (MIGOWSKI et al., 2018).

Thus, an important gap is evident between the public policy in force until then and the contemporary epidemiological reality, particularly in regions with a high incidence of breast cancer, such as the Federal District. Studies conducted in public referral services play a strategic role in providing empirical data on the profile of women diagnosed outside the age range covered by the recently implemented population screening.

The analysis of these data contributes substantially to the scientific and institutional debate on the anticipation of the age of initiation of mammoFigureic screening, offering technical support for the revision of national guidelines and for the formulation of public policies that are more aligned with current evidence.

3 METHODS

This is an observational, retrospective, cross-sectional, quantitative and descriptive study, carried out through the review of medical records of patients treated at the mastology outpatient clinic of the Regional Hospital of Taguatinga (HRT/DF), a reference service of the public health network of the Federal District. Consultations carried out from January 1, 2024 to December 31, 2024, with consultation of complementary records from the institution's infirmary and gynecology outpatient clinics, when necessary, were included.

Initially, for the sample calculation, the total number of consultations performed at the mastology outpatient clinic of the HRT/DF in 2024 was considered, which corresponded to 2,702 records. However, after a detailed analysis of the productivity reports, a conceptual error was identified in this procedure, since this total included multiple visits to the same patient, a frequent situation in specialized services that perform longitudinal follow-up.

By disregarding repetitions and counting each patient only once, it was found that the actual number of unique patients seen in the period was 1,438. The observed duplication rate was 46.8%, reflecting the nature of specialized care, in which successive returns are necessary for diagnostic investigation, clinical follow-up, and therapeutic definition.

Based on epidemiological data from the National Cancer Institute, it is estimated that the incidence of breast cancer in the Federal District is approximately 1,030 new cases per year, with a rate of 49.76 cases per 100 thousand women. Considering that the mastology

outpatient clinic is a referral service for patients with clinical suspicion or imaging abnormalities, based on the prevalence described in similar secondary and tertiary services (15–30% of diagnostic confirmation), we adopted the estimate that approximately 20% of the patients treated have a confirmed diagnosis of breast cancer.

Thus, the estimated target population for the study was approximately 287 patients diagnosed with breast cancer in 2024, obtained from the number of unique patients treated in the period (1,438 × 0.20).

To ensure a confidence level of 95% and a margin of error of 5%, the sample size calculation for finite populations was used, adopting an expected proportion of 50% (p = 0.5), as this is the most conservative estimate. The sample size was calculated using the following equation:

$$N = (Z^2 \times p \times (1 - p) \times N) / (e^2 \times (N - 1) + Z^2 \times p \times (1 - p)) \quad (1)$$

In the formula used, *n* represents the sample size; *Z*, the value of the normal distribution corresponding to 95% confidence (1.96); *p*, the expected proportion of the event; *and*, the margin of error (0.05); and *N*, the total population (287). The calculation indicated the minimum need of 165 young patients with a confirmed diagnosis of breast cancer to ensure statistical representativeness.

The correction of the previously identified conceptual mistake led to the readjustment of the estimated number, with a reduction of 60 cases (26.7%) in relation to the initial value. This methodological review provided greater accuracy and better correspondence with the population effectively served, preserving the scientific validity, analytical power, and reliability of the findings.

Female patients treated at the mastology outpatient clinic of the HRT/DF in the established period, with a confirmed histopathological diagnosis of breast cancer, were included in the study. Patients aged 50 years or older at the time of diagnosis, absence of histopathological report, medical records with incomplete information for the variables analyzed, and cases characterized as loss to follow-up, defined as absence of clinical records after the initial diagnosis, were excluded.

Data were collected from medical records, using a standardized instrument, including sociodemoFigureic and clinical variables, including age at diagnosis, use of hormonal contraceptives, presence of comorbidities, smoking, alcoholism, family history of breast cancer, imaging findings according to the BI-RADS classification, histopathological type,

tumor grade, immunohistochemical profile, clinical staging according to the TNM system, and therapeutic conduct instituted.

