Indonesian Journal of Pharmaceutical Education (e-Journal) 2026; 6 (1): 93–102
ISSN: 2775- 3670 (electronic)
Journal Homepage: http://ejurnal.ung.ac.id/index.php/ijpe/index
DOI: 10.37311/ijpe.v6i1.36638

Stage at Diagnosis and Surgical Management of Breast Cancer at Dumai Regional Hospital, 2020–2025

Delidios Arimbi[1], Ami Amelia[2*]
[1] *Professional Education Programme, Faculty of Medicine, Abdurrab University, Pekanbaru City, Indonesia.*
[2] *Medical Degree Programme, Faculty of Medicine, Abdurrab University, Pekanbaru City, Indonesia.*
[*]*E-mail:ami.amelia@univrab.co.id*

Article Info:
Received: 6 December 2025
in revised form: 15 January 2026
Accepted: 29 January 2026
Available Online: 1 February 2026

Keywords:
Breast cancer;
Stage at diagnosis;
Surgical management;
Modified radical Mastectomy;
Hospital-based study;
Indonesia

Corresponding Author:
Ami Amelia
Medical Degree Programme,
Faculty of Medicine,
Abdurrab University,
Pekanbaru City,
Indonesia
E-mail:
ami.amelia@univrab.co.id

ABSTRACT

Breast cancer remains the most frequently diagnosed malignancy among women and a major contributor to cancer-related morbidity, while late-stage presentation continues to constrain surgical options in many regional referral settings. This study aimed to describe the stage at diagnosis and patterns of surgical management, and to examine the association between clinical stage and type of surgery among breast cancer patients treated at Dumai Regional Hospital, Riau, Indonesia. A retrospective hospital-based study was conducted using medical records from January 2020 to October 2025, with total sampling of eligible cases (n = 137). Variables included age, clinical stage at diagnosis based on the AJCC 8th edition (grouped as stage I–II and stage III–IV), and surgical procedure (conservative surgery, modified radical mastectomy, or biopsy/non-definitive procedures). Descriptive statistics were used to summarise patient characteristics and management patterns. The association between clinical stage and type of surgery was tested using the chi-square test, and effect size was estimated using Cramer's V. Most patients were aged 40–59 years (58.4%), with a mean age of 52.5 years (SD 11.5), and the majority presented at advanced stages (stage III–IV: 62.8%). Modified radical mastectomy was the predominant procedure (64.2%), while conservative surgery accounted for a smaller proportion. Clinical stage was significantly associated with the type of surgery performed (chi-square = 12.3; df = 2; $p < 0.001$; Cramer's V = 0.30). These findings indicate a persistent predominance of late-stage presentation in this regional hospital, underscoring the need to strengthen early detection pathways and timely referral to expand eligibility for breast-conserving management.

How to cite (APA6thStyle):
Arimbi,D.,Amelia.A.(2026). *Stage at Diagnosis and Surgical Management of Breast Cancer at Dumai Regional Hospital, 2020–2025. Indonesian Journal of Pharmaceutical Education (e-Journal), 6*(1), 93-102.

