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Breast Cancer and its associated factors: A Review

Jyotsana Singh[1*], Kanika Beniwal[2], Janvi Chaudhary[3], Himani[4], Chhavi Sharma[5], Aayushi Sharma[6], Sonam[7], Shakshi Singh[8], Himanshi[9], Aman Kumar[10]

Department of Microbiology, Krishna College of Science and Information Technology, Bijnor NAAC Accredited Affiliated to M.J.P. Rohilkhand University Bareilly (U.P).

***Corresponding Author**
Jyotsana Singh

Department of Microbiology, Krishna College of Science and Information Technology, Bijnor NAAC Accredited Affiliated to M.J.P. Rohilkhand University Bareilly (U.P).

Orcid ID:
https://orcid.org/0000-0002-7442-5576.

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Abstract: The second most common malignancy among women is malignancy of the breast, behind skin cancer. carcinoma of the breast is the most common cancer among women. It is estimated that each year, 2.3 million new cases of breast cancer are diagnosed worldwide. Breast carcinoma is the name for cancer that develops in the breast tissue. It happens when breast cells multiply and change uncontrolled. Usually, a tumor develops from the cells. The malignancy of the breast is among the cancers diagnosed most frequently in women worldwide, and if caught early and without metastases, it can be treated in approximately 70 to 80 percent of cases. To acquire the data for this study, a literature review was done and pertinent terms were looked for on reputable scientific websites including SID, Google Scholar, the Library of Congress, and the entirety of the Comprehensive Portal of Human Medical Sciences. Cancer, carcinoma of the breast, cell, gene, women's life quality, worker efficiency, age, obesity, alcohol, smokes, menopause, genetics, and mortality were among the search terms used.

Keywords: Malignancy, Carcinoma, Obesity, Menopause, Cytokine, Genetics.

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Introduction

According to Khuwaja (1), the abnormal development and multiplication of cells that start in the breast tissue is referred to as breast cancer. Cancers are usually named for the area of the body where they initially manifest. Stromal (supporting) tissues and glandular tissues are the two main kinds of cells that comprise the breast. Stromal (supporting) cells and glandular tissues are the two main tissue types that comprise the breast. The glandular cells contain the glandules that create milk and the ducts that carry the milk throughout, whereas the stromal cells are made up of the fatty and fibrous connective tissues of the mammary gland. Additionally, the breast contains tissue from the immune system and the lymphatic circulatory system that removes waste and cellular fluids (2). As one of the most common cancers among women across the globe, carcinoma of the breast claimed almost 570,000 lives in 2015. Annually, approximately 1 million women globally—or 25% of all malignancy-stricken women—are diagnosed with carcinoma of the breast (2-4), according to Stewart. Breast cancer is primarily considered incurable due to its metastatic nature, which allows it to spread to distant organs such as the liver, brain, lungs, and bone. Early diagnosis of the condition can lead to a good prognosis and a high survival rate. According to Sariego (5) states that carcinoma of the breast is a kind of cell cancer that mostly affects the inner layer of milk glands, known as lobules, and the ducts, which are tiny tubes that carry milk. Age, a high hormone level (6), race, socioeconomic position, and a diet low in iodine are the main risk factors for cancer (7-9). A single stage of the several phases inflammatory process that results in malignancy in women involves viruses (10). In one stage of the multi-stage inflammatory process leading to carcinoma of the breast, viruses play a role. In general, viruses are linked to several cancer forms (11).

The Underlying Factors of Breast Carcinoma:

Breast carcinoma has been reported to be the result of a complex interplay between several modifiable and non-modifiable factors. The beginning of this disease is determined by the elements that contribute to its development, such as heredity, nutrition, hormones, environment, and genetics. Risk factors include having a family member with a history of malignancy, being obese, being tall, consuming alcohol or cigarettes, suffering early menarche, having a late menopause, leading a sedentary lifestyle, being nulliparous, and using hormone replacement therapy. According to Siegel (12), there is a 0.5% annual increase in breast cancer incidence rates, which may be related to a drop in fertility and an increase in body weight nationwide. This shows how the etiology of carcinoma of the breast is influenced by variables such as weight and fertility. Breast cancer is highly associated with age and race, with White women having the highest overall rates, followed by Black, Asian, and Hispanic women, in that order. It is also noticeably more common in women than in men. If a woman has a first-degree relative who has had breast cancer, her lifetime risk of developing the disease is increased by two to three times (13).