As this is a retrospective study based on a review of medical records, limitations related to the quality, completeness, and standardization of the available clinical records are recognized, as well as the impossibility of controlling for variables not documented in the analyzed medical records.

4 RESULTS AND DISCUSSION

In 2024, the mastology outpatient clinic of the Regional Hospital of Taguatinga (HRT/DF) treated 1,438 patients. In the area of breast cancer at a young age, 171 diagnoses were identified in women under 50 years of age. This result allowed us to characterize an epidemiological and clinical-pathological profile of high relevance in a public reference service, bringing direct implications for the discussion on early detection in women under 50 years of age.

By revealing expressive diagnoses outside the age group included in the population screening, the findings expose the gap between current public policy and the epidemiological reality in the Federal District.

Next, the results are presented in a systematic way, organized into thematic sections, presenting the main characteristics observed in the study.

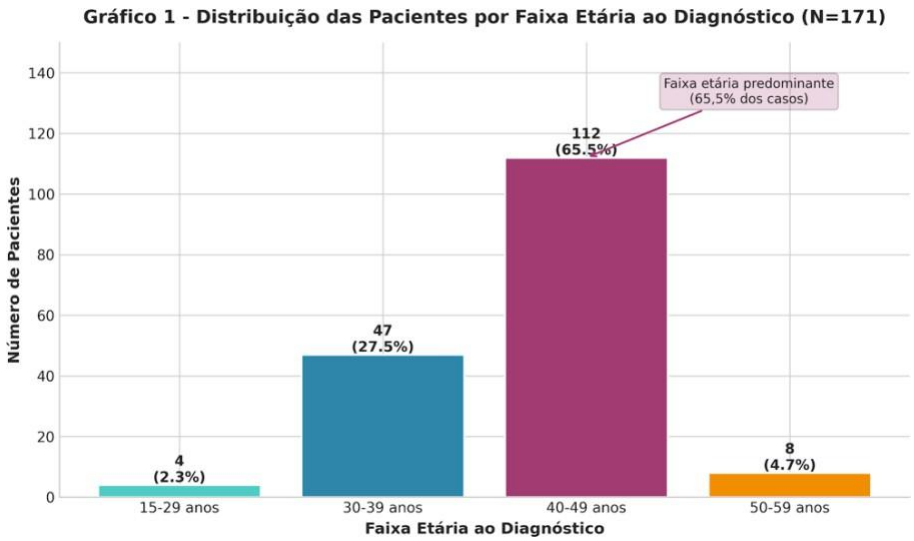
4.1 DEMOFIGUREIC PROFILE

Figure 1 shows the number of diagnoses before the age of 50, especially in the 40–49 age group, which brought together **112 cases** (65.5%) of the total analyzed (N=171). This pattern is pertinent, as it demonstrates a relevant number of diagnoses in the age group closest to the threshold currently adopted for organized screening from the age of 50 onwards.

Breast cancer cases in the 30–39 age group reinforce that the service serves a relevant contingent of young women with an established disease, which increases the importance of sensitive care flows for clinical suspicion and rapid access to diagnostic confirmation. As for the results of patients aged 50 years (8 cases; 4.7%), although the main focus of the study was <50 years, this data reflects the inclusion of a borderline range for comparison; But it does not change the central finding: the case load is concentrated in 40–49 years.

Figure 1

Distribution of patients by age group at diagnosis, showing the concentration of cases in the 40-49 age group (65.5%)