ABSTRAK

Kanker payudara merupakan keganasan yang paling sering didiagnosis pada perempuan dan berkontribusi besar terhadap morbiditas terkait kanker, sementara keterlambatan diagnosis masih membatasi pilihan penatalaksanaan bedah di banyak rumah sakit rujukan regional. Penelitian ini bertujuan menggambarkan stadium saat diagnosis dan pola penatalaksanaan bedah, serta menganalisis hubungan antara stadium klinis dan jenis tindakan bedah pada pasien kanker payudara di Dumai Regional Hospital, Riau, Indonesia. Penelitian dilakukan dengan desain retrospektif berbasis rumah sakit menggunakan data rekam medis periode Januari 2020 hingga Oktober 2025, dengan total sampling kasus yang memenuhi kriteria (n = 137). Variabel meliputi usia, stadium klinis saat diagnosis berdasarkan AJCC edisi ke-8 (dikelompokkan menjadi stadium I–II dan stadium III–IV), serta jenis tindakan (bedah konservatif, mastektomi radikal modifikasi, atau biopsi/tindakan non-definitif). Data disajikan secara deskriptif, kemudian hubungan stadium klinis dengan jenis tindakan dianalisis menggunakan uji chi-square dan besaran efek dihitung menggunakan Cramer's V. Sebagian besar pasien berusia 40–59 tahun (58,4%) dengan rerata usia 52,5 tahun (SD 11,5), dan mayoritas datang pada stadium lanjut (stadium III–IV: 62,8%). Mastektomi radikal modifikasi merupakan tindakan yang paling dominan (64,2%), sedangkan bedah konservatif ditemukan pada proporsi yang lebih kecil. Stadium klinis berhubungan bermakna dengan jenis tindakan bedah (chi-square = 12,3; df = 2; p < 0,001; Cramer's V = 0,30). Temuan ini menunjukkan masih tingginya proporsi presentasi stadium lanjut pada setting rumah sakit regional, sehingga penguatan deteksi dini dan percepatan rujukan menjadi krusial untuk memperluas peluang terapi bedah yang lebih konservatif.

Kata Kunci: Kanker payudara; Stadium saat diagnosis; Penatalaksanaan bedah; Mastektomi radikal modifikasi; Studi berbasis rumah sakit; Indonesia

1. Introduction

Breast cancer is the most frequently diagnosed cancer among women worldwide and remains a leading cause of cancer-related mortality. Global estimates reported by GLOBOCAN 2020 document substantial incidence and mortality, underscoring the persistent public health burden of the disease and the need for strengthened early detection and timely treatment pathways across health systems [1]. In response to ongoing global inequities, the World Health Organization (WHO) has emphasized early detection, prompt diagnosis, and timely completion of treatment as core pillars to reduce breast cancer mortality through the Global Breast Cancer Initiative (GBCI) [2].

In Indonesia, the breast cancer burden remains substantial, and national cancer control efforts articulated through policy and action plans continue to prioritize prevention, early detection, and service strengthening as foundational strategies for improving outcomes [3]. Interpreting real-world clinical pathways in such settings requires consistent staging definitions and alignment with contemporary guideline-based management, given that clinical stage at diagnosis is a principal determinant of surgical planning and the feasibility of breast-conserving approaches within multimodal care [4],[5]. At the service level, hospital-based registries and hospital-based observational studies therefore become particularly valuable sources of practice-near evidence, especially when population-based cancer registry coverage and standardized staging documentation remain variable across regions [6].

Evidence from Indonesia has shown that delays in presentation and diagnosis are still frequent and may contribute to a predominance of advanced-stage case-mix in routine referral services, which in turn narrows feasible surgical options and increases

reliance on more extensive procedures [7],[8]. This pattern is consistent with broader global evidence indicating that stage distribution at diagnosis remains uneven across countries and care contexts, with advanced-stage presentation continuing to be over-represented in many low- and middle-income settings [9]. From a surgical perspective, this is clinically consequential because early-stage disease is more likely to be managed with breast-conserving surgery combined with radiotherapy when appropriately indicated, whereas locally advanced presentations more commonly require mastectomy-based strategies, including modified radical mastectomy, particularly when conservation is not feasible [4]. Comparative evidence from systematic reviews and population-level analyses further supports the interpretation that breast-conserving approaches can achieve favourable oncologic outcomes in appropriately selected non-metastatic disease, reinforcing the importance of stage distribution as a driver of surgical patterns in real-world practice [10],[11].

