

Original Article

Evolution of mammographic screenings and impact on early diagnosis of breast cancer at the University Hospital of Alessandria: a comparison between 2019 and 2023

Evoluzione degli screening mammografici e impatto sulla diagnosi precoce del cancro al seno presso l'Azienda Ospedaliero-Universitaria di Alessandria: un confronto tra il 2019 e il 2023

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Key words: breast cancer, screening service, breast unit.

ABSTRACT

Background: Breast Cancer (BC) is one of the most common cancers in women, with its incidence increasing with age. Early detection through screening programs is crucial for improving treatment outcomes.

Materials and Methods: this study evaluates the outcomes of the Breast Unit at the University Hospital of Alessandria (AOU AL), established in 2020, in collaboration with the “Prevenzione Serena” Breast Cancer Screening Service of Local Health Authority of Alessandria and compares data from 2019 and 2023 to assess improvements in early detection and surgical interventions. Seven women were treated in 2019, whereas 51 received surgery in 2023. Data from the Oncological Screening Information System (SIOSOweb), Trackcare InterSystem, and the Quality of Breast Cancer Treatment Form (SQTM) were analyzed.

Results: the results show an increase in screening participation (46.8% in 2019 to 58% in 2023) and an increase in early-stage tumor detection. Smaller tumors (pT1) were detected more frequently, rising from 50% in 2019 to 83% in 2023. Sentinel Lymph Node Biopsy (SNB) remained the most common procedure, although node-free tumors slightly decreased.

Conclusions: the data highlight the importance of the “Prevenzione Serena” screening program and the establishment of the Breast Unit at AOU AL in improving the early diagnosis and management of BC. The study underscores the significance of a multidisciplinary approach to BC care and suggests that continuous investment in screening and specialized units is essential for improving patient outcomes.

Background: il cancro al seno è uno dei tumori più comuni nelle donne, con un'incidenza che aumenta con l'età. La diagnosi precoce attraverso i programmi di screening è fondamentale per migliorare gli esiti terapeutici.

Materiali e Metodi: questo studio valuta i risultati della Breast Unit dell'Azienda Ospedaliero-Universitaria di Alessandria (AOU AL), istituita nel 2020, in collaborazione con il Servizio di Screening per il Cancro al Seno “Prevenzione Serena” dell'Azienda Sanitaria Locale di Alessandria (ASL AL) e confronta i dati del 2019 e del 2023 per valutare i miglioramenti nella diagnosi precoce e negli interventi chirurgici. Nel 2019, 7 donne sono state trattate, mentre nel 2023 il numero è salito a 51. I dati provenienti dal Sistema di Informazione Oncologica (SIOSOweb), Trackcare InterSystem e il Modulo di Qualità del Trattamento del Carcinoma Mammario (SQTM) sono stati analizzati.

Risultati: i risultati mostrano un aumento della partecipazione allo screening (dal 46,8% nel 2019 al 58% nel 2023) e un incremento nella rilevazione di tumori in stadio precoce. I tumori più piccoli (pT1) sono stati rilevati con maggiore frequenza, passando dal 50% nel 2019 all'83% nel 2023. La biopsia del linfonodo sentinella è rimasta la procedura più comune.

Conclusioni: i dati sottolineano l'importanza del programma di screening “Prevenzione Serena” e l'istituzione della Breast Unit presso l'AOU AL nel migliorare la diagnosi precoce e la gestione del tumore al seno. Il lavoro evidenzia l'importanza di un approccio multidisciplinare nella cura del carcinoma mammario e suggerisce che investimenti continui in programmi di screening e in unità specializzate siano essenziali per migliorare i risultati per le pazienti.

Introduction

Breast Cancer (BC) is one of the most common malignant tumors in women,¹ with its incidence increasing with age. Over 80% of cases are diagnosed in women over the age of 50.² In 2020, female breast cancer became the most frequently diagnosed cancer worldwide, with approximately 2.26 million new cases.³ Projections suggest that by 2040, the annual number of new cases could exceed 3 million.⁴

Most breast cancers originate from alterations in breast cells, usually beginning in the cells lining the milk ducts, leading to ductal carcinoma.⁵ Lobules, which are responsible for milk production, can also give rise to lobular carcinoma. Both types may be *in situ* (confined to the site of origin) or invasive if they have spread to surrounding tissues.⁶

