Quality of care in Colombian women with early-onset breast cancer in two time periods: findings from a nationwide administrative registry cohort

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The Lancet Regional Health - Americas 2025;43: 101018

https://doi.org/10.1016/j.lana.2025.101018

Summary

Background Early-onset breast cancer (EOBC) refers to breast cancer diagnosed in women aged 18–45 years, being in many cases associated with hereditary breast cancer syndromes, diagnosed at more advanced stages and worse prognosis. In this paper, we sought to describe the main characteristics of EOBC and quality of care within the framework of the national health system in Colombia.

Methods Cross-sectional study. We used a national administrative cancer registry, including women diagnosed with EOBC between 2017 and 2022. Demographic and clinical characteristics, as well as quality healthcare indicators, were compared (numbers and percentages) over two periods (2017–2019, 2020–2022), stratified by health insurance scheme.

Findings 7621 women with incident EOBC were included, constituting 19.4% (7621/39,238) of all breast cancers reported in the study period. The mean age was 39.2 (SD 5.2). Most of the cases (23% [1753/7621]) were diagnosed at stage IIA. Systemic therapy was the most frequent first treatment. When comparing both periods, the main areas of improvement were related to breast-conserving surgery for early stages (from 60.3% [459/761] to 68.3% [699/1024]), access to palliative care for metastatic cancer (from 29.5% [59/199] to 54.9% [101/184]), and reduction of waiting times. The time from collecting biopsy samples to receiving results showed the biggest improvement between periods (from a mean of 24.5 to 5.0 days). However, delays in initiating treatment persist, with an average of over two months.

Interpretation While the quality of breast cancer care in women with EOBC has improved in recent years in Colombia, mainly due to better access to specific technologies and treatments, there are important challenges regarding early detection and health services delays that require corrective measures.

Funding Work at the IARC/WHO was supported by regular budget funding.

Keywords: Breast cancer; Quality of care; Early-onset breast cancer; Waiting times; Early stage at diagnosis; Universal coverage

Introduction

Breast cancer is the most frequent cancer worldwide among females, with an estimated 2.3 million new cases diagnosed in 2022.[1] In Colombia, breast cancer is also the leading cancer among women, with an estimated 17,018 new cases and 4752 deaths annually. The age-standardized incidence and mortality rates have been estimated at 50.7 and 13.3 per 100,000 inhabitants, respectively.[1]

The risk of breast cancer increases with age, with the majority of cases occurring in women over 50 years of age. However, early-onset breast cancer (EOBC), defined

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Research in context

Evidence before this study

We searched PubMed and Google Scholar for observational studies describing the clinical characteristics and quality of care in women with early-onset breast cancer. We used the following search terms: ("breast neoplasm" OR "breast cancer" OR "breast carcinoma") AND ("Young Adult" OR "early-onset" OR "young women" OR "women under 40" OR "pre-menopausal") AND ("Quality of Health Care" OR "quality of care" OR "health care quality" OR "clinical profile" OR "clinical characteristic"). Our search was limited to studies in Spanish or English among adults which were published before June 30, 2023.

Studies identified indicated that early-onset breast cancer (EOBC) represents a clinically and biologically distinct group, with a higher prevalence of aggressive subtypes and poorer prognoses compared to late-onset breast cancer. Additionally, research highlighted the challenges EOBC patients face in middle-income countries, including inequities in access to timely diagnosis and treatment. However, evidence on quality-of-care indicators and their performance within health systems in Latin American countries, including Colombia, remains limited. There is a knowledge gap regarding the effect of health insurance schemes on EOBC outcomes and the impact of recent health policies on reducing disparities in care.

Added value of this study

This study evaluates quality-of-care indicators for EOBC in a middle-income country using comprehensive, nationwide data from the Colombian High-Cost Account (CAC-NCIS) Administrative Registry. By analyzing 7621 newly diagnosed EOBC cases between 2017 and 2022, this research identifies progress in access to treatments, such as breast-conserving surgery and anti-HER2 therapy, while documenting persistent disparities between health insurance schemes and delays in initiating treatment, despite observed improvements. The findings extend current knowledge by linking geographic, socioeconomic, and systemic factors to cancer care inequities. This study also demonstrates the value of a centralized administrative registry for monitoring quality indicators and reducing gaps in cancer care.

