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A Review On Breast Cancer

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ABSTRACT

Breast cancer is the most common malignancy worldwide, influenced by diverse risk factors including genetic and hereditary predisposition. Due to its pronounced heterogeneity, therapeutic strategies are determined by molecular characteristics like HER2 activation, hormonal receptor status, BRCA1/2 and PIK3CA mutations, and immune-related biomarkers. arly-stage breast cancer can be potentially cured with surgery and radiotherapy, often complemented by systemic therapy. Neoadjuvant targeted and immune-based therapies are now standard for most HER2-positive and triple-negative subtypes, while prolonged endocrine therapy remains key for ER-positive disease. In contrast, metastatic breast cancer is largely incurable and managed with systemic approaches tailored to molecular profiles, such as CDK4/6 inhibitors for hormone receptor-positive tumors and anti-HER2 agents for HER2-positive disease. Advances in precision medicine offer promise for optimizing individualized treatment. This overview highlights current therapeutic paradigms and future perspectives in breast cancer management, emphasizing the importance of molecular characteristics in guiding **treatment decisions.**

Keywords: breast cancer, epidemiology, risk factors, classification, diagnosis, prognosis, marker, treatment

INTRODUCTION BREAST CANCER

Carcinogenesis might occur in every cell, tissue, and organ, leading to the pathological alterations which results in a various kind of cancers. The major mechanisms that help its progression include avoidance of apoptosis, acceleration of rate of cell division, enhanced angiogenesis, resistance to antigrowth signals and induction of own growth signals; and capacity to metastasized. Carcinogenesis is a process which is stimulated by multiple factors but the primary factors are- predispositions of genetic materials and environmental causesCancer cells are the normal cells that behaving abnormally that are beyond the paradigm of life and death. Like an organism that evolves through a process of mutation and natural selection, cancer cells also progress from normal cell through selective transformation to malignancy [2]. Breast cancer is the most common type of malignancy among women, the number onecause of mortality by cancer, and one of the leading causes of morbidity and mortality for women worldwide [3]. Breast cancer is currently one of the most frequently diagnosed cancers and 5th cause of death related to cancer which estimated a number of 2.3 million cases worldwide according to the GLOBOCAN 2020 data [4]. The current edition reports of the International Agency for Research on Cancer (IARC), an increase of 66% global number of cancer deaths since 1960. Currently, breast cancer is the second most common cancer after lung cancer worldwide. Regarding possible minimization of breast cancer incidence, several procedures such as prevention behaviors as well as screening programs are crucial and the implementation of early treatment.

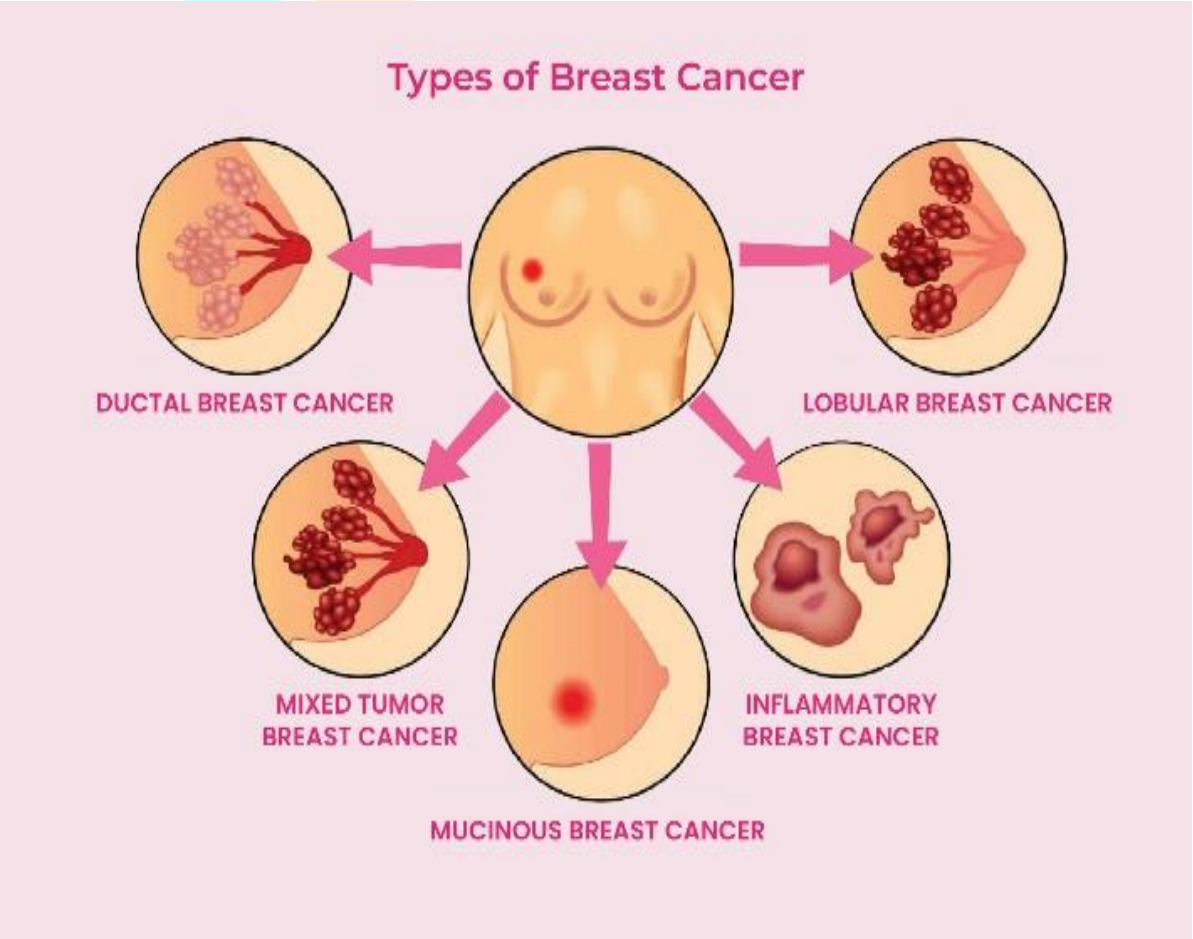
Currently, the Breast Health Global Initiative (BHGI) is responsible for preparation of proper guidelines and approaches to provide sufficient breast cancer control worldwide [4]. In this reviewarticle, we aim at providing information regarding breast cancer.