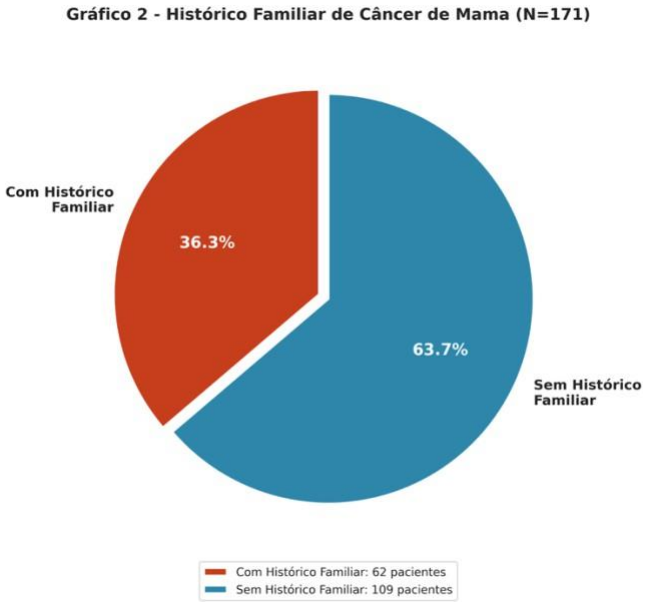
Source: Prepared by the authors (2026).

4.2 FAMILY HISTORY

In Figure 2, the analysis of family history revealed that 36.3% (62 patients) had at least one first- or second-degree relative diagnosed with breast cancer, which raises a reflection on the increased genetic risk in the population studied.

Figure 2

Distribution of patients according to family history of breast cancer



Source: Prepared by the authors (2026).

This result reinforces that the absence of a family history does not exclude significant risk and, therefore, strategies based only on "family risk screening" are insufficient to capture most cases in this population.

We sought to collect data on genetic investigation, including referral for specialized evaluation and testing for germline mutations associated with breast cancer. However, there was limited access to consultation with a geneticist in the Unified Health System (SUS), especially among patients with a recent diagnosis who were still waiting for care during a collection. This restriction may have compromised the completeness of information on genetic profile, constituting a limitation of the study and evidencing obstacles to the incorporation of strategies based on genetic risk in public practice.

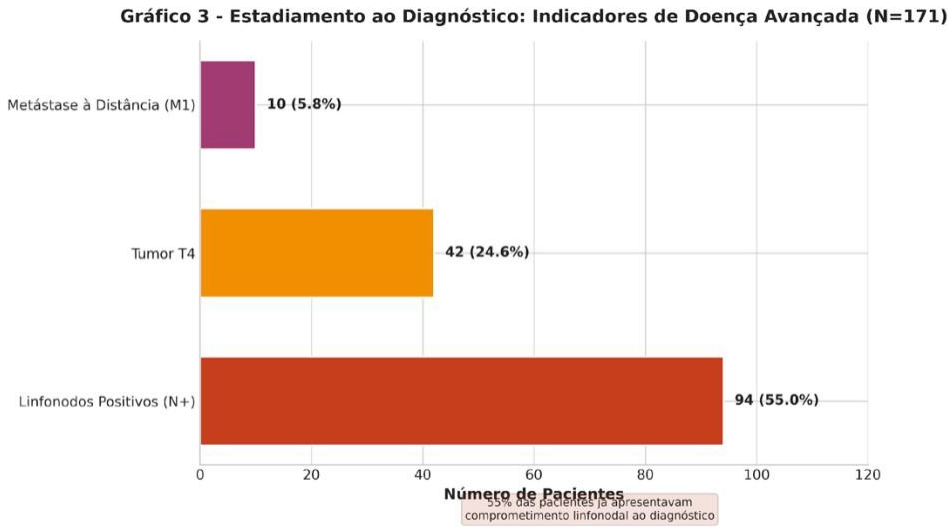
4.3 ADVANCED STAGING AND AGGRESSIVE BIOLOGICAL PROFILING

Another relevant finding reported in Figure 3 indicates the advanced stage of the disease at the time of diagnosis, **a direct indicator of failure in early detection**. Approximately 94 patients (55.0%) already had lymph node involvement (N+), which is a classic indicator of higher tumor burden and worse prognosis.

These results reinforce that, in the scenario studied, a relevant part of the patients arrive at the service with an established disease, increasing the therapeutic complexity and the potential for unfavorable outcomes.