Implications of all the available evidence

The findings highlight the importance of implementing policies to address delays in diagnosis and treatment for EOBC, particularly among the poorest populations covered by subsidized insurance schemes and those residing in rural areas. Efforts should focus on improving early detection through public education campaigns, strengthening the oncology workforce, and decentralizing specialized services. The results also underscore the necessity of integrating comprehensive quality indicators, including biomarker reporting and timely palliative care, into health system evaluations. Future research should explore additional patient-centered factors, such as reproductive and psychological needs, to develop interventions tailored to young women with EOBC. These insights can inform policy and practice improvements in other middle-income countries with similar healthcare challenges.

as those diagnosed below age 46,[2] constitutes a clinically and biologically distinctive group of breast cancer patients. EOBCs are more aggressive[3,4] and exhibit a distinctive expression of key biomarkers such as endocrine receptors, human epidermal growth factor receptor (HER2) and cell proliferation markers. Previous studies have shown a higher prevalence of triple-negative tumors in EOBC compared to late-onset cases, which might contribute to worse outcomes in EOBC patients.[3,5] In addition, EOBC has special survivorship considerations affecting reproductive and sexual health and quality of life.[3]

In Colombia, an upper middle-income country, the current health system implemented in 1993 covers almost 98% of the national population.[6] It operates through two main health insurance schemes: the contributory scheme covering the formal workforce and their families, and the subsidized scheme covering poor populations outside the formal sector. Health insurance coverage is provided by health maintenance organizations, which coordinate healthcare delivery through a variety of arrangements contracting with public and private healthcare providers.

Despite universal health coverage, a government-sponsored 10-year cancer control plan,[7] and local strategies, disparities in cancer care quality between schemes remain a concern.[8] Evidence indicates that inequities in breast cancer survival may stem from health system fragmentation, causing diagnosis and treatment delays.[9] To tackle these disparities, the Colombian Health Ministry established the Oncological Services Provision Networks and the Functional Units for comprehensive cancer care.[10] Additionally, in 2019, a value-based healthcare resource allocation mechanism linked to cancer care outcomes was implemented.[11] The Cuenta de Alto Costo (High-Cost Account, CAC in Spanish) is an institution of the health system, established to monitor amongst others, quality and access to health services and to generate information for decision-making, gathering detailed data on all cancer patients (and other high-cost diseases) reported by the health maintenance organizations. These initiatives aim to ensure access, continuity, and quality in cancer care, prioritizing early detection and timely risk-based treatment.[12]

Despite these efforts, EOBC continues to present unique challenges within the Colombian health system. EOBC is estimated to account for around 20% of cancer cases in Colombia,[1] with a burden expected to increase 12% by 2035.[13] Given its poor prognosis and the health impact on a productive segment of the population, evaluating the quality of care of EOBC patients in Colombia warrants special attention. Furthermore, while initiatives such as the Oncological Services Provision Networks and the High-Cost Account aim to reduce disparities, the potential effects of the COVID-19 pandemic may have exacerbated existing inequities in cancer care.[14] Therefore, this study aims to characterize the quality of care of EOBC patients and compare the compliance with quality care indicators between 2017 and 2022 at the national level and by health insurance scheme.

Methods

Data sources

We performed a retrospective longitudinal study with data from a National Cancer Information System (NCIS), an administrative registry managed by the High-Cost Account (Cuenta de Alto Costo (CAC) in Spanish). The NCIS is designed to capture all cancer cases diagnosed within the Colombian health system, serving as a national census of cases reported by the health maintenance organizations. The detailed methodology, procedures, and scope of the CAC-NCIS have been published elsewhere.[15] Reporting of cancer cases occurs annually to CAC-NCIS, with new cases undergoing comprehensive registration, while for prevalent cases, variables related to follow-up, treatment, and vital status are updated every year.[12,16]

Data quality is ensured throughout a two-step standardized data monitoring process. First, algorithms verify the uploaded data for consistency, coherence, and structure. Subsequently, reported information is cross-verified with clinical records to ensure validity and completeness. In case of inconsistencies, the CAC-NCIS team retrieves data from clinical records.[15] The CAC-NCIS strictly adheres to national regulations to guarantee confidentiality and personal data protection.

Eligibility of participants

We included women aged 18–45 years, who were newly diagnosed with breast cancer, classified according to the International Classification of Diseases – 10th Revision (ICD-10: C50) reported to the CAC-NCIS between January 1 of 2017 and December 31 of 2022. We restricted our analysis to the two main schemes: those under the contributory and subsidized health insurance schemes,[17] accounting for 94.6% of all breast cancer cases reported in the study period. For those women with two primary breast neoplasms, only information on the first tumor diagnosed was included.