Breast cancer is one of the most common cancers affecting women worldwide. It occurs when cells in the breast grow uncontrollably, forming a tumor that can often be felt as a lump or seen on imaging. While it primarily affects women, men can also develop breast cancer, though it is much rare.

-Breast cancer originates in the breast tissue, most commonly in the ducts (which carry milk to the nipple) or the lobules (glands that produce milk). Cancer occurs when mutations in the DNA of breast cells cause them to divide and grow rapidly, often forming a lump or mass.

-According to a study 1 in 8 women in the United States will be diagnosed with breast cancer in her lifetime. In 2025, an estimated 316,950 women and 2,800 men will be diagnosed with invasive breast cancer, and an additional 59,080 new cases of non-invasive (in situ) breast cancer will be diagnosed.

Types of breast cancer



There are several types of breast cancer, but some of them are quite rare. In some cases a single breast tumor can be a combination types or be a mixture of invasive and in situ cancer.

1. **Ductal carcinoma in situ Ductal carcinoma in situ** (DCIS; also known as intraductal carcinoma) is considered noninvasive or pre-invasive breast cancer. DCIS means that cells that lined the ducts have changed to look like cancer cells. The difference between DCIS and invasive cancer is that the cells have not spread (invaded) through the walls of the ducts into the surrounding breast tissue. About 1 in 5 new breast cancer cases will be DCIS. Nearly all women diagnosed at this early stage of breast cancer can be cured.

2**. Lobular carcinoma** in situ This is not a true cancer or pre-cancer. A risk factor is anything that affects your chance of getting a disease, such as cancer. Different cancers have different risk factors. For example, exposing skin to strong sunlight is a risk factor for skin cancer. Smoking is a risk factor for cancers of the lung, mouth, larynx (voice box), bladder, kidney, and several other organs

3. **Invasive (or infiltrating)** ductal carcinoma This is the most common type of breast cancer. Invasive (or infiltrating) ductal carcinoma (IDC) starts in a milk duct of the breast, breaks through 4. Invasive (or infiltrating) lobular carcinoma Invasive lobular carcinoma (ILC) starts in the milkproducing glands (lobules). Like IDC,it can spread (metastasize) to other parts of the body. nvasive breast cancer in10 is an ILC. Invasive lobular carcinoma may be harder to detect by a mammogram thaninvasive ductal carcinoma. The wall of the duct, and grows into the fatty tissue of the breast.

Less common types of breast cancer 1. Inflammatory breast cancer This uncommon type of invasive breast cancer accounts for about 1% to 3% of all breast cancers. Usually there is no single lump or tumor. In its early stages, inflammatory breast cancer is often mistaken for an infection in the breast (called mastitis) and treated as an infection with antibiotics. If the symptoms are caused by cancer, they will not improve, and a biopsy will find cancer cells. This type of breast cancer tends to have a higher chance of spreading and a worse outlook (prognosis) than typical invasive ductal or lobular cancer.