Figure 3

Staging indicators at diagnosis, showing the high rate of lymph node involvement (55%) and the low proportion of stage I diagnoses (20.5%)

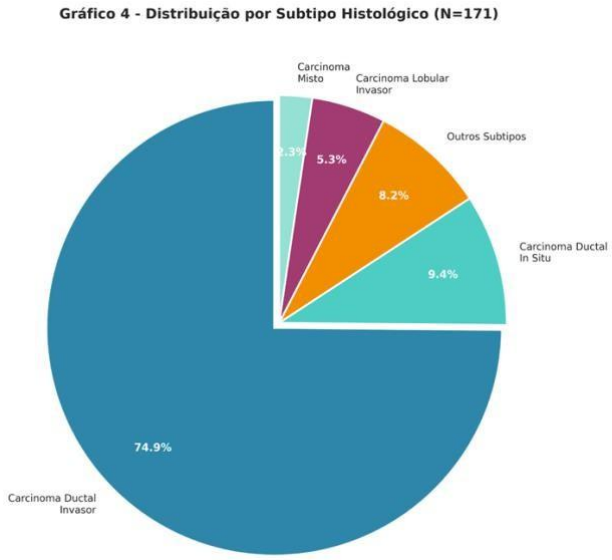


Source: Prepared by the authors (2026).

In addition, late diagnosis is aggravated by the high prevalence of histological and molecular subtypes of aggressive behavior. As shown in Figure 4, there was a predominance of the histological type: Invasive Ductal Carcinoma (CDI), corresponding to 74.9% of the cases.

Figure 4

Distribution of patients by histological subtype, with a predominance of Invasive Ductal Carcinoma (74.9%)



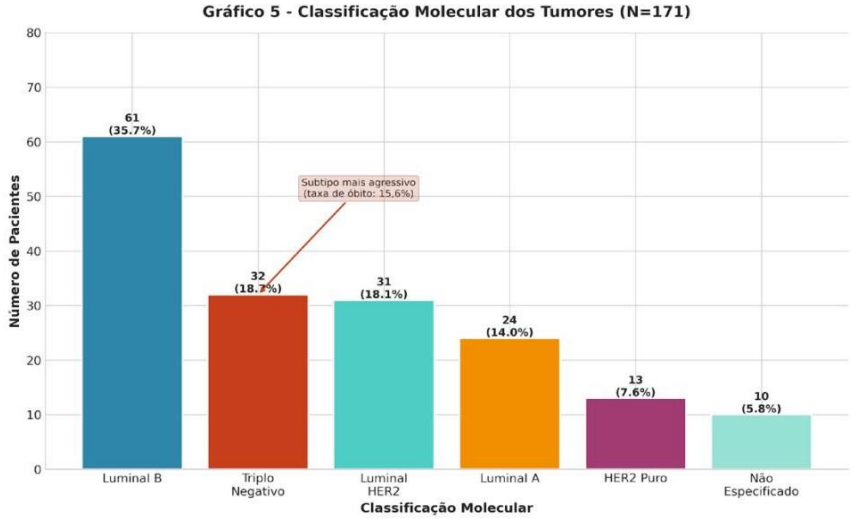
Source: Prepared by the authors (2026).

4.4 MOLECULAR CLASSIFICATION OF TUMORS

The analysis of the immunohistochemical profile for directing the therapy revealed a high frequency of biologically aggressive tumors (Figure 5).

Figure 5

Distribution of patients by molecular classification, highlighting the prevalence of Luminal B (35.7%) and Triple-Negative (18.7%)



Source: Prepared by the authors (2026).

Although the Luminal B subtype is the most prevalent (35.7%), there is a significant proportion of subtypes associated with a higher risk of recurrence and a greater need for systemic treatment. In this context, the subtypes with the worst prognosis (Luminal HER, Pure HER, and Triple-Negative) corresponded to 44.4% of all diagnosed cases. The Triple-Negative subtype totaled 18.7% and corresponds to the most aggressive subtype, with rapid growth and absence of hormonal or anti-HER2 therapeutic targets, being more common in young women and associated with a more reserved prognosis.