Definition of variables

Sociodemographic variables included age at diagnosis, health insurance scheme (contributory and subsidized), and region of residence. Region of residence was classified according to the six regions defined by the Colombian Administrative Department for National Statistics (DANE, for its acronym in Spanish): Bogotá, D.C., Central, Eastern, Pacific, Caribbean, and Amazonian (detailed composition by departments is provided in Supplementary Table S1).[18]

Clinical information included the basis of diagnosis (clinical or histopathologic diagnosis), stage at diagnosis, tumor subtype and initial treatment. Stage at diagnosis was based on the tumor-nodes-metastasis (TNM) classification (8th edition)[19] classified as early (stages IA to IIA), locally advanced (stages IIB to IIIC), metastatic (stage IV), or unknown.[20] Cases were also grouped as early (stages I and II) vs. late (stages III and IV) stage, in agreement with the WHO Global Breast Cancer Initiative.[21]

Tumor subtypes were categorized -with the limitation of not having information on Ki-67 expression-according to the expression of the following hormone receptors (HR): estrogen (ER), progesterone (PR) and human epidermal growth factor (HER2), as follows:

- HR positive (ER or PR)/HER2 positive
- HR positive (ER or PR)/HER2 negative
- HR negative (ER and PR)/HER2 positive
- HR negative (ER and PR)/HER2 negative

Finally, initial treatment was grouped as systemic therapy or surgery. For stage IV cases, in addition to the aforementioned options, radiotherapy and palliative care were also included. The initial treatment is described independently from subsequent combinations of the various alternative treatments.

Quality of care

A total of 11 specific quality indicators for breast cancer care were evaluated and grouped as follows: 1) Diagnosis-related indicators: percentage of cases with TNM at diagnosis (%TNM), percentage of cases with histopathologic diagnosis before surgery (%HD), percentage of cases with HR and HER2 results (%H), and percentage of cases with early stage at diagnosis; 2) Treatment-related indicators: percentage of cases diagnosed in stages I to IIA receiving breast-conserving surgery (%conserving), percentage of patients with positive hormone receptors who received endocrine therapy, percentage of patients positive for HER2 who received anti-HER2 therapy and percentage of women diagnosed at metastatic stage who received palliative care; 3) Waiting time indicators (all expressed in days): from referral to specialty care services, from biopsy sample collection to results, from diagnosis to first treatment. Supplementary Table S2 contains descriptive details on these indicators.

Statistical analysis

Demographic and clinical characteristics of new cases were analyzed in two periods (2017–2019 and 2020 to 2022), stratifying by health insurance scheme. All variables and quality indicators, except waiting times, were described as absolute numbers and percentages by period at the national level and by insurance scheme. Missing data was reported as unknown/no data. Waiting time indicators were reported as means and standard deviations in days. Women with missing data for any of the required dates were excluded from this part of the analysis. Descriptive statistical analysis was performed using Stata version 17.0 (Stata Corporation, College Station, Texas, USA).

This study utilizes secondary data from the mandatory reports submitted by health maintenance organizations in compliance with Resolution 0247 of 2014, with the CAC-NCIS database managed by the High-Cost Account. As such, it is exempt from requiring approval by an ethics committee.

Role of the funding sources

This study did not have any funding.

Results

Across all age groups and insurance schemes, a total of 39,238 female breast cancer cases with new diagnosis from 2017 to 2022 were reported to CAC-NCIS. Of these, 37,136 (94.6% [37,136/39,238]) were affiliated either to contributory or subsidized schemes. Among those, 7621 (19.4% [7621/39,238]) were aged between 18 and 45, constituting the subset of incident early-onset breast cancer cases. 3405 cases were diagnosed in 2017–2019 (2017: 1192; 2018: 961; 2019: 1252) and 4216 in 2020–2022 (2020: 1157; 2021: 1423; 2022: 1636).

Characteristics of early-onset breast cancer cases diagnosed from 2017 to 2022

Demographic and clinical variables by health insurance for each period are presented in Table 1. The majority (75.1% [5722/7621]) of the EOBC patients were between 36 and 45 years at the time of diagnosis, and approximately 71% (5407/7621) of cases across both periods were affiliated to the contributory insurance scheme. Almost 50% (3859/7621) of the women were residents of Bogotá and the Central region. The overall number of EOBC cases reported increased over time in all regions, particularly in the Caribbean region, where it doubled in the 2nd period. Regarding ethnicity, 2.4% (186/7621) of the total women included identified as Black, mulatto, Afro-Colombian, or Afro-descendant; 0.6% (46/7621) were Raizal from the Archipelago of San Andrés, Providencia, and Santa Catalina; 0.1% (8/7621) were indigenous; and 96.8% (7380/7621) did not belong to any ethnic group.

Histopathological diagnosis was reported in 99.8% (4208/4215) of all EOBC cases in the 2020–2022 period, with no differences by insurance scheme. In both schemes, the proportion of women without histopathological information to determine the tumor subtype was reduced (overall, from 22.4% [762/3405] to 16.4% [691/4216]).

The percentage of new cases diagnosed at early stages (stages I-IIA) was stable (from 42.2% [1037/2459] to 42.6% [1256/2948]) among patients in the contributory scheme. A decrease in early-stage diagnosis (29.8% [282/946] to 24.8% [315/1268]) was evidenced in those belonging to the subsidized scheme, where most cases (23.3% [516/2214]) were diagnosed in stage IIIB. When grouping early diagnosis according to the WHO Global Breast Cancer Initiative[21] a slight change was observed at the national level (from 55.9% [1904/3405] to 57.3% [2414/4216]) and in both insurance schemes (Table 2).