2. Triple-negative breast cancer: This term is used to describe breast cancers (usually invasive ductal carcinomas) whose cells lack estrogen receptors and progesterone receptors, and do not have an excess of the HER2 protein on their surfaces. Breast cancers with these characteristics tend to occur more often in younger women and in African-American women. Triple-negative breast cancers tend to grow and spread more quickly than most other types of breast cancer. Because the tumor cells neither lack these certain receptors, neither hormone therapy nor drugs that target HER2 are effective treatments.

3. Paget disease of the nipple: This type of breast cancer starts in the breast ducts and spreads to the skin of the and then to the areola, the dark circle around the nipple. It is rare, accounting for only about 1% of all cases of breast cancer. The skin of the nipple and areola often appears crusted, scaly, and red, with areas of bleeding or oozing.The woman may notice burning or itching.

4. Phyllodes tumor: This very rare breast tumor develops in the stroma (connective tissue)of the breast, in contrast to carcinomas, which develop in the ducts or lobules. Other names for these tumors include phylloides tumor and cystosarcoma phyllodes. Thesetumors are usually benign but on rare occasions may be malignant. Benign phyllodes tumors are treated by removing the tumor along with a margin of normal breast tissue.

5. Angiosarcoma: This form of cancer starts in cells that line blood vessels or lymph vessels. It rarely occurs in the breasts. When it does, it usually3. Paget disease of the nipple: This type of breast cancer starts in the breast ducts and spreads to the skin of the and then to the areola, the dark circle around the nipple. It is rare, accounting for only about 1% of all cases of breast cancer. The skin of the nipple and areola often appears crusted, scaly, and red, with areas of develops as a complication of previous radiation treatments. This is an extremely rare complication of breast radiation therapy that can develop about 5 to 10 years after radiation. Angiosarcoma can also occur in the arms of women who develop lymphedema as a result of lymph node surgery or radiation therapy to treat breast cancer.

Major genes associated with an increased risk of breast cancer occurrence.

Stages of Breast Cancer:[13,14]

The stages of breast cancer ranges from 0-4 (0-IV).

- Stage II
- Stage III
- Stage IV

Cancer stage is based on four characteristics:

- The size of the cancer
- Whether the cancer is invasive or non-invasive
- Whether cancer is in the lymph nodes
- Whether cancer has spread to other parts of the body beyond the breast.

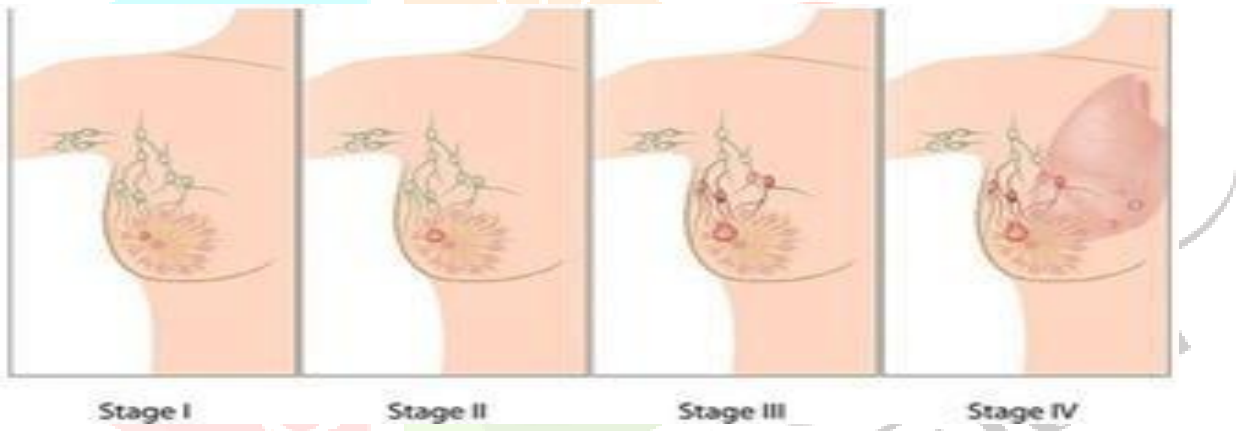


Figure 4: Stages of breast cancer

Cancer may also describe as-

- Local
- Regional
- Distant

1) **Stage 0**: This breast cancer means that breast cancer cells have developed, but they cannot spread to any other surrounding tissues, or to the lymph nodes or other organs.
2) **Stage I**: The first stage of breast cancer means that tumor size is less than 2 cm. The I stage is divided into two Stage IA & Stage IB.

