Breast Cancer

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Abstract- Breast cancer is a malignant disease originating in breast tissue, primarily affecting women but also occurring in men. It commonly begins in the ducts (ductal carcinoma) or lobules (lobular carcinoma) of the breast. Breast cancer is categorized into non-invasive (in situ) and invasive types, with invasive ductal carcinoma being the most prevalent, accounting for 70–80% of cases. Risk factors encompass genetic mutations (e.g., BRCA1/BRCA2), hormonal influences, lifestyle choices, and family history. Early detection through regular screening, such as mammography, significantly enhances treatment outcomes. Treatment modalities include surgery, radiation therapy, chemotherapy, hormone therapy, and targeted biological therapies. Advancements in medical research continue to improve prognosis and survival rates for breast cancer patients

Keywords: Breast cancer, Ductal carcinoma in situ (DCIS), Lobular carcinoma in situ (LCIS), Invasive ductal carcinoma (IDC), Invasive lobular carcinoma (ILC), BRCA1/BRCA2 mutations, Hormone receptor-positive breast cancer

INTRODUCTION

Breast cancer is a malignant tumor originating in the breast tissue, predominantly affecting women but also occurring in men. It commonly arises in the lining of the milk ducts (ductal carcinoma) or the lobules (lobular carcinoma) that supply the ducts with milk. Globally, breast cancer is one of the most prevalent cancers among women, with significant variations in incidence and mortality rates across different regions. Early detection through regular screening, such as mammography, has been shown to significantly improve treatment outcomes. Risk factors include age, genetic predisposition (e.g., BRCA1/BRCA2 mutations), hormonal influences, lifestyle factors, and family history. Advancements in medical science have led to a range of treatment options, including surgery, radiation therapy, chemotherapy, hormone therapy, and targeted biological therapies.

EPIDEMIOLOGY

Breast cancer remains the most commonly diagnosed cancer among women worldwide. According to recent statistics, it accounts for a significant proportion of cancer-related deaths, with variations observed across different countries and regions. In 2022, there were an estimated 2.3 million new breast cancer cases and 670,000 deaths worldwide.

It is the most frequent cancer among Indian women, with an age-adjusted incidence rate of 25.8 per 100,000 women. Incidence and mortality rates vary globally, influenced by factors such as socioeconomic status, access to healthcare, and public health initiatives. Developed countries often report higher incidence rates due to better screening practices, while developing countries may experience higher mortality rates due to limited access to early detection and treatment.

CAUSES

Breast cancer does not have a single known cause but results from a combination of genetic, hormonal, environmental, and lifestyle factors. Below are some of the most recognized causes and risk factors:

Genetic Factors: Inherited gene mutations significantly increase the risk BRCA1 and BRCA2 Family history of breast or ovarian cancer also predisposes the person to breast cancer.

Hormonal Factors: Early menstruation (before age 12) or late menopause (after age 55) increases lifetime estrogen exposure also Hormone replacement therapy (HRT) after menopause and Use of birth control pills increase the risk with long-term use)

Lifestyle and Environmental Factors: Lack of physical activity, Obesity (especially after menopause), Alcohol consumption, Smoking, Radiation exposure (chest radiation in youth)

Reproductive History having no children or having the first child after age 30 and not breastfeeding predisposes the women to breast cancer.

SIGNS AND SYMPTOMS: Early detection of breast cancer greatly improves treatment outcomes. Here are the common signs and symptoms to watch for:

1. Lump in the Breast or Underarm: A hard, painless lump or thickening in the breast or armpit that feels different from surrounding tissue.

2. Changes in Breast Size or Shape: Noticeable changes in the contour, size, or shape of the breast.

3. Nipple Changes: Inversion (turning inward) of the nipple, Redness, scaling, or thickening of the nipple or surrounding area, Nipple discharge, especially if bloody or occurring without squeezing.

4.Skin Changes on the Breast: Dimpling, puckering, or wrinkling of the skin (often described as resembling an orange peel), Redness or flaky skin over the breast.

5. Pain in the Breast or Nipple: Persistent pain in any part of the breast, though most breast cancers are not painful.

6. Swelling: Swelling in part of the breast even without a distinct lump, Swollen lymph nodes under the arm or near the collarbone.

MANAGEMENT

The management of breast cancer is multifaceted and tailored to the individual, depending on factors such as the cancer type, stage, hormone receptor status, HER2 status, and the overall health and preferences of the patient. The primary goal is to remove or destroy cancer cells and prevent recurrence, using a combination of local and systemic treatments.

Surgical management is often the first line of treatment for localized breast cancer. This may involve a lumpectomy, where only the tumor and a small margin of surrounding tissue are removed, allowing for breast conservation. In more advanced cases or depending on patient preference, a mastectomy—removal of one or both breasts either partially or completely—may be performed. Additionally, lymph node dissection, such as a sentinel lymph node biopsy or axillary lymph node dissection, is carried out to determine whether the cancer has spread to nearby lymph nodes.

Following surgery, radiation therapy is frequently used, particularly in patients who have undergone breast-conserving surgery. This involves the use of high-energy rays, like X-rays, to destroy any remaining cancer cells in the breast, chest wall, or lymph nodes, thereby reducing the risk of recurrence.

Chemotherapy is a systemic treatment involving anti-cancer drugs that circulate through the body to kill cancer cells. It may be given before surgery (neo-adjuvant chemotherapy) to shrink large tumors and make them operable, or after surgery (adjuvant chemotherapy) to eliminate any remaining cancer cells and reduce the risk of metastasis.

For patients whose tumors are hormone receptor-positive, hormonal (endocrine) therapy plays a vital role. This therapy works by blocking the effects of estrogen on breast cancer cells or lowering estrogen levels in the body. Common medications include Tamoxifen, which blocks estrogen receptors, and aromatase inhibitors like Letrozole and Anastrozole, which reduce estrogen production in postmenopausal women.

In cases where the cancer is HER2-positive, targeted therapy is employed. These drugs specifically target the HER2 protein that promotes cancer cell growth. One of the most well-known targeted therapies is Trastuzumab (Herceptin), which binds to the HER2 receptors and inhibits the proliferation of cancer cells.

Emerging treatments like immunotherapy are also being explored, especially for triple-negative breast cancer, a more aggressive subtype that lacks estrogen,

progesterone, and HER2 receptors. Immunotherapy helps boost the body's natural defenses to recognize and attack cancer cells.

In addition to medical treatment, comprehensive care includes supportive therapies, such as pain management, nutritional counseling, psychological support, and rehabilitation services, to help patients cope with the physical and emotional effects of the disease and its treatment. Regular follow-up care is essential to monitor for recurrence and manage any long-term side effects.

CONCLUSION

Breast cancer remains a significant public health concern. Early detection and personalized treatment approaches have improved outcomes, but ongoing efforts are needed to address disparities and advance therapeutic options. Continued research into the molecular underpinnings of breast cancer will be crucial in developing more effective prevention and treatment strategies.

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