Probabilities of Breast Cancer:

Between 5 and 10% of occurrences of carcinoma of the breast are thought to be caused by hereditary gene abnormalities passed down

***Corresponding Author:** Jyotsana Singh

via families. The two most well-known inherited mutant genes that can increase the risk of developing breast carcinoma are breast carcinoma gene 1 (BRCA1) and the 2nd breast cancer gene (BRCA2). The risk of breast and ovarian cancer is also significantly increased by these genes. Being a woman is the most significant risk factor for the development of breast cancer. Breast carcinoma affects women in roughly ninety-five percent of instances, while it affects men at an average rate of 0.5% to 1%. When treating breast cancer, men and women use similar treatment strategies. A higher risk of breast cancer arises from advanced age, obesity, excessive alcohol consumption, radiation medical history in siblings, suffering children, using tobacco products, undergoing postmenopausal hormone therapy, and starting menstruation later than thirty years of age. A previous diagnosis of the disease enhances one's risk of having breast cancer; however, still, most women diagnosed with the condition do not have a known family history of the illness. A woman's unknown familial history does not make her any less dangerous.

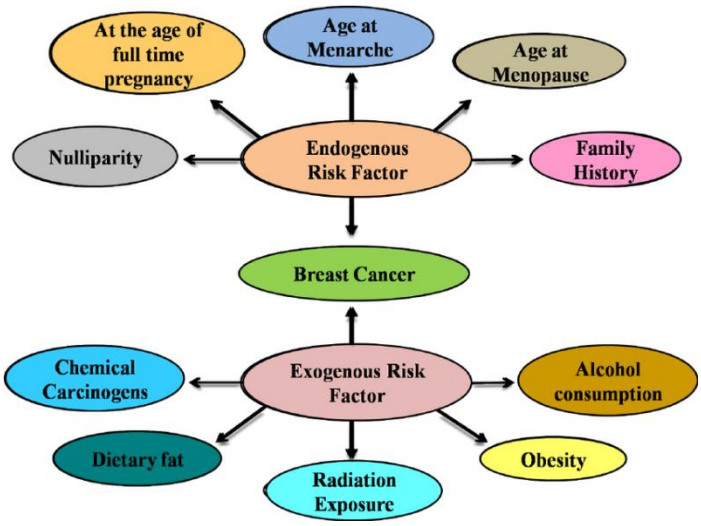

Fig1: Probabilities of Breast Carcinoma

1) Personal History of Breast Cancer: The malignancy has an impact on every family member. Numerous studies interfere with family carers' everyday lives. Couples in qualitative research shared two main insights from their experiences: emphasizing an individual's illness and caregiving and putting the family first to maintain it. According to Hilton (14), present, decision-making, dependence on the medical team, and managing financial matters were some of the study's peripheral ideas. Women who have had breast cancer before are more likely to face a recurrence. The second breast cancer could develop in a different breast or the same breast as the first. While the majority of women with breast tumors that are detected in situ (the in situ growth of lobular or duct malignancy) do not experience recurrence, these women are more likely to do so (15).

2) BRCA and Breast Cancer: A genetic mutation is a change in a gene. Gene alterations may increase the risk of developing specific cancer kinds. Gene mutations that are inherited can be passed from one parent to the next. Mutations in inherited genes cause between 5 and 10% of breast tumors. Normal human physiology includes both the BRCA1 and BRCA2 genes, which are linked to breast carcinoma. These genes are referred to as tumor suppressors because of their apparent role in controlling the development of cancer cells. Mutations in the BRCA1 or BRCA2 genes may impair their capacity to control the growth of cancer. Mutations like these are uncommon. Men and women can inherit mutated BRCA genes from either their father or mother. The offspring of carriers of the mutation may potentially inherit the gene mutation. If one of the two copies of the BRCA gene has the mutation in one or both parents, the child has a 50% chance of inheriting it. This also indicates that a child has a 50% chance of not inheriting the gene mutation (16).