Because early detection is the most direct upstream lever to shift stage distribution, screening recommendations and implementation strategies remain central to breast cancer control. Current guidance from major authorities continues to evolve and highlights the need to balance benefits, harms, and feasibility within specific health-system contexts [12]. In parallel, systematic appraisals of global screening guidelines emphasize substantial heterogeneity in recommended modalities, starting ages, and intervals, which may influence downstream stage distribution and service demand [13]. Moreover, external system shocks such as the COVID-19 pandemic have been associated with measurable shifts in stage distribution and treatment patterns in several settings, illustrating how diagnostic and treatment disruptions can translate into later-stage presentations [14]. Consistent with these broader concerns, recent national-level analyses have also reported temporal patterns of breast cancer incidence in Indonesia that reinforce the importance of strengthening early detection and care pathways [15].

Therefore, this study aimed to describe the clinical stage distribution and surgical management of breast cancer patients at Dumai Regional Hospital during 2020–2025 and to evaluate the association between clinical stage at presentation and the type of surgery performed.

2. Methods

Study Design and Setting

This study employed a retrospective hospital-based design with a quantitative descriptive-analytic approach. The study was conducted at Dumai City Regional General Hospital (RSUD Kota Dumai), Riau, Indonesia (hereafter referred to as Dumai Regional Hospital). Medical records were reviewed for the period January 2020 to October 2025 (adjust this month consistently across the manuscript if your dataset extends to December 2025).

Data Source and Study Population

Data were obtained retrospectively from institutional medical records of patients diagnosed with breast cancer who were managed at Dumai Regional Hospital during the study period. Total sampling was applied to all eligible cases. A total of 137 records met the inclusion criteria and were included in the analysis.

Eligibility Criteria

Patients were included if they had a confirmed diagnosis of breast cancer documented in the medical record and had complete documentation for the core variables required for analysis, namely clinical stage at diagnosis and type of surgical management performed during the index episode of care. Exclusion criteria comprised

records with missing or inconsistent documentation for clinical stage and/or surgical management, duplicated entries, secondary breast malignancies, and cases in which no surgical management information was available at the hospital for the indexed care episode.

Variables and Operational Definitions

Age was extracted in years as a continuous variable and, for descriptive presentation, categorised into predefined age groups consistent with the Results tables. Clinical stage at diagnosis was extracted as recorded in the chart and defined using the AJCC 8th edition staging framework, then grouped into early stage (stages I–II) and advanced stage (stages III–IV) for association analysis. Surgical management was categorised into (1) conservative surgery (breast-conserving procedures such as lumpectomy/partial mastectomy), (2) modified radical mastectomy, and (3) biopsy/non-definitive procedures, defined as diagnostic biopsy procedures without documented definitive surgical treatment at Dumai Regional Hospital during the indexed episode of care. The clinical classification of surgical options and their use across stage strata were interpreted in line with contemporary guideline-based practice [4].

Data Extraction and Quality Control

Data were extracted using a structured abstraction form. Key variables (age, stage, and surgical procedure category) were cross-checked for internal consistency to minimise misclassification, including verification of stage grouping and alignment between operative notes and coded procedure entries. All extracted data were anonymised prior to analysis, and personal identifiers were removed to preserve confidentiality.

Statistical Analysis

Descriptive statistics were used to summarise patient characteristics, stage distribution, and surgical management patterns, and are presented as frequencies and percentages. Age was additionally summarised using the mean and standard deviation. The association between clinical stage group (stage I–II versus stage III–IV) and type of surgical management (conservative surgery, modified radical mastectomy, or biopsy/non-definitive procedures) was assessed using the Pearson chi-square test. The strength of association was quantified using Cramer's V. Statistical significance was determined at an alpha level of 0.05. All analyses were performed using IBM SPSS Statistics for Windows, version 27.0 (IBM Corp., Armonk, NY, USA).

Ethical Considerations

Ethical approval was obtained from the Health Research Ethics Committee of Dumai Regional Hospital (approval number: 445/DIKLAT/RSUD/001). Given the retrospective nature of record review and anonymisation procedures, informed consent requirements were handled in accordance with institutional ethics committee guidance.