- **Stage IA**: The tumor measures up to 2 cm and cancer have not spread outside the breast; no lymph nodes are involved.
- **Stage IB**: There is a tumor in the breast that is no larger than 2 cm, and there are small groups of cancer cells larger than 0.2 mm but not larger than 2 mm in the lymph nodes.

On the 1st stage, the survival rate during 5 years is almost 100%.

3) **Stage II:** Stage II is divided into subcategories known as IIA and IIB**.**

- **Stages IIA:** It this tumor size is less than 2 cm.In this tumor spread to no more than 3 lymph nodes under the arm, forming metastases more than 2 mm in diameter.
- **Stages IIB**: The tumor is larger than 2 cm but not larger than 5 cm, small groups of breast cancer cells larger than 0.2 mm but not larger than 2 mm are found in the lymph nodes.

4) **Stage III:** Stage III is divided into subcategories known as IIIA, IIIB, and IIIC.

- **Stage IIIA:** Indicates that tumor is not more than 5 cm and has spread to not more than 9 lymph nodes in the axilla or formed metastases in the lymph nodes in the mammary gland, but not to internal organs.
- **Stage IIIB:** In this stage, the tumor starts growing in the chest and skin but did not form metastases in the internal organs**.**
- **Stages IIIC:** It describes invasive in which tumor start starts developing. In this cancer effect more than 10 axillary lymph nodes. The tumor may be any size and may have spread to the chest wall and the skin of the breast.

5) **Stage IV:** It is described as invasive breast cancer that has spread beyond the breast and nearby lymph nodes to other organs of the body, such as the lungs, distant lymph nodes, skin, bones, liver, or brain**.**

Symptoms of Breast Cancer:[13,15]

The first sign of breast cancer is a new lump or mass in the breast that you can feel, the lump is painless, hard, and has uneven edges is more likely to be cancer. But sometimes cancers can be tender, soft, and rounded. So, as soon as any unusual changes are seen the person should go to the physician. They are some of the main symptoms that may be seen during breast cancer are-

- Swelling of all or part of the breast.
- Skin irritation or dimpling.
- Breast pain.
- Nipple pain or the nipple turning inward.
- Redness, thickening of the nipple or breast skin.
- A nipple discharge other than breast milk.
- A lump in the underarm

Risk Factors for Breast Cancer:[15,16,17]

Many studies found that breast cancer caused due to the combination of many diseases in women. Most of the cancer cases are found in the women who are older than 50.the major risk factors that may cause Breast cancer is as follows-

- **Getting older**- The risk of breast cancer increases with age, most breast cancers are diagnosed after age 50.
- **Genetic mutations**- Inherited changes (mutations) to certain genes, such as BRCA1 and BRCA2. Women who have inherited these genetic changes are at higher risk of breast and ovarian cancer.
- **Early menstrual period**- Women who start their periods before age 12 are exposed to hormones longer, raising the risk for breast cancer by a small amount.
- **Late or no pregnancy**- Having the first pregnancy after age 30 and never having a full- term pregnancy can raise breast cancer risk.
- **Late Menopause** -If you have a late menopause (after the age of 55) this increases your breast cancer risk compared to women who have an earlier menopause.
- **Obesity** -Older women who are overweight or obese have a higher risk of getting breast cancer than those who have normal weight.
- **Having dense breasts**- Dense breasts have more connective tissue than fatty tissue, which can sometimes make it hard to see tumors on a mammogram. Women with dense breasts are more likely to get breast cancer.
- **Using combination hormone therapy**- Taking hormones to replace missing estrogen and progesterone in menopause for more than five years raises the risk for breast cancer. When hormones progesterone and estrogen are taken together it increases the risk of breast cancer.
- **Taking oral contraceptives (birth control pills)**- Certain forms of oral contraceptive pills have been found to raise breast cancer risk.

- **A family history of breast cancer**- A woman's risk for breast cancer is higher if she has a mother, sister, or daughter or multiple family members on either her mother's or father's side of the family who has had breast cancer. Having a first-degree male relative with breast cancer also raises a woman's risk.
- **Previous treatment using radiation therapy**- Women who had radiation therapy to the chest or breasts (like for treatment of Hodgkin's lymphoma) before age 30 have a higher risk of getting breast cancer later in life.
- **Drinking alcohol**-Studies show that a woman's risk for breast cancer increases with the more alcohol she drinks.
- **Smoking** – Smoking tobacco also causes the risk factor for breast cance

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