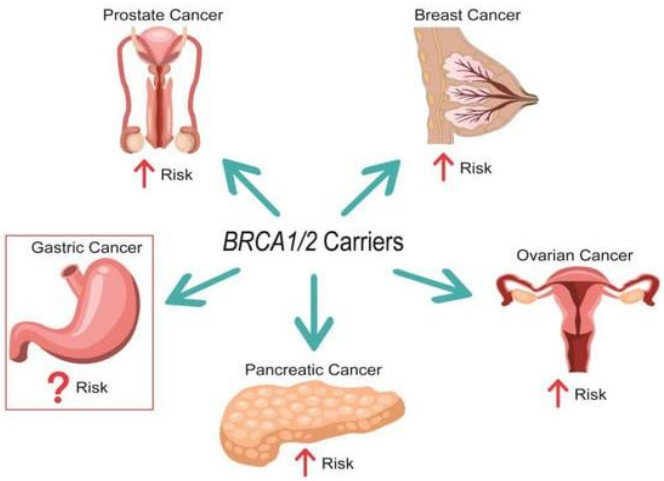

Fig 2: Cancer Risks Associated with BRCA1 and BRCA2 16(Le *et al*., 2021)

3) Nutritional Factors and Breast Cancer: Two nutritional factors that contribute to the development of breast cancer are weight increase and high-calorie consumption. among women who are not yet menopausal, there is no association between obesity and high body weight index (BWI) and breast cancer risk; however, among those who are (17). Research results for the first time indicated in 1940 that higher animal usage of fat causes breast tumors (18). High-fat consumption and the risk of breast cancer were found to be positively correlated by Howe and Goodwin (19). A calorie-rich diet can cause weight gain and obesity on the one hand, as well as childhood height rise and premature menopause on the other. According to Hanf (20), both elements have the potential to set the stage for the development of cancer later on.

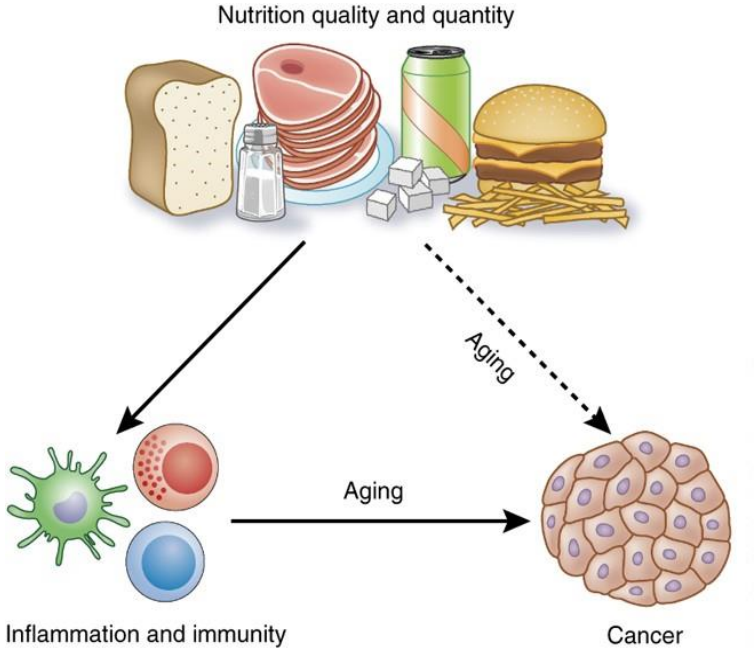

Fig 3: Effects of Nutritional Factors (http://www.servier.com/Powerpoint-image-bank/)

4) Hormonal Effect: Breast cancer may develop faster if there is a hormonal shift. Hormone replacement medication, early pregnancy, oral pill use, menstrual cycle starting and terminating, and other factors could all contribute to it (21). Research by the Women's Health Initiative (WHI) found that the risk of breast cancer rose by around 1% annually with estrogen alone, and by approximately 8% annually with hormone replacement treatment (HRT) in combination. The target organ of multiple hormones, the breast modifies the phases of reproduction in response to different steroids. Growth hormones are additionally recognized to influence the growth and development of breast tumors (22-26).

5) Estrogen: Oestrogens, both synthetic and natural, have been linked to a higher risk of breast carcinoma. Because the ovary naturally produces endogenous estrogen, Endogenous (27) claims that ovarian excision can lower the risk of breast tumors in premenopausal women. The two primary sources of exogenous estrogen are oral contraceptives and hormone replacement treatment (HRT). Oral contraceptives have been widely used since the 1960s, and their formulations have been refined to reduce side effects. The OR is still higher than 1.5 for the populations of African American and Iranian women, though (28, 29). Since the negative effects of HRT were initially documented in 2003 based on the Women's Health Initiative randomized controlled trial (30), the incidence rate of breast cancer in America has decreased by approximately 7% due to a decline in the usage of HRT 30 years ago.