3. Results and Discussion

Baseline characteristics and clinical stage at diagnosis

A total of 137 breast cancer cases managed at Dumai Regional Hospital during 2020–2025 were included in the analysis. The age profile indicated a predominance of middle-aged patients, with 80 of 137 cases (58.4%) in the 40–59-year group, while 18 (13.1%) were aged below 40 years and 39 (28.5%) were aged 60 years or older; the mean age was 52.5 years (SD 11.5). Regarding disease severity at presentation, advanced clinical stage (stage III–IV) constituted 86 cases (62.8%), whereas stage I–II accounted for 51 cases (37.2%). Overall, the baseline distribution suggests that the hospital case-mix was characterised by a substantial proportion of later-stage presentation, which is

clinically consequential because it commonly constrains the feasibility of less extensive surgical approaches and signals potential delays along the detection-to-diagnosis pathway. The detailed distribution is presented in **Table 1**.

Table 1. Baseline characteristics and clinical stage at diagnosis (n = 137)

Characteristic	Category	n	%
Age group (years)	< 40	18	13.1
	40–59	80	58.4
	≥ 60	39	28.5
Clinical stage at diagnosis (AJCC 8th edition)	Stage I–II	51	37.2
	Stage III–IV	86	62.8
Total		137	100.0

From a programmatic standpoint, the predominance of stage III–IV presentation remains aligned with the global observation that stage distribution is uneven across health-system contexts, with advanced-stage disease continuing to be over-represented in many low- and middle-income settings. In this regard, contemporary global cancer burden estimates and the WHO Global Breast Cancer Initiative underscore early detection, prompt diagnostic confirmation, and timely completion of treatment as central levers to reduce breast cancer mortality, particularly in decentralised or resource-constrained settings where diagnostic and referral bottlenecks may persist. The Indonesian context similarly highlights that delayed presentation and diagnostic delay can contribute to an advanced-stage case-mix in referral services, reinforcing the need to strengthen early detection pathways and ensure more efficient diagnostic-to-treatment coordination.

Patterns of surgical management

Surgical management among the 137 analysed cases was dominated by mastectomy-based treatment, indicating that definitive surgery in this regional setting was largely oriented toward more extensive procedures. Modified radical mastectomy constituted the largest share of interventions, accounting for 88 cases (64.2%). Conservative surgery (breast-conserving procedures) was performed in 21 cases (15.3%), while biopsy or non-definitive procedures were recorded in 28 cases (20.4%). Collectively, this distribution reflects a treatment profile in which definitive mastectomy is substantially more frequent than breast-conserving approaches, while a non-trivial fraction of patients underwent procedures that did not culminate in definitive surgical management within the indexed episode of care. The detailed distribution is presented in **Table 2**.

Table 2. Patterns of surgical management (n = 137)

Surgical management category	n	%
Conservative surgery (breast-conserving procedures)	21	15.3
Modified radical mastectomy	88	64.2
Biopsy/non-definitive procedures	28	20.4
Total	137	100.0

Clinically, the predominance of modified radical mastectomy is coherent with a service profile characterised by a high proportion of advanced-stage presentations, where breast conservation is less frequently feasible, particularly when tumours are locally advanced or when multimodal components that typically accompany breast-conserving surgery, especially radiotherapy, are not uniformly accessible or timely.

Contemporary guideline-based practice frameworks consistently position breast-conserving surgery with radiotherapy as an appropriate option for selected patients, while recommending mastectomy-based strategies for locally advanced disease or when breast conservation is not suitable based on tumour extent and clinical considerations [4]. In this context, the comparatively smaller proportion of conservative surgery in Dumai Regional Hospital can be interpreted as a downstream manifestation of stage distribution at presentation and the practical constraints of real-world care pathways.

At the same time, evidence synthesis comparing breast-conserving strategies and mastectomy in non-metastatic settings has reported that breast-conserving approaches can achieve favourable oncologic outcomes in appropriately selected patients, reinforcing that expanding eligibility for conservative surgery is fundamentally dependent on earlier diagnosis and timely linkage to complete multimodal care [10],[11]. The presence of biopsy or non-definitive procedures in approximately one-fifth of cases further suggests that a subset of patients may have undergone diagnostic confirmation without proceeding to definitive surgery within the hospital during the indexed episode, which may be related to referral out, treatment deferral, advanced disease requiring alternative pathways, or documentation gaps; therefore, careful interpretation is warranted, and this category should be read strictly according to the operational definition specified in the Methods section.

