

BREAST CANCER

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Abstract: Breast cancer is one of the most common malignancies affecting women worldwide and represents a significant public health concern. The disease is characterized by uncontrolled proliferation of cells in the breast tissue, leading to tumor formation and potential metastasis. Early detection and accurate diagnosis are critical for effective treatment and improved survival. This article reviews the epidemiology, risk factors, pathogenesis, clinical manifestations, diagnostic approaches, treatment options, and preventive strategies for breast cancer, highlighting the importance of early intervention and comprehensive patient care.

Keywords: Breast cancer, oncology, diagnosis, treatment, prevention, risk factors, tumor biology.

Breast cancer is a leading cause of cancer-related morbidity and mortality among women globally. The incidence of the disease has been steadily increasing due to a combination of genetic, hormonal, and lifestyle factors. Risk factors include age, family history, genetic mutations (such as BRCA1 and BRCA2), hormonal influences, obesity, and lifestyle habits. Early detection through screening programs, including mammography and clinical breast examinations, is essential for timely intervention. Advances in diagnostic techniques and therapeutic strategies have significantly improved patient outcomes, emphasizing the need for a multidisciplinary approach to management and care.

Breast cancer is one of the most frequently diagnosed cancers among women worldwide. Its prevalence varies depending on geographic region, age, lifestyle, and genetic predisposition. The primary risk factors include advancing age, family history of breast cancer, and mutations in genes such as BRCA1 and BRCA2. Hormonal influences, early menarche, late menopause, obesity, alcohol consumption, and sedentary lifestyle also contribute to increased risk. Understanding these factors is crucial for implementing preventive measures and screening strategies.

Breast cancer develops due to uncontrolled proliferation of mammary epithelial cells, often triggered by genetic mutations and hormonal imbalances. The tumor microenvironment, including interactions between stromal cells and immune cells, plays a key role in tumor progression. Abnormal activation of oncogenes and inactivation of tumor suppressor genes lead to disrupted cell cycle regulation and

evasion of apoptosis. Tumor growth may remain localized initially but can eventually invade surrounding tissues, lymph nodes, and distant organs through metastasis. Early-stage breast cancer is often asymptomatic, which complicates timely diagnosis. Common signs and symptoms include a palpable lump in the breast, nipple discharge, changes in breast shape or skin texture, and localized pain. In advanced stages, patients may experience swelling of the lymph nodes, skin ulceration, or systemic symptoms such as fatigue and unexplained weight loss.

Accurate diagnosis relies on a combination of imaging, histopathology, and molecular testing. Mammography and ultrasound are primary screening tools for early detection. Magnetic resonance imaging (MRI) is used in high-risk patients or for detailed assessment of tumor extent. Biopsy and histological examination confirm malignancy, while immunohistochemistry and molecular profiling help determine tumor subtype, hormone receptor status, and potential targets for therapy. Treatment depends on tumor type, stage, and molecular characteristics. Surgical options include lumpectomy and mastectomy. Adjuvant therapies such as chemotherapy, radiotherapy, hormonal therapy, and targeted therapy are tailored to individual patient profiles. Immunotherapy is emerging as a promising option for certain breast cancer subtypes. Multidisciplinary management improves survival rates and quality of life. Effective prevention focuses on lifestyle modification, including maintaining a healthy weight, regular physical activity, limiting alcohol intake, and avoiding tobacco. Screening programs, particularly mammography for women over 40 or high-risk groups, facilitate early detection. Genetic counseling and testing are recommended for individuals with a strong family history of breast cancer to identify and manage high-risk patients proactively.

Conclusion.

Breast cancer remains a major health concern worldwide due to its high incidence and potential for metastasis. The disease arises from complex interactions between genetic, hormonal, and environmental factors, with mutations in BRCA1 and BRCA2 genes representing significant hereditary risks. Early detection through screening programs such as mammography is essential for improving patient outcomes and reducing mortality. Advances in diagnostic techniques, including imaging, biopsy, and molecular profiling, allow precise identification of tumor subtype and guide personalized treatment strategies. Management typically involves a combination of surgery, chemotherapy, radiotherapy, hormonal therapy, and targeted therapy, tailored to the individual patient. Emerging therapies, such as immunotherapy, further enhance treatment effectiveness. Preventive measures, including lifestyle modification, risk factor reduction, and genetic counseling for high-risk individuals, play a crucial role in minimizing disease occurrence. A comprehensive approach combining early detection,

effective treatment, and preventive strategies is essential to improve survival rates and quality of life for patients with breast cancer.

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