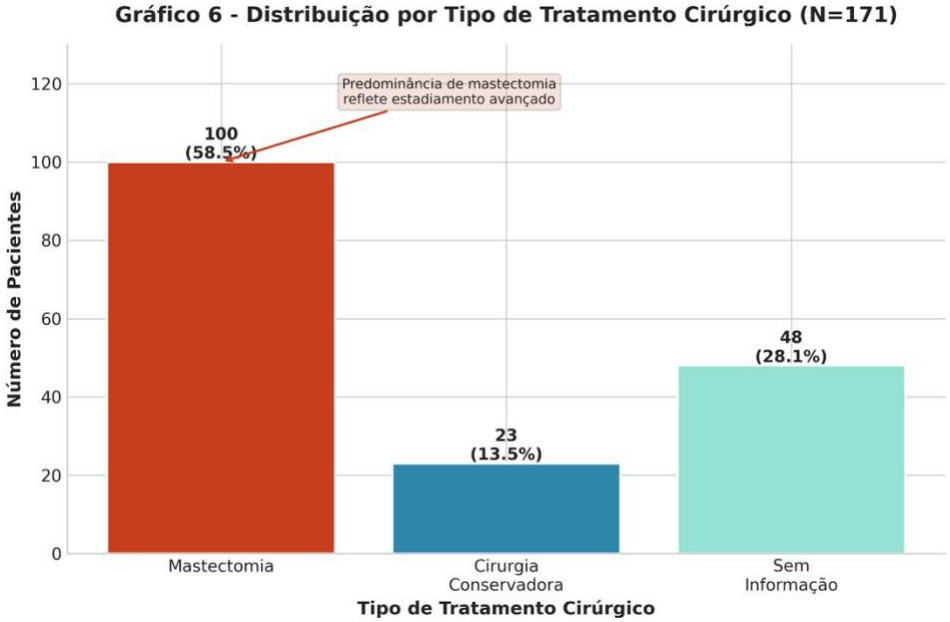
4.5 THERAPEUTIC IMPLICATIONS

Regarding the treatment instituted, it was noted that the diagnosis in advanced stages and the prevalence of aggressive tumors had a direct impact on the therapeutic approach, as described in Figure 6.

Mastectomy was performed in 100 patients (58.5%), while conservative surgery occurred in 23 cases (13.5%). In 48 medical records (28.1%) there was no recorded information about the procedure, which indicates limited data completeness and requires caution in the interpretation of proportions.

Figure 6

Distribution of patients by type of surgical treatment, demonstrating the predominance of mastectomy (58.5%)



Source: Prepared by the authors (2026).

It is important to highlight that it was not possible to systematically obtain specific data regarding the axillary approach, including sentinel lymph node biopsy or axillary dissection. The absence of this information prevents a more detailed analysis of the regional management of the disease and its correlation with staging and prognosis, which is an additional limitation of the study.

The high mastectomy rate observed suggests an association with greater tumor extension and lymph node involvement at diagnosis, reflecting a possible loss of opportunity for conservative interventions.

In addition, a significant portion of the patients underwent systemic therapies, such as neoadjuvant and/or adjuvant chemotherapy, with a recognized impact on morbidity and quality of life.