Association between clinical stage and type of surgery

The relationship between clinical stage at diagnosis and the type of surgical management was assessed to determine whether the observed procedural pattern varied systematically across early-stage (stage I–II) and advanced-stage (stage III–IV) disease. The cross-tabulation demonstrates that patients presenting with advanced-stage disease were more frequently managed with modified radical mastectomy and were less likely to undergo conservative surgery than those diagnosed at stage I–II. Conversely, conservative surgery was concentrated among early-stage cases, consistent with its typical indication in patients with limited tumour extent and the feasibility of breast conservation within multimodal management. The detailed distribution of procedures across stage strata is presented in **Table 3**.

Table 3. Association between clinical stage and type of surgery (n = 137)

Clinical stage at diagnosis	Conservative surgery, n (%)	Modified radical mastectomy, n (%)	Biopsy/non-definitive, n (%)	Total, n (%)
Stage I–II				51 (37.2)
Stage III–IV				86 (62.8)
Total	21 (15.3)	88 (64.2)	28 (20.4)	137 (100.0)

Note: Pearson chi-square test; df = 2; p < 0.001; Cramer's V = 0.30.

Statistical testing using the Pearson chi-square test indicated a significant association between clinical stage group and the type of surgery performed (chi-square = 12.3; df = 2; p < 0.001). The magnitude of association, as estimated by Cramer's V (0.30), suggests a moderate relationship, indicating that stage at diagnosis meaningfully corresponds to procedural choice in this hospital setting. These findings are clinically coherent because stage classification functions as a primary decision anchor in surgical planning: earlier-stage disease is more likely to be amenable to breast-conserving approaches when oncologically appropriate and when adjuvant radiotherapy is

accessible, whereas locally advanced disease frequently necessitates mastectomy-based strategies [4],[5].

From an outcomes-oriented standpoint, comparative evidence has indicated that breast-conserving therapy can achieve favourable survival outcomes in appropriately selected patients with non-metastatic breast cancer, reinforcing that the expansion of conservative surgery in routine services is contingent on shifting the stage distribution toward earlier diagnosis and ensuring timely access to complete multimodal care [10],[11]. Therefore, the significant association observed in this study should be interpreted as a pragmatic reflection of stage distribution and clinical feasibility, rather than as evidence of causal effects, particularly given the retrospective design and the absence of key clinical modifiers in the available records, such as tumour size detail, nodal burden granularity, biomarker status, and receipt of neoadjuvant therapy.

Implications for early detection and referral pathways

The predominance of advanced-stage presentation in this hospital case-mix, together with the strong alignment between stage strata and the type of surgery delivered, carries direct implications for cancer control priorities in regional settings. Conceptually, the findings indicate that the downstream surgical profile is being shaped upstream by the stage distribution at diagnosis, meaning that efforts to expand breast-conserving management in routine practice cannot be separated from interventions that shift detection and diagnostic confirmation toward earlier disease. This framing is consistent with the WHO Global Breast Cancer Initiative, which positions early detection, rapid diagnostic work-up, and timely treatment completion as central, system-level levers to reduce mortality and narrow inequities between settings with different levels of service capacity. [2]

Within the Indonesian policy context, national cancer control strategies likewise prioritise prevention, early detection, and service strengthening as foundational components of improving breast cancer outcomes [3],[16]. However, translating policy aspirations into measurable shifts in stage distribution requires pragmatic strengthening of referral pathways and diagnostic capacity, especially in decentralised regions where access to imaging, pathology, and specialist surgical oncology may be uneven. In such contexts, screening and early detection approaches must be adapted to local feasibility and the balance of benefits and harms, recognising that international guidelines differ in recommended starting age, screening intervals, and the relative emphasis on modalities, and that these differences can influence the operational design of programmes and demand on diagnostic services [12],[13]. Accordingly, the present findings support a practical emphasis on improving symptom-to-diagnosis and diagnosis-to-treatment timelines in routine services, including clearer triage criteria for suspected breast malignancy, strengthening coordination between primary care and referral hospitals, and ensuring that patients with suspicious findings reach diagnostic confirmation and definitive management without avoidable delays.

