

Review Article

Breast cancer in the United States: current treatment and diagnosis strategies, risk factors and preventive methods

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ABSTRACT

Breast cancer is the most frequently diagnosed cancer in women and remains a leading cause of cancer-related deaths worldwide. Its burden affects women physically, mentally, and socially, making it a major public health concern. The development and outcome of the disease are influenced by several risk factors, including age, family history, genetic alterations, reproductive history, lifestyle behaviors such as physical inactivity, obesity, alcohol use, smoking, and exposure to radiation. In the United States, recent evidence indicates that breast cancer among younger women (ages 20–49) is rising, with variations by race, ethnicity, tumor stage, and hormone receptor status. Younger patients often face worse prognoses than older women. Treatment requires a multidisciplinary approach, guided by tumor biology, stage, and molecular markers. For early-stage disease, breast-conserving surgery with radiotherapy or mastectomy remains the standard, often combined with adjuvant systemic therapy based on nodal involvement, hormone receptor, and HER2 status. In metastatic disease, the focus shifts to prolonging survival and maintaining quality of life. Advances in chemotherapy, radiotherapy, endocrine therapy, targeted therapy, immunotherapy, and gene-based treatments continue to expand options. However, disparities in access and outcomes persist.

Keywords: Breast cancer, Risk factors, Epidemiology, Treatment, Prevention, Early detection, Women's health

INTRODUCTION

Breast cancer is one of the most common malignant tumors affecting women and remains a leading cause of cancer-related death worldwide.¹ It originates in breast epithelial cells and can grow into a tumor capable of invading surrounding tissue and metastasizing to distant organs. In some cases, breast cells undergo non-cancerous but abnormal changes, such as atypical hyperplasia, cysts, or intraductal papillomas, which may increase cancer risk later.² Globally, breast cancer accounts for more than one million new cases annually, and incidence is rising,

particularly in low- and middle-income countries.³ In the United States, breast cancer makes up approximately 30% of all cancers in women, with an estimated 300,590 new cases and 43,700 deaths projected for 2023. The lifetime risk for American women is around 1 in 8, while the risk of dying from breast cancer is 1 in 35.¹

Genetic predispositions such as BRCA1/2 mutations account for 5–10% of cases while lifestyle and environmental exposures contribute to 20–30%.^{4,5} Age, reproductive history, and hormonal status also play critical roles in risk.⁶

Alarming, incidence among younger women (20–49 years) is rising, with these patients often presenting with aggressive tumors and poorer survival.^{7,8} Non-Hispanic Black women are more likely to develop aggressive subtypes such as triple-negative breast cancer (TNBC), contributing to disparities in outcomes.⁷

Given its complexity, breast cancer requires a multidisciplinary approach integrating surgery, radiotherapy, systemic therapies, and supportive care. This review summarizes current diagnostic methods, treatment strategies, risk factors, and preventive measures relevant to breast cancer in the United States (Table 1).

Table 1: Summary of breast cancer in the United States: diagnosis, treatment, risk factors, and prevention.

Category	Key points	References
Diagnosis	Mammography: gold standard for early detection, ultrasound: distinguishes solid tumors versus cysts, biopsy (core, fine-needle aspiration, lymph node): confirms diagnosis and staging	1–6
Treatment – surgery	Breast-conserving surgery (BCS) + radiotherapy = survival equal to mastectomy, sentinel lymph node biopsy (SLNB) preferred for node-negative cases, mastectomy for multicentric disease or recurrence	1–4
Treatment – chemotherapy	Reduces recurrence by ~30%, neoadjuvant chemo allows breast conservation, taxanes + anthracyclines standard; platinum effective in TNBC, dose-dense regimens improve survival	5–10
Treatment – radiotherapy	Adjuvant RT essential after BCS, hypofractionated RT reduces toxicity with equal outcomes, post-mastectomy RT indicated for ≥4 positive nodes, partial breast irradiation for low-risk cases	11–15
Treatment – endocrine therapy	Standard for HR+ cancers, tamoxifen (5–10 years) reduces recurrence, AIs preferred postmenopause; ovarian suppression beneficial premenopause, CDK4/6 inhibitors + AI improve advanced disease outcomes	16–21
Advanced therapies	HER2-targeted therapy (trastuzumab, pertuzumab, T-DM1), immunotherapy (pembrolizumab, atezolizumab) effective in TNBC, gene therapy under investigation, promising but experimental	1–3
Prevention	Screening: regular mammography + clinical exam, lifestyle: diet, exercise, no smoking/alcohol, breastfeeding protective, genetic counselling for BRCA carriers, education increases early detection	7–11
Risk factors	Non-modifiable: family history, BRCA mutations, age, dense breasts, late menopause, modifiable: obesity, alcohol, smoking, poor diet, hormone replacement therapy, others: reproductive history, radiation exposure	1–6