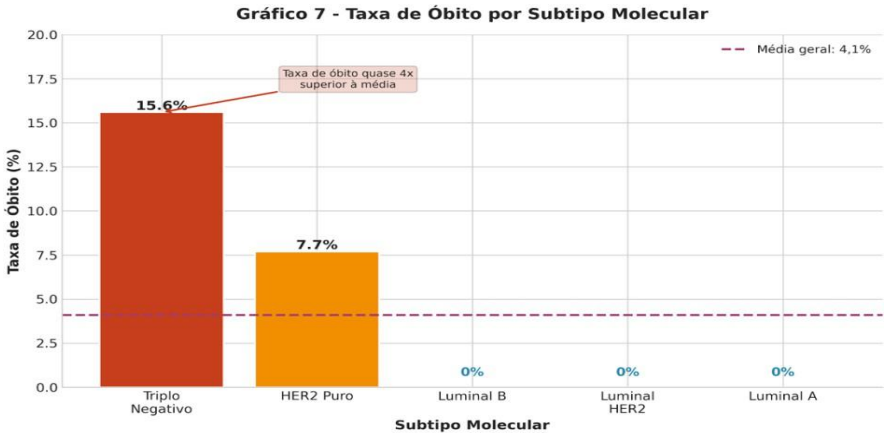
Therefore, the standard of care indirectly reinforces the central hypothesis that late detection may increase the need for more aggressive interventions, supporting the discussion on anticipation and organization of screening to expand the diagnosis into phases that can be managed conservatively.

4.6 CLINICAL OUTCOMES: MORTALITY ASSOCIATED WITH BIOLOGICAL AGGRESSIVENESS

During the follow-up period analyzed, the overall death rate was 4.1% (7 deaths) and this negative outcome was not homogeneously distributed among the molecular subtypes in the cohort analyzed.

Figure 7

Death rate by molecular subtype, evidencing the dramatic disparity of the Triple-Negative (15.6%) compared to the overall cohort average (4.1%)



Source: Prepared by the authors (2026).

Finally, during data collection, we sought to include the analysis of modifiable risk factors, such as the use of hormonal contraceptives, smoking, alcoholism, and the presence of comorbidities. However, the sample referring to these variables was impaired due to the incomplete recording of information in medical records, which made it impossible to perform an adequate analysis and the consistent application of these data to the present study.

5 CONCLUSION

The present study demonstrated that breast cancer in women under 50 years of age represents a clinically and epidemiologically relevant contingent in care practice, evidencing an epidemiological profile of young patients, with an increased incidence of positive family history for breast cancer and without adequate access to genetic testing, advanced tumors highlighting frequent axillary involvement, more aggressive molecular subtypes and with a greater association with increased mortality.

In 2024, among 1,438 unique patients seen at the mastology outpatient clinic of the HRT/DF, 171 diagnoses were identified in women <50 years old, with a clear predominance in the 40–49 age group (65.5%). This finding supports, based on local empirical evidence, that population-based screening guidelines initiated only at the age of 50 years tend to

exclude a significant portion of cases diagnosed in the service, precisely in the age decade that is at the center of the debate on anticipation of screening. Patients at risk left out of active screening is not just a statistical data, it is the visual representation of a systemic failure in the SUS.

Taken together, the results point to a gap between the public policy in force until then and the epidemiological reality observed in the Federal District, reinforcing the need for a critical review of the national guidelines for early detection.

Although the study is limited by the retrospective design and by the loss of information inherent to medical records, its results provide concrete subsidies for institutional reflection and for the improvement of screening and early diagnosis strategies in the SUS, especially regarding the effective and organized inclusion of women in the 40-49 age group.

Despite these limitations, the study fulfills a strategic function: it exposes the distance between the passive policy (dependent on search/referral) and the observed epidemiology. By demonstrating a large concentration of cases in the age group between 40 and 49 years, a high frequency of advanced disease, and a significant presence of more aggressive subtypes, the data offer subsidies to discuss the transition from a model that "does not prohibit" mammoFigurey under 50 years of age to an organized, active, and equitable model of early detection.

In practice, this implies carefully considering the anticipation of mammoFigureic screening, at least from the age of 40, accompanied by planning of diagnostic capacity, ensuring adequate follow-up, and systematic monitoring of indicators, especially in regions with high incidence, such as the Federal District. It is noteworthy, however, that the conclusions of this study were based on the scope of secondary prevention. Thus, it is recommended that research be developed to identify risk factors associated with increased breast cancer incidence in young women, in order to support the implementation of effective primary prevention strategies.

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