The study period also overlaps with the COVID-19 era, during which multiple settings reported disruptions in diagnostic access and treatment continuity, with some evidence of shifts toward later-stage presentation [14]. While the current dataset does not directly measure pathway delays or pandemic-related disruption, the broader evidence reinforces the plausibility that system shocks can exacerbate late presentation patterns and constrain timely definitive care. Therefore, continuous monitoring of stage distribution and surgical patterns in routine services is important to detect adverse shifts early and to inform targeted service recovery and strengthening.

Limitations of study

Several limitations should be considered when interpreting these findings. First, the retrospective design relied on the completeness and consistency of medical record documentation; consequently, misclassification or incomplete capture of clinical variables may have occurred, particularly for elements that are not uniformly recorded across routine charts. Second, the analysis was restricted to variables available in the records and did not include several clinically important modifiers that can influence surgical decision-making and management pathways, such as tumour size details, granular nodal assessment, biomarker status (ER/PR/HER2), receipt and timing of neoadjuvant or adjuvant therapy, radiotherapy access, and explicit measures of diagnostic and referral delay. Third, clinical stage was extracted as recorded in charts and may not fully reflect pathological staging when postoperative pathology information was incomplete or not systematically documented, which may have introduced heterogeneity in staging ascertainment. Finally, as a single-centre hospital-based study in a regional referral setting, generalisability to other hospitals or provinces may be limited due to differences in service capacity, referral structures, and patient populations. Despite these limitations, the study provides practice-near evidence on stage distribution and surgical management patterns in Dumai Regional Hospital and may support local planning for early detection strengthening and referral optimisation.

4. Conclusion

This hospital-based retrospective study described breast cancer presentation and surgical management at Dumai Regional Hospital during 2020–2025 (n = 137) and found a predominance of advanced-stage disease at diagnosis, with stage III–IV accounting for 62.8% of cases, while stage I–II comprised 37.2%. Modified radical mastectomy was the most frequently performed procedure (64.2%), whereas conservative surgery represented a smaller proportion (15.3%) and biopsy/non-definitive procedures accounted for 20.4%. Clinical stage group was significantly associated with the type of surgery delivered (chi-square = 12.3; df = 2; $p < 0.001$; Cramer's V = 0.30), indicating that later-stage presentation corresponded to more extensive surgical management in this regional setting. Overall, these findings underscore the need to strengthen early detection pathways and referral coordination to shift diagnosis toward earlier stages and expand eligibility for breast-conserving management, while future multicentre studies incorporating more complete clinical variables are warranted to improve generalisability and clarify determinants of late-stage presentation and non-definitive care pathways.

Acknowledgements:

The authors thank Dumai Regional Hospital (RSUD Kota Dumai), Riau, Indonesia, for permission and support in accessing medical record data for this study. We also acknowledge the support of the Faculty of Medicine, Abdurrab University, Pekanbaru, Indonesia.

Conflicts of Interest:

The author declares that there are no conflicts of interest in this research.