CURRENT TREATMENTS

Surgery

Surgery remains the cornerstone for localized breast cancer. Breast-conserving surgery (BCS) plus radiotherapy provides equivalent survival to mastectomy, with 10-year recurrence rates as low as 2–5% and superior cosmetic outcomes.⁹ Contraindications include multicentric disease, diffuse microcalcifications, and inability to receive radiotherapy.¹⁰ Sentinel lymph node biopsy (SLNB) has replaced axillary dissection in most clinically node-negative patients.¹¹ For local recurrence, mastectomy remains standard.¹²

Chemotherapy

Chemotherapy reduces recurrence risk by ~30% in early breast cancer.¹³ Neoadjuvant chemotherapy (NAC) allows downstaging, facilitating breast conservation.¹⁴ Standard regimens include anthracyclines and taxanes, while platinum agents show benefit in TNBC.¹⁵ Capecitabine maintenance improves outcomes in TNBC following standard therapy.¹⁶ Dose-dense regimens every 14 days

provide superior outcomes compared to conventional schedules.¹⁷

Radiotherapy

Adjuvant radiotherapy is standard after BCS, reducing local recurrence and mortality.¹⁸ Hypofractionated radiotherapy offers equivalent control with fewer side effects.¹⁹ Partial breast irradiation is suitable for carefully selected low-risk patients.²⁰ Post mastectomy radiotherapy (PMRT) is strongly indicated in patients with ≥4 positive lymph nodes.²¹ Regional nodal irradiation improves disease-free survival but carries risks of cardiopulmonary toxicity.²²

Endocrine therapy

Endocrine therapy is fundamental for hormone receptor (HR)-positive breast cancer. Tamoxifen for 5–10 years significantly reduces recurrence and mortality.^{23,24} For high-risk premenopausal women, combining ovarian suppression with tamoxifen or aromatase inhibitors (AIs) improves survival.²⁵ In postmenopausal women, AIs are superior to tamoxifen but increase bone-related side

effects.²⁶ CDK4/6 inhibitors combined with AIs markedly prolong survival in advanced disease.²⁷

Targeted therapy and immunotherapy

HER2-targeted agents such as trastuzumab, pertuzumab, and T-DM1 have revolutionized outcomes in HER2-positive disease.²⁸ Immunotherapy with checkpoint inhibitors like pembrolizumab and atezolizumab improves survival in PD-L1-positive TNBC.²⁹ Gene therapies and adoptive cell approaches (CAR-T, TCR-modified T cells) remain experimental but promising.³⁰

DIAGNOSIS

Diagnosis involves mammography- standard for screening and early detection using low-dose X-rays.³¹ Ultrasound, differentiates cystic from solid lesions and guides biopsies.³² Biopsy, gold standard for diagnosis; includes core needle, vacuum-assisted, and excisional methods.^{33,34} Lymph node biopsy, determines nodal spread, guiding staging and management.³⁵ Fine needle aspiration (FNA), useful for distinguishing cysts but limited in confirming invasiveness.³⁶

Prevention

Screening included regular mammograms and clinical exams improve early detection and outcomes.³⁷ Healthy lifestyle included maintaining normal body mass index (BMI), regular exercise, reduced alcohol intake, and smoking avoidance lowers risk.³⁸ Breastfeeding included protective against breast cancer.³⁹ Education included awareness campaigns improve early presentation and detection, and genetic counseling was recommended for women with strong family history or BRCA mutations.^{40,41}

RISK FACTORS

Personal history such as previous breast cancer increases recurrence risk.⁴² Family history such as strong family clustering elevates risk.⁴³ Inherited mutations- BRCA1/2 and TP53 mutations significantly increase lifetime risk.³ Age/hormonal factors such as early menarche, late menopause, nulliparity, and HRT increase risk.⁴⁴ Lifestyle factors like obesity, alcohol, smoking, poor diet, and inactivity are associated with higher incidence.^{4,8} Breast density as dense breasts increase both risk and diagnostic difficulty.⁶

DISCUSSION

Breast cancer incidence in the U.S. reflects both advances in detection and ongoing challenges in prevention and equity. While mortality has declined due to screening and improved therapies, younger women and racial minorities continue to experience disproportionately poor outcomes.^{1,7,8,18,19} Advances in systemic therapies—including endocrine, HER2-targeted, and immunotherapy—have reshaped management, but

disparities in access and treatment remain critical barriers.^{8,23,30}

Future research is moving toward precision oncology, using molecular profiling, AI-driven diagnostics, and gene-editing tools to personalize care.³⁰ Preventive strategies—including lifestyle interventions, expanded access to genetic counseling, and widespread education—remain underutilized but essential to reducing incidence and improving equity in outcomes.³⁷⁻⁴¹

CONCLUSION

Breast cancer in the United States remains a major health concern, with increasing incidence in young women and persistent disparities in survival. Significant progress has been achieved through advances in surgery, radiotherapy, chemotherapy, targeted therapy, and immunotherapy, yet challenges of treatment resistance and unequal care access remain.

Prevention and early detection remain cornerstones of reducing disease burden. Public health strategies must integrate lifestyle modification, genetic counseling, and equitable screening access. Looking forward, personalized medicine and emerging immuno-genetic therapies hold promise for transforming breast cancer care, improving survival, and enhancing quality of life for women across the country.

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