The risk of developing breast cancer is influenced by a combination of genetic, hormonal, and lifestyle factors. Genetic and hormonal factors account for 40% of its prevalence in women, while lifestyle factors contribute the remaining 60%.⁷ Multidisciplinary research efforts to improve the effectiveness of primary prevention (modification of risk factors), secondary prevention (early detection and timely initiation of treatment), and tertiary prevention (monitoring) are essential to reducing BC incidence, as well as its mortality, morbidity, and economic burden.⁸

Women aged 45 to 74 are eligible for mammography through the Breast Cancer Screening Program (BCSP), which aims to detect the disease at an early stage when treatment is more likely to be effective.⁹ In Italy, the specialized healthcare model for diagnosing and treating breast lesions is the Breast Unit (BU), which provides comprehensive, multidisciplinary care for BC patients. This includes services for prevention, genetic counseling, treatment of primary tumors, accurate cancer surveillance, and management of metastatic disease, as well as supportive, palliative, psychosocial rehabilitation, and survivorship care.^{10,11}

Over the past 25 years, growing evidence has shown that BC patients treated in dedicated BUs by specialized teams experience better long-term oncological outcomes, leading to significant survival benefits.¹² The goal of BUs is to establish a personalized and comprehensive care pathway tailored to each patient's needs. In Italy, BUs were established following the «Guidelines for Organizational and Care Methods of Breast Centers,» developed by a group of experts appointed by the Ministry of Health and subsequently approved by the State-Regions Conference in 2014.¹³

These units are required to manage at least 150 new BC cases annually and meet the technical standards set by the European Society of Breast Cancer Specialists (EUSOMA).¹⁴ At the University Hospital of Alessandria (AOU AL), where all the specialties needed to form a BU were already present, a Departmental Breast Surgery Structure (BSS) was established on September 15, 2020, completing the necessary team.¹⁵ Since then, the collaboration between Breast Surgery and the Service of Local Health Authority of Alessandria Screening Program («Prevenzione Serena Screening,» PSS, ASL AL) for BC has intensified.

In addition to breast lesion screening, the Prevenzione Serena program also focuses on the prevention and early detection of cervical and colorectal cancers. The PSS screening program invites all women aged 45 to 74 years, including both Italian and foreign residents who are registered with the regional health registry.¹⁶ This approach aims to reduce socio-economic disparities among

women,^{17,18} as some studies indicate that women with higher socioeconomic status and education levels are more likely to receive early diagnoses and have better access to effective and timely care.¹⁹

The BCSP plays a critical role in identifying asymptomatic cancers, with the primary objective of allowing women to undergo less invasive treatments (by detecting smaller tumors), which leads to improved outcomes. Smaller tumors tend to have less metastatic potential, are more amenable to conservative breast and axillary surgery, and generally require fewer aggressive treatments, such as chemotherapy. As a result, this leads to reduced treatment-related morbidity and improved survival rates.²⁰

Diagnostic mammography, which uses low doses of radiation to obtain images of the breast, is an essential tool for investigating unexpected findings from clinical exams or screening mammograms.²¹ Double reading in BCSP can help reduce false-positive recall rates while increasing cancer detection rates. This approach involves two independent readers reviewing a woman's mammograms without knowledge of each other's findings, along with an effective system for resolving any disagreements.¹²

The panel recommends using tomosynthesis instead of additional mammographic projections for women at average risk of BC who are called back for further evaluation due to suspicious findings on screening mammography.²² Cancer confirmation is achieved through biopsy, which allows for the analysis of tissues or cells. The choice of biopsy technique depends on the palpability of the lesion and may be guided by ultrasound or mammography to ensure precision.²³

Preoperative percutaneous biopsy (Core Needle Biopsy, CNB; Vacuum-Assisted Biopsy, VAB) is the preferred diagnostic method for evaluating screen-detected or clinically evident breast lesions, enabling the development of a tailored treatment plan, ideally in a single procedure. This technique is a key component of the diagnostic triad (clinical assessment, imaging, and histology), providing essential information to guide treatment planning.²⁴

Preoperative histological diagnosis offers several advantages: i) it determines the nature of the lesion, avoiding surgery for most benign lesions; ii) it allows for personalized treatment planning, as it helps establish whether the carcinoma is *in situ* or invasive, and provides details on the histological type and grade of the tumor; iii) it helps establish key prognostic and predictive indicators (receptor status, proliferation index, Her-2), which are crucial for decisions regarding systemic therapy before surgery.²⁴