Regarding initial treatment, systemic therapy was the most frequent (67.9% [4683/6893]). The proportion of patients with early-stage disease receiving conservative surgery as initial treatment increased by 12% between periods (70.8% [465/657] vs. 79.1% [576/728]) and was more common in the subsidized insurance scheme. When comparing both periods, the proportion of women without any treatment decreased (from 12.5% [396/3158] to 8.2% [332/4042]), whereas access to palliative care assessment considerably increased (from 8.5% [17/199] to 17.4% [32/184]).

Quality measures and evaluation of access to early-onset breast cancer care

Table 2 shows the result of selected quality measures at the national and health insurance levels, comparing both periods. The percentage of cases with histopathology diagnosis increased in both insurance schemes (94.2% [3208/3405] to 99.8% [4208/4216]), with a notable variation in the contributory scheme. The same pattern was observed for the proportion with information on HR status, showing slightly better performance in the subsidized insurance scheme, with an increase from 76.9% (727/946) to 81.2% (1030/1268).

New cases diagnosed at stages IV who received palliative care increased from 29.5% [59/199] in the initial period to 54.9% [101/184] in the last period. The access to conservative surgery in early-stage cases was higher for women in the subsidized insurance scheme (24% increase, from 58.2% [78/134] to 72.1% [147/204]) compared to the contributory (11% increase, from 60.8% [381/627] to 67.3% [552/820]). Similarly, the proportion of patients with an indication to receive anti-HER2 and ET who received these treatments improved particularly in the subsidized scheme.

Regarding waiting times, the time from diagnosis to first treatment was reduced by 13.4 days between both periods, yet still above 60 days. The gap between the