Diagnosis of Breast Cancer: The malignancy can be diagnosed using several kinds of tests. Almost every individual will undergo every test that is outlined here. When selecting a diagnostic test, your doctor might consider these factors:

- The presumed kind of cancer
- Your manifestations and indicators
- Your age and overall well-being
- The conclusions from previous medical examinations

1:Mammography: The mammogram is the term for a diagnostic scan of the breast cells. Mammograms are a common screening method for breast cancer. If the results of your screening mammography are concerning, you can arrange for a follow-up mammogram to look at the area in further detail. This more detailed scan is called cancer screening mammography. It is commonly used to perform a thorough examination of both breasts. (31). Tumors that are not felt can frequently be found thanks to X-ray imaging. Microcalcifications, or microscopic calcium deposits, are another finding made possible by screening mammography that may occasionally point to the existence of breast cancer.

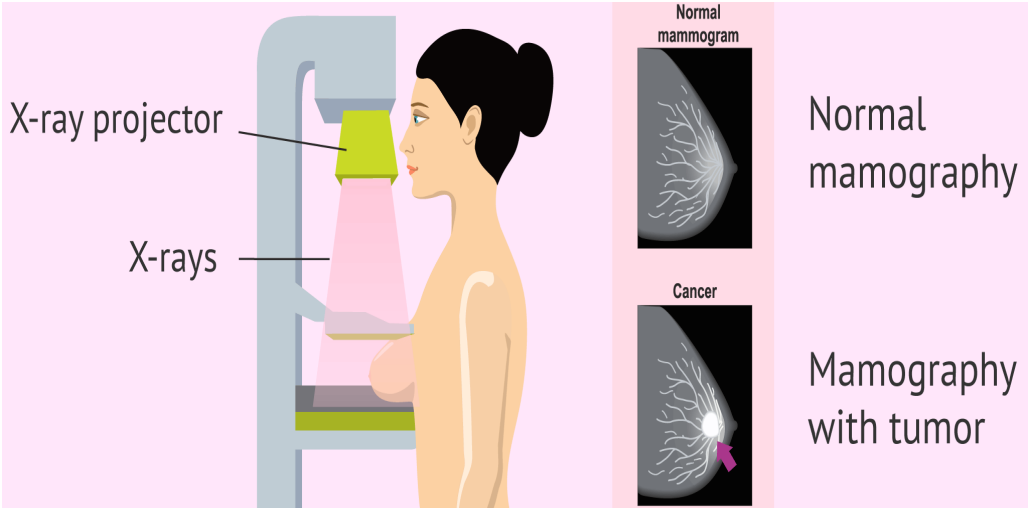

Fig 4: Mammography of Breast Cancer

2:Magnetic Resonance Imaging: According to Graves (32), breast MRI is a diagnostic imaging technique that is non-invasive and non-ionizing. To create fine-grained pictures of the internal structures of the breast, low-energy radiofrequency radiation is combined with a magnetic field. An MRI can be used to determine the extent of breast cancer and look for metastasized tumors in women who have already been diagnosed with the disease. Less than or above two-centimetre tumors can be accurately identified and measured using magnetic resonance imaging. Forty years ago (33), Goldsmith et al. reported on the first application of nuclear MRI for the breast. According to Torrisi (34), MRI is capable of identifying possible breast cancers that frequently go undetected by clinical, mammography, and ultrasound methods.