Preoperative histological diagnosis should always be evaluated by a multidisciplinary team, which, by correlating clinical and radiological data, must confirm its representativeness. In cases of discordance, such as when a benign histological diagnosis is found alongside a suspicious radiological image, the radiologist will determine whether a repeat biopsy is necessary, possibly with a larger needle, to ensure a comprehensive preoperative diagnosis is presented at the multidisciplinary meeting.²⁴

BC diagnostic protocols categorize lesions into five main groups, each indicating different levels of malignancy risk. B1 represents normal or inadequate tissue, containing benign tissue without significant lesions. B2 includes benign lesions, such as fibroadenomas and fat necrosis. B3 encompasses lesions with uncertain malignant potential, including morphologically benign but complex lesions, such as papillomas, and lesions at higher risk of progression, such as atypical ductal hyperplasia. B4 consists of suspicious lesions with a strong suspicion of malignancy, although

a conclusive diagnosis may be hindered by limited sample quality or artifacts. B5 confirms malignancy and includes various forms of ductal carcinoma and rare neoplasms. Within B5, B5a represents *in situ* carcinomas where the invasive nature cannot be confirmed, B5b includes infiltrating carcinomas and less common neoplasms, and B5c refers to rare cases where the invasive status is unclear.²⁴

Following diagnosis, the TNM staging system evaluates the extent of cancer. «T» represents the size and invasion level of the primary tumor, ranging from Tis (*in situ*) to T4 (indicating invasion into the chest wall or skin). «N» assesses lymph node involvement, classified from N0 (no involvement) to N3 (extensive spread). «M» signifies metastasis, with M0 indicating absence and M1 confirming the presence of distant metastasis. Staging is crucial for predicting outcomes and guiding treatment decisions.²⁵

A key factor in determining treatment strategies is the presence or absence of Estrogen Receptors (ER), Progesterone Receptors (PR), and Human Epidermal Growth Factor Receptor 2 (HER2) in cancer cells.²

Therapeutic options for operable patients (*i.e.*, those who are not metastatic at diagnosis, have no medical contraindications to surgery, and do not have disease extending beyond the breast area) are primarily surgical. Surgical options can be categorized into two main groups: Breast-Conserving Surgery (BCS), including Partial Mastectomy (PM or QUAD) and Oncoplastic Surgery (OPS), and mastectomy, including Total Mastectomy (TM) and Mastectomy with Breast Reconstruction (M+R).^[26]

In some cases, Neoadjuvant Therapy (NACT) is preferred prior to surgery. Appropriate candidates for NACT include patients with inflammatory BC and those in whom residual disease may prompt a change in therapy, such as patients with triple-negative neoplasms or HER2 3+ tumors >1 cm or 1.5 cm. NACT can also be used to reduce the extent of local therapy or minimize delays in starting treatment.²⁷

Multidisciplinary treatments for operable BC patients combine local therapies (surgical and radiation) with systemic therapies, which include a wide range of drugs. Systemic therapy is particularly important for improving Disease-Free Survival (DFS) by controlling micrometastases with the potential to spread throughout the body.²⁸ The drugs used for systemic therapy are classified into hormone therapy, chemotherapy, and Molecular Targeted Therapy (MTT), and can be administered alone or as part of combination regimens.²⁸

When used after surgery, these therapies are referred to as Adjuvant Therapies (AT). As mentioned earlier, tumors are classified by immunohistochemistry into different subtypes, which help in selecting the most appropriate AT. Endocrine therapies and anti-HER2 therapies are effective for BC with ER-positive and HER2-positive receptors, respectively. Most BC patients will receive chemotherapy either in the adjuvant or neoadjuvant setting.²⁹

Finally, the treatment approach should consider the individual patient's prognosis, preferences, and the specific characteristics of the tumor. The role of personalized medicine is growing, and ongoing research continues to refine treatment paradigms for BC patients.³⁰

Materials and Methods

This work compared data from 2019 and 2023 for women who underwent surgery following a positive BC screening at the AOU

of Alessandria. In 2019, 7 women were examined, while in 2023, this number increased to 51.

Data were obtained from the Oncological Screening Information System (SIOSOweb), Trackcare InterSystem, and the Quality of Breast Cancer Treatment Form (SQTM).

These systems are integral in managing and evaluating screening programs, hospital care, and clinical data collection, respectively, in particular SIOSOweb is a crucial tool for the management, monitoring, and evaluation of screening programs. TrackCare InterSystem is a hospital information system used to provide, manage, and transform care. SQTM is software for collecting and analyzing clinical data, enabling the monitoring of diagnosis quality, treatment, follow-up of breast cancer, and screening effectiveness indicators.