Characteristics	2017–2022% (n/d) (n = 7621)	2017–2019% (n/d)			2020–2022 % (n/d)		
		Contributory (n = 2459)	Subsidized (n = 946)	National (n = 3405)	Contributory (n = 2948)	Subsidized (n = 1268)	National (n = 4216)
Age at diagnosis (years)							
18–25	1.7 (128/7621)	1.6 (40/2459)	2.4 (23/946)	1.8 (63/3405)	1.4 (41/2948)	1.9 (24/1268)	1.5 (65/4216)
26–35	23.2 (1771/7621)	22.5 (553/2459)	22.1 (209/946)	22.4 (762/3405)	23.7 (699/2948)	24.4 (310/1268)	23.9 (1009/4216)
36–45	75.1 (5722/7621)	75.9 (1866/2459)	75.5 (714/946)	75.8 (2580/3405)	74.9 (2208/2948)	73.7 (934/1268)	74.5 (3142/4216)
Region							
Bogotá, D.C.	21.5 (1636/7621)	30.2 (743/2459)	7.3 (69/946)	23.9 (812/3405)	26.3 (774/2948)	3.9 (50/1268)	19.6 (824/4216)
Central	29.2 (2223/7621)	30.2 (744/2459)	24.7 (234/946)	28.7 (978/3405)	32.5 (957/2948)	22.7 (288/1268)	29.5 (1245/4216)
Pacific	15.9 (1209/7621)	15.5 (382/2459)	20.9 (198/946)	17.0 (580/3405)	13.4 (395/2948)	18.5 (234/1268)	14.9 (629/4216)
Eastern	12.9 (980/7621)	313.5 (331/2459)	12.8 (121/946)	13.3 (452/3405)	13.1 (386/2948)	11.2 (142/1268)	12.5 (528/4216)
Caribbean	19.3 (1470/7621)	9.8 (240/2459)	31.8 (301/946)	15.9 (541/3405)	13.7 (405/2948)	41.3 (524/1268)	22.0 (929/4216)
Amazonian	1.4 (103/7621)	0.8 (19/2459)	2.4 (23/946)	1.2 (42/3405)	1.0 (31/2948)	2.4 (30/1268)	1.5 (61/4216)
Histopathological diagnosis	97.3 (7416/7621)	93.3 (2295/2459)	96.5 (913/946)	94.2 (3208/3405)	99.8 (2943/2948)	99.8 (1265/1268)	99.8 (4208/4216)
Stage at diagnosis							
I	14.9 (1137/7621)	19.3 (475/2459)	12.9 (122/946)	17.5 (597/3405)	14.6 (430/2948)	8.7 (110/1268)	12.8 (540/4216)
IIA	23.0 (1753/7621)	22.8 (562/2459)	16.9 (160/946)	21.2 (722/3405)	28.0 (826/2948)	16.2 (205/1268)	24.4 (1031/4216)
IIB	14.0 (1066/7621)	18.9 (464/2459)	12.8 (121/946)	17.2 (585/3405)	20.5 (604/2948)	18.7 (237/1268)	19.9 (841/4216)
IIIA	13.4 (1021/7621)	12.6 (310/2459)	16.1 (152/946)	13.6 (462/3405)	12.3 (363/2948)	15.5 (196/1268)	13.3 (559/4216)
IIIB	16.7 (1270/7621)	14.3 (352/2459)	23.1 (218/946)	16.7 (570/3405)	13.6 (402/2948)	23.5 (298/1268)	16.6 (700/4216)
IIIC	2.3 (173/7621)	2.2 (53/2459)	2.4 (23/946)	2.2 (76/3405)	2.07 (61/2948)	2.8 (36/1268)	2.3 (97/4216)
IV	5.0 (383/7621)	5.0 (122/2459)	8.1 (77/946)	5.8 (199/3405)	3.3 (97/2948)	6.9 (87/1268)	4.4 (184/4216)
Unknown/No data	6.0 (458/7621)	4.9 (121/2459)	7.7 (73/946)	5.7 (194/3405)	5.6 (165/2948)	7.8 (99/1268)	6.3 (264/4216)
Tumor subtype							
HR + (ER or PR)/HER2 +	13.1 (999/7621)	13.0 (320/2459)	12.2 (115/946)	12.8 (435/3405)	13.7 (405/2948)	12.5 (159/1268)	13.4 (564/4216)
HR + (ER or PR)/HER2 –	45.6 (3472/7621)	45.6 (1122/2459)	36.7 (347/946)	43.1 (1469/3405)	50.3 (1484/2948)	40.9 (519/1268)	47.5 (2003/4216)
HR – (ER and PR)/HER2 +	6.0 (457/7621)	5.7 (141/2459)	7.2 (68/946)	6.1 (209/3405)	5.3 (156/2948)	7.3 (92/1268)	5.9 (248/4216)
HR – (ER and PR)/HER2 –	16.3 (1240/7621)	15.3 (376/2459)	16.3 (154/946)	15.6 (530/3405)	17.1 (503/2948)	16.3 (207/1268)	16.8 (710/4216)
Unknown/No data	19.1 (1453/7621)	20.3 (500/2459)	27.7 (262/946)	22.4 (762/3405)	13.6 (400/2948)	23.0 (291/1268)	16.4 (691/4216)
Initial treatment							
Systemic therapy	61.4 (4683/6852)	67.5 (1474/2184)	74.4 (595/800)	69.3 (2069/2984)	66.4 (1803/2715)	70.3 (811/1153)	67.6 (2614/3868)
Surgery	23.7 (1627/6852)	27.9 (609/2184)	21.4 (171/800)	26.1 (780/2984)	23.5 (639/2715)	18.0 (208/1153)	21.9 (847/3868)
Conserving surgery in early stage	75.2 (1041/1385)	69.9 (370/529)	74.2 (95/128)	70.8 (465/657)	78.4 (442/564)	81.7 (134/164)	79.1 (576/728)
Radiotherapy in stage IV	0.9 (35/383)	6.6 (8/122)	15.6 (12/77)	10.1 (20/199)	8.3 (8/97)	8.1 (7/87)	8.2 (15/184)
Palliative care in stage IV	12.8 (49/383)	9.8 (12/122)	6.5 (5/77)	8.5 (17/199)	7.5 (17/97)	17.3 (15/87)	17.4 (32/184)
Not treatment[a]	10.1 (728/7206)	11.2 (259/2318)	16.3 (137/840)	12.5 (396/3158)	7.9 (226/2860)	8.9 (106/1188)	8.2 (332/4048)
Unknown/No data	10.1 (769/7621)	11.2 (275/2459)	15.4 (146/946)	14.1 (421/2984)	0.8 (233/2948)	0.9 (115/1268)	0.8 (348/4216)

HR: Hormone receptor. ER: estrogen. PR: progesterone. HER2: human epidermal growth factor. [a]219 (22.3%) were diagnosed in 2019 and 227 (68.4%) in 2022 (the final year of each period).

Table 1: **Demographic and clinical characteristics of women with EOBC measured across two time periods at the national level and by health insurance scheme, Colombia 2017–2022.**

health insurance schemes decreased from 19 to 11.5 days on average, although the subsidized scheme showed longer waiting times than the contributory scheme (Table 2). Refer to Supplementary Table S3 for information on waiting times, presented as median and IQR.

Discussion

Using information from a nationwide administrative registry, we describe the main demographic, clinical and quality of care characteristics for 7621 women diagnosed with EOBC and treated within the Colombian health system. Overall, quality indicators related to access to treatments, including conservative surgery, hormone-blocking, and anti-HER2 therapies, as well as palliative care improved over time and indicated fewer disparities between insurance schemes. However, an advanced stage at diagnosis and long waiting times indicate major barriers to timely access to diagnosis and treatment.