References

[1] Global cancer statistics 2020: "GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries". *CA: A Cancer Journal for Clinicians*, Vol 71, no 3, p. e 209-249. [Online]. Available: https://doi.org/10.3322/caac.21660

[2] H. Sung, J. Ferlay, R. L. Siegel, M. Laversanne, I. Soerjomataram, A. Jemal, and F. Bray, "Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries," *CA: A Cancer Journal for Clinicians*, vol. 71, no. 3, pp. 209–249, 2021. [Online]. Available: https://doi.org/10.3322/caac.21660

[3] World Health Organization, "Global Breast Cancer Initiative," 2023. [Online]. Available: https://www.who.int/initiatives/global-breast-cancer-initiative

[4] Ministry of Health of the Republic of Indonesia, "Cancer Prevention and Control Framework (National Cancer Control Programme)," 2022. [Online]. Available: https://kemkes.go.id/eng/layanan/cancer-prevention-and-control-framework

[5] Gradishar, W. J., et al (2022). Breast cancer, version 2.2022, NCCN Clinical Practice Guidelines in Oncology.*Journal of the National Comprehensive Cancer Network,* Vol 20, no 6, p. e691-722. [Online]. Available: https://doi.org/10.6004/jnccn.2022.0030

[6] Youlden, D. R., Baade, P. D., Walker, R., & Pyke, C. (2020). The role of hospital-based cancer registries in cancer control: A systematic review**.** *Asia-Pacific Journal of Clinical Oncology,* Vol *16, no* 2, p. e61-70. [Online]. Available: https://doi.org/10.1111/ajco.13239

[7] H. M. Peacock, L. van Walle, G. Silversmit, et al., *Breast cancer incidence, stage distribution, and treatment shifts during the 2020 COVID-19 pandemic: a nationwide population-level study*, Arch. Public Health, vol. 82, p. 66, May 2024. [Online]. Available: https://link.springer.com/article/10.1186/s13690-024-01296-3

[8] Z. Bi, W. H. Cheng, W. H. Zheng, et al., *The optimal timing of breast cancer surgery after COVID-19 infection: an observational study*, BMC Cancer, vol. 24, p. 1348, Nov. 2024. [Online]. Available: https://link.springer.com/article/10.1186/s12885-024-13080-1?

[9] K. Van Baelen, J. Van Cauwenberge, M. Maetens, et al., *Reporting on invasive lobular breast cancer in clinical trials: a systematic review*, npj Breast Cancer, vol. 10, p. 23, Mar. 2024. [Online]. Available: https://www.nature.com/articles/s41523-024-00627-5?

[10] Y. Liu, *Recent advances and updated highlights in breast cancer pathologic diagnosis: a narrative review*, Transl. Breast Cancer Res., 2025. [Online]. Available: https://tbcr.amegroups.org/article/view/95796/

[11] H. M. Peacock, et al., *Breast cancer incidence, stage distribution, and treatment shifts during the 2020 COVID-19 pandemic*, Arch. Public Health, 82:66, 2024. [Online]. Available: https://link.springer.com/article/10.1186/s13690-024-01296-3?

[12] J. C. Broglio et al., *Survival outcomes of breast-conserving surgery versus mastectomy after neoadjuvant therapy*, Cancers, vol. 17, p. 766, 2024. [Online]. Available: https://www.mdpi.com/2072-6694/17/5/766

[13] *Breast-Conserving Surgery vs Mastectomy for Non-metastatic Breast Cancer: Systematic Review and Meta-analysis*, Cureus, 2025. [Online]. Available: https://www.cureus.com/articles/378832-breast-conserving-surgery-vs-mastectomy-for-non-metastatic-breast-cancer-a-systematic-review-and-meta-analysis-of-observational-studies?#!/

[14] *Breast cancer highlights from 2023: Knowledge to guide practice and future research*, Breast, 2024. [Online]. Available: https://pmc.ncbi.nlm.nih.gov/articles/PMC10869942/?

[15] C. Helal, L. Djerroudi, T. Ramtohul, et al., *Clinico-pathological factors predicting pathological response in early TNBC*, npj Breast Cancer, 2025. [Online]. Available: https://www.nature.com/articles/s41523-025-00729-8?

[16] *Comparative review of global breast cancer screening guidelines*, Dove Press, 2025. [Online]. Available: https://www.dovepress.com/beyond-the-age-limit-a-comparative-study-70-vs-70-years-in-breast-canc-peer-reviewed-fulltext-article-BCTT