Statistics

A descriptive analysis was performed on the collected variables. Patient information was analyzed using descriptive statistics. Continuous variables are presented as mean (\pm standard deviation) or median (interquartile range), while categorical variables are expressed as frequencies (percentages). All statistical analyses were conducted using dedicated statistical software.

Results

In 2019, 34.979 women were invited to participate in the breast cancer screening program in the province of Alessandria, with 16.354 women (46.8%) completing the initial screening test. Among these, 1.291 women (7.9% of those invited) were recalled for secondary evaluation, resulting in the diagnosis of 100 malignant tumors (7.8% of those recalled). Surgical interventions were performed on 7 women (7% of those diagnosed) at the Alessandria University Hospital.

In 2023, the number of women invited for screening increased to 36.433, with 17.582 women (58%) completing the initial screening. Among them, 1.529 women (7.9% of those invited) were recalled for secondary evaluation, leading to the diagnosis of 120 malignant tumors (7.8% of those recalled). A total of 51 women (42.5% of those diagnosed) underwent surgical intervention.

The data presented in this section are summarized in Table 1.

The mean age of patients was 62 in 2019 and 60 in 2023. The proportion of postmenopausal patients was 71.4% in 2019 to 80.4% in 2023, while the proportion of patients of childbearing age decreased from 28.6% to 19.6%.

Histological analysis showed that B5b lesions (malignant invasive) were the most common biopsy type, representing 57.14% of cases in 2019 and 49.0% in 2023. B3 lesions decreased from 28.57% in 2019 to 13.7% in 2023, while B5a lesions (malignant non-invasive) showed a decrease from 14.29% in 2019 to 11.8% in 2023. Smaller tumors (classified as pT1) were more frequently detected, increasing from 50% in 2019 to 83% in 2023. Sentinel lymph node biopsy (SNB) was the most commonly performed procedure, with rates of 83.3% in 2019 and 73.2% in 2023. Node-free tumors (pN0) were slightly less frequent in 2023 (58.5%) compared to 2019 (66.7%).

The most common tumor location shifted from the supero-lateral quadrant in 2019 to the supero-external quadrant in 2023. The proportion of patients undergoing quadrantectomy decreased from 66.67% in 2019 to 60.8% in 2023.

Demographic and baseline clinical characteristics are summarized in Table 2.

Conclusions

Breast cancer screening aims to detect asymptomatic cancer, enabling women to undergo less invasive treatments that lead to improved outcomes, ideally at an early stage before the disease progresses. Early detection is associated with identifying smaller tumors that are less likely to metastasize, which can be managed with conservative breast and axillary surgeries and often reduces the need for chemotherapy. This approach results in decreased treatment-related morbidity and enhanced survival rates.

The “Prevenzione Serena” program, provided by the Piedmont region, is an oncological screening initiative targeting breast, cervical, and colorectal cancers.

Breast cancer screening in the city and province of Alessandria has shown a significant improvement in participation, comparing data between 2019 and 2023. Also, the introduction of BU in the AOU has improved mammographic screening in the area.

With a coverage rate of 58% in 2023, the program has facilitated the early diagnosis of tumors, with a higher percentage of lesions identified at the initial stages compared to 2019. The data indicate that the majority of diagnosed tumors were small (under 20 mm), which is associated with improved surgical outcomes and a reduced need for invasive procedures, such as axillary dissection.

The results of the study also highlight the importance of a multidisciplinary approach in breast cancer care, where collaboration between different specialties within the Breast Unit of Alessandria Hospital ensures personalized, high-quality treatment for patients. Continuous investment in screening programs, along with the expansion of services in specialized facilities such as the Breast Unit of Alessandria, is essential to further improve outcomes for women with breast cancer. Future research should focus on optimizing diagnostic protocols, adopting more targeted therapeutic strategies, and eliminating inequalities in access to care to ensure fair and effective management of breast cancer across all populations.

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Authors' contributions: all the authors made a substantive intellectual contribution. All the authors have read and approved the final version of the manuscript and agreed to be held accountable for all aspects of the work.

Conflict of interest: the authors declare no potential conflict of interest.

Funding: none.

Ethics approval and consent to participate: not applicable.

Informed consent: not applicable.

Availability of data and materials: all data generated or analyzed during this study are included in this published article.

Received: 8 January 2025.

Accepted: 11 March 2025.

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Working Paper of Public Health 2025;13:10221

doi:10.4081/wpph.2025.10221

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