The number of EOBC cases reported annually by the nationwide CAC-NCIS system averaged 1271 cases. Despite being a mandatory notification system, this number seems low when compared to the estimated 3933 breast cancer cases expected to occur annually

Quality care measures	2017–2019 n (%)			2020–2022 n (%)		
	Contributory	Subsidized	National	Contributory	Subsidized	National
Diagnosis						
New cases staged with TNM at diagnosis (%)	95,1 (2338/2459)	92,3 (873/946)	94,3 (3211/3405)	94,4 (2783/2948)	92,2 (1169/1268)	93,7 (3952/4216)
New cases diagnosed at early stage (%)						
AJCC–I to IIA	42,2 (1037/2459)	29,8 (282/946)	38,7 (1319/3405)	42,6 (1256/2948)	24,8 (315/1268)	37,3 (1571/4216)
WHO GBCI–I to II	61,0 (1501/2459)	42,5 (403/946)	55,9 (1904/3405)	63,2 (1862/2948)	43,5 (552/1268)	57,3 (2414/4216)
New cases with histopathologic diagnosis before surgery (%)	93,4 (1062/1137)	96,0 (311/324)	94,0 (1373/1461)	97,3 (1560/1604)	96,3 (571/593)	97,0 (2131/2197)
New cases with hormone receptor (estrogens/progesterone) and HER2 results (%)	86,4 (2125/2459)	76,9 (727/946)	83,8 (2852/3405)	90,5 (2669/2948)	81,2 (1030/1268)	87,7 (3705/4216)
Treatment						
New cases with tumors in early stages who received conserving surgery (%)	60,8 (381/627)	58,2 (78/134)	60,3 (459/761)	67,3 (552/820)	72,1 (147/204)	68,3 (699/1024)
New cases with positive hormone receptors who received hormone-blocking therapy (%)	47,3 (690/1458)	35,7 (156/437)	44,6 (846/1895)	47,1 (848/1802)	45,4 (291/641)	46,6 (1139/2443)
New cases HER2 (+) who received anti-HER2 therapy (%)	72,5 (350/483)	59,6 (118/198)	68,7 (468/681)	74,5 (436/585)	70,1 (183/261)	73,2 (619/843)
New cases diagnosed at stages IV who received palliative care (%)	31,2 (38/122)	27,3 (21/77)	29,5 (59/199)	61,2 (60/97)	47,1 (41/87)	54,9 (101/184)
Waiting times (days)[a]						
From referral to specialty care services	35,1 (128,1)	46,7 (92,5)	38,4 (119,2)	26,0 (SD 47,1)	44,4 (70,1)	30,9 (54,8)
From biopsy sample collection to results	20,2 (184,2)	34,9 (205,4)	24,5 (190,7)	8,3 (8,4)	10,7 (12,9)	9,0 (10,0)
From diagnosis to first treatment	75,1 (84,2)	94,1 (94,9)	80,2 (87,6)	63,4 (74,8)	74,9 (69,4)	66,8 (73,5)

TNM: tumor-nodes-metastasis classification. AJCC: American Joint Committee on Cancer. WHO GBCI: World Health Organization Global Breast Cancer Initiative. HER2: human epidermal growth factor.
[a] Values are mean (standard deviation).

***Table 2:* Quality care measures across the two time periods at the national level and by health insurance scheme, Colombia 2017–2022.**

among women aged 15–44 years.[1] EOBC cases accounted for approximately 20% of all breast cancer cases reported to CAC-NCIS, a proportion consistent with findings in the literature.[2]

Almost half of the EOBC cases were reported in two regions (Bogotá and Central), which together cover approximately 40% of the total female population in the country[22] and concentrate 48% of the Colombia's oncological services.[23] The concentration of oncology centers might be a relevant factor, as a previous study in Colombia showed a positive correlation between the number of new cancer cases and the availability of oncology facilities.

In addition to the availability of healthcare infrastructure, other factors may contribute to these geographic disparities. Regions with higher urbanization, such as Bogotá D.C. and the Central region, correspond to those with a higher Gross Domestic Product (GDP). These areas also benefit from increased health awareness and healthcare-seeking behavior in urban areas, where access to public health campaigns, screening programs, and specialized professionals is higher. In contrast, rural and peripheral regions face barriers such as geographic isolation, limited infrastructure, healthcare professional shortages, and higher poverty rates, which hinder access to early diagnosis and treatment.[24]