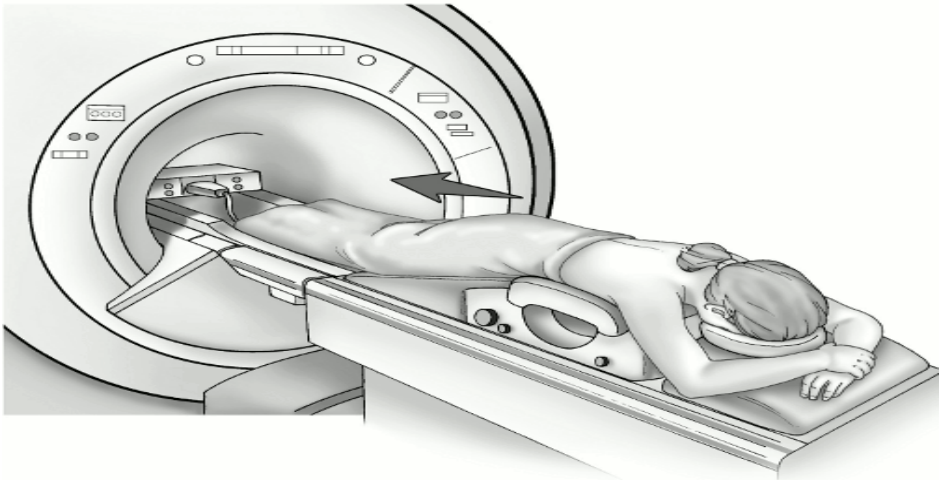

Fig 5: Breast MRI

3: Ultrasound: A high-frequency sound wave is used in an ultrasound to make images of different bodily sections. It helps distinguish between a solid tumor and a cyst when there is a lump in the breast. Furthermore, medical personnel can use ultrasonography to guide them to the biopsy location. Ladies who have advanced breast cancer may get an ultrasound to check for liver metastases (35).

4: An Autopsy: During a breast biopsy, tissue or occasionally fluid is removed from the area of concern. To check if a tumor is present, the removed cells are examined under a microscope and put through additional tests. A biopsy is the sole screening procedure that can determine whether the suspected region is cancerous. The type of biopsy that is performed depends on whether a lump is palpable, something you can feel, non-palpable, or something you can't. The doctor may use ultrasound or radiography to identify the area that needs to be examined (36).

There are four different kinds of biopsies:

- Aspiration with tiny needles
- Nephroneedle biopsy
- Surgical biopsy
- Skin punch biopsy

Prevention: Preventive medicine is the greatest treatment for cancer. To prevent invasive malignancies from developing, primary prevention entails promoting health and lowering risks among the general public. These three main preventive strategies are supplementing with vitamins and micronutrients, changing one's diet and lifestyle, and giving up smoking. It is possible to lower the morbidity and mortality rate from cancers in general and breast cancer in particular by identifying inherited risk, understanding tumor development, developing effective screening

techniques, avoiding risk factors, and using effective chemoprevention.

Treatment of Breast Cancer: When it comes to cancer care, medical specialists with advanced training in specialties like pathology, radiology, and cancer chemotherapy work with radiologists and medical oncologists to create a patient's all-inclusive treatment plan that includes a range of therapies. Some patients may receive hormone therapy or chemotherapy before surgery. These medications may aid in the cancer's shrinkage and facilitate its removal. For local and regional breast cancer, surgery remains the cornerstone of care. In 1894, William Stewart Halsted was the first to describe radical mastectomy as a common therapy for breast cancer in women. This practice persisted throughout the first half of the 20th century. The treatment of early breast cancer, (37,38), showed that survival with radiotherapy plus lumpectomy was equal to that with mastectomy, which led to the development of breast conservation surgery, or BCS. Treatment for breast cancer frequently involves the use of external beam radiation. During this type of radiation therapy, you lie on a table while a machine moves all around you. The radiation from the gadget is directed at specific parts of your body. Radiation entering the body occurs less frequently. Brachytherapy is the term for this kind of radiation (39). Chemotherapy is a common post-operative treatment for breast tumors. It can eliminate any tumors that remain and lessen the chance that the disease will develop again. Chemotherapy could also aid in the management of a tumor that has spread to the lymph nodes before surgery. If after chemotherapy the nodes stop exhibiting symptoms of malignancy, then it might not be required to remove a large number of lymph nodes surgically. The medical team's determination of possible post-operative treatments is aided by the cancer's response to chemotherapy before surgery. (40).

Conclusion:

Annually affecting millions of people worldwide, breast cancer is still a major health concern. By identifying numerous risk factors and diagnostic techniques that are essential to comprehending and treating this disease, this review has emphasized the complex nature of breast cancer. Furthermore, the results of early detection and therapy have been greatly enhanced by developments in diagnostic methods. Breast cancer is generally associated with several risk factors, including aging, a family history of the disease, specific changes to the breasts, genetics, menopause, productivity history, lack of exercise, drinking regularly, nutrient deficiencies, and previous chest medical treatment to the chest. Furthermore, several cutting-edge treatments for breast cancer are being researched, including gene therapy, vaccinations against the disease, adoptive cell therapies (such as CAR-T therapy for T cell receptor therapy), and others.

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Conflict of Interests:

The authors state they have no relevant conflicts of interest.

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