For all periods examined and for both schemes analyzed, more than 90% of the breast cancer cases had information on the TNM stage at diagnosis. This is indeed a positive finding, and can be related to the strict completeness criteria that CAC has imposed on the informing health maintenance organizations. On average, 38.0% of women with EOBC were diagnosed at early stages (I to IIa), with better performance observed in the contributory insurance scheme compared to the subsidized scheme (second period: 42.6% vs. 24.8%). However, when applying the WHO Global Breast Cancer Initiative benchmark, which defines early stages as I and II, and sets a target of 60%, only the contributory scheme achieved this goal, with an average of 61.2% of EOBC diagnosed at early stages. A previous study conducted at the National Cancer Institute of Colombia, also found that the majority of women with breast cancer (all ages) on the subsidized health insurance scheme were diagnosed at more advanced stages (51.1% at stage III) and had lower survival rates compared to those of the contributory scheme (75.0% vs. 80.8%).[25] Cancer-related inequities have been widely documented in Colombia and elsewhere.[25–27] This is consistent with the characteristics of the population covered by the subsidized scheme,[28] including people without formal employment and lower educational levels who represent the poorest and most vulnerable population in the country. Overall, when comparing the stage at diagnosis between both periods studied, no stage shift was observed.

Regarding time to diagnosis, there were significant improvements in the biopsy-related timelines, with an average reduction of 15 days across the two periods.

However, delays in accessing diagnostic specialized services persisted, especially within the subsidized scheme. This may be related to the low risk perception in this age group or lack of suspicion at first contact with the health system, which is particularly concerning because tumors in younger women tend to grow more rapidly than in older women.[29] Delays in EOBC diagnosis have been also documented in similar settings. For example, in Mexico City, the reported median time to diagnosis for women under 40 was 103 days, compared to 57 days for those over 40. Women aged 40 or younger were 69% more likely to face a diagnostic delay compared to older women, primarily due to a lack of suspicion by the initial clinician or a mistaken benign interpretation of the first breast imaging study.[30]

Delays to treatment initiation have been documented previously in Colombia[8,31–33] being major contributors to breast cancer disparities, resulting in higher recurrence rates, and mortality with a gradient time relation.[34–36] Despite the favorable trend of overall reduced waiting times, which has helped narrow the gap between insurance schemes, particularly in the time from biopsy sample to results, the mean time to first treatment initiation still exceeds eight weeks in both schemes. This warrants urgent intervention to achieve the recommended timeframes.[35,36] Despite efforts related to surveillance, monitoring, measurement of indicators, and strengthening national regulations for cancer control, reducing access times is challenging due to the concentration of oncologist services in the principal cities[23] and the deficiency of oncology and radiotherapy professionals in Colombia.[37,38] Consequently, efforts should focus on ensuring access to diagnostic tests and biopsies for symptomatic women, which are crucial for improving early disease detection and ensuring timely treatment initiation. Furthermore, treatment must be delivered in oncology centers that provide a multidisciplinary approach and continuity of care.

During the 2020–2022 period, the gap between insurance schemes for the new cases receiving endocrine therapy decreased importantly compared to the previous period, passing from a difference of 11.6 to 1.7 for hormone blocking therapy and from a difference of 12.9 to 3.7 points for anti-HER2 therapy. Despite a reduction in the cases lacking information for HR and HER2 status, still around 20% were missing the specific tumor subtype, which not only has important therapeutic and prognostic implications[39] but is also considered a crucial measure of breast cancer quality of care worldwide.[16,40,41] Availability of complete information on the clinical stage and the biomarkers that determine the biological classification of breast cancer is critical for accurately tailoring treatment.

Access to treatments, including conservative surgery, endocrine therapy, and anti-HER2 therapies, as well as palliative care showed a significant improvement during the study period and a reduction of disparities between health insurance schemes. We found an 8-point increase in the percentage of women with EOBC who underwent breast-conserving surgery. For women diagnosed with early-stage breast cancer, opting for breast-conserving surgery is the preferred treatment approach[42] often included as a quality indicator for surgical management and equity of care.[40,41] During the last period, women in both insurance schemes had access to breast-conserving surgery with a 13.9 percentage point increase in those patients pertaining to the subsidized insurance scheme. In contrast, in other health system contexts like in the US, there are existing disparities in access to breast-conserving surgery due to sociodemographic and geographical barriers.[43]

A comprehensive treatment for advanced breast cancer includes palliative care.[44] Our study showed a significant increase (30.1 percentage point) in the proportion of stage IV EOBC patients who received palliative care. However, despite being the quality indicator that showed the best improvement between periods, the gap between both insurance schemes increased and only 47.1% of stage IV patients in the subsidized scheme received palliative care compared to 61.2% in the contributory scheme. In the US, Giap et al. showed disparities based on racial and ethnic characteristics in the access to palliative care for women with *de novo* metastatic breast cancer from 2000 to 2017, with only 25% of the patients receiving palliative care.[45] In the Latin American region, Colombia was the first country to launch a palliative care service and to accredit palliative medicine as a medical specialty, with comprehensive regulations to promote access to palliative care. However, important gaps remain, amongst others to integrating palliative care into primary care.[46] Furthermore, while the procedure for accessing palliative care does not differ between insurance schemes,[47,48] differences arise from the healthcare providers contracted by each insurer, which may impact the availability and delivery of palliative care services.[46]

Since 2016, the CAC-NCIS has been monitoring the quality indicators for the continuum of breast cancer care across the country,[16] and publishes information enabling trend evaluation and comparison among insurers, insurance schemes, and regions. Additionally, since 2020, an ex post redistribution mechanism has been implemented, linking indicator results to financial incentives for health maintenance organizations.[11] This could be associated with the improvement in results and reduction of gaps between the insurance schemes presented in this study, without a negative impact of the COVID-19 pandemic on outcomes for the second period (2020–2022).

Barriers to effective and timely cancer care in the Colombian health system include multiple administrative delays due to its fragmented structure.[49,50] Limited installed capacity and trained personnel at primary care levels contribute to widening disparities across the country.[37,38,49,51] A possible explanation for gaps between insurance schemes involves individual barriers that can occur in those under the subsidized scheme, due to poverty and lack of education being associated with late-stage diagnosis.[52] These conditions are common in other Latin American contexts, where socioeconomic heterogeneity makes addressing these limitations more challenging.[53] Potential solutions to these issues include adopting patient navigation programs, strengthening local capacity for cancer care, community and medical education, and adopting a multidisciplinary approach, starting at primary care levels. Active involvement of stakeholders, patients, and healthcare professionals is crucial for implementing these strategies.[49,50]

Our study has important strengths. Firstly, the scope of the CAC-NCIS allows us to describe the trends in access to cancer care at demographic and health insurance levels, capturing the heterogeneity of women treated in the Colombian health system. Additionally, the audit, which includes the verification of reported data against the patient's medical record, ensures the quality and accuracy of the information. In addition, the regulatory support mandating reporting for all insurers in the country contributes to the robustness of the registry.

Nevertheless, due to the administrative nature of the CAC-NCIS, certain limitations should be considered when interpreting the results. Despite mandatory reporting to the CAC-NCIS, information comes from a passive process that might result in underreporting of cases. Sociodemographic characteristics such as educational and income levels, rurality, and distance to healthcare points can explain cancer care gaps beyond insurance schemes. Unfortunately, we were unable to explore this information because these variables are not reported to the CAC-NCIS. Additionally, since the main goal of the CAC-NCIS is to monitor access to cancer care from a planning perspective, certain specific histopathologic, molecular and genetic markers, and treatment features relevant to EOBC cases are not captured in the registry. Furthermore, future efforts should explore areas not directly addressed here, such as meeting the information needs of young women regarding treatment side effects, fertility, quality of life, and long-term follow-up to manage higher recurrence risks in this group.

Conclusions

The quality of breast cancer care in women with early-onset disease in Colombia has improved in recent years, mainly due to better access to specific diagnostic tests, specialized medical consultations, and a multidisciplinary approach. A key finding is the increased access to conservative surgery for early-stage disease, particularly among women in the subsidized insurance scheme. These advancements have been supported by Colombia's health policies that guide stakeholders to report, monitor, and follow up on cases treated within the healthcare system.[12]

However, challenges remain, particularly in achieving early detection and reducing delays in treatment initiation. Addressing these issues requires multifaceted strategies, including public education to raise awareness, increasing the availability of specialized healthcare professionals, decentralizing oncological services, and timely referrals.

Our findings provide a foundation for designing targeted interventions and shaping health policies aimed at improving outcomes for this specific population in similar settings globally.

Contributors

Conceptualization AMVG, MP, SP. Data curation: AMVG. Formal analysis with access to database: AMVG, SJTC, JAHV. Methodology: AMVG, MP, SP, SD, LA. Resources and validation: LA. Writing-original draft: AMVG, SJTC, JAVH. All authors critically revised the manuscript and approved its final version.

Data sharing statement

Our use of data follows Colombian Resolution 994 of 2022, which establishes the mechanism for permanent access and use of data, reports, and information related to high-cost, devastating, and catastrophic diseases. This regulation specifies that third-party access to the data used for these analyses is authorized exclusively by the Ministry of Health and Social Protection (https://minsalud.gov.co/Normatividad_Nuevo/Resoluci%C3%B3n%20No.%20994%20de%202022.pdf). As a result, individual-level data used in this study cannot be shared. However, aggregate and anonymized data are available from the corresponding author upon reasonable request.

Declaration of interests

The authors declare no competing interests.

Acknowledgements

The authors would like to thank the CAC-NCIS audit team for their efforts in enhancing the quality of the information used for this research. Additionally, they extend their gratitude to Dr. Esther de Vries for her contributions and reviews in the English writing course, which is part of the PhD program in Clinical Epidemiology at Pontificia Universidad Javeriana.

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.lana.2025.101018.

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