



REVIEW ON AGE TRENDS IN BREAST CANCER

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ABSTRACT

One of the most common malignancies that afflict women globally is breast cancer, which has serious consequences for public health. This review looks at age-related patterns in the development of breast cancer and offers a thorough examination of the disease's prevalence. Synthesized data from many epidemiological studies are used to illustrate the incidence rates for distinct demographics, age categories, and geographic areas. The review also covers the role that genetic, environmental, and lifestyle variables have in the development of breast cancer. The study also examines improvements in screening and early detection techniques and how they affect prevalence rates according to age. The objective is to provide a thorough review that emphasizes the significance of age-specific treatments and focused preventative measures in lowering the incidence of breast cancer.

KEYWORDS: Breast cancer, Age trends, Prevalence, Risk factors.

INTRODUCTION

A malignant tumor that arises from breast cells is called breast cancer. While it can happen to males as well, women are significantly more likely to experience it. Usually, the cancer begins in the breast's ducts (ductal carcinoma) or lobules (lobular carcinoma). Breast cancer comes in several forms, such as:

- Ductal Carcinoma In Situ (DCIS):** This non-invasive cancer is identified when aberrant cells are discovered in the breast duct lining but do not have the ability to migrate outside.
- Invasive Ductal Carcinoma (IDC):** The most prevalent kind of breast cancer, in which malignant cells penetrate the duct wall and infiltrate the breast tissue nearby.
- Invasive Lobular Carcinoma (ILC):** A cancer that starts in the lobules and extends to the tissues in the vicinity.
- Triple-Negative Breast Cancer:** Triple-negative breast cancer is more likely to be aggressive and lacks the three typically detected receptors (progesterone, estrogen, and HER2).
- HER2-Positive Breast Cancer:** This type of breast cancer grows more cancer cells by overproducing the HER2 protein.
- Inflammatory Breast Cancer:** An uncommon and severe kind that results in warm, puffy, and red breasts.

- Paget's Disease of the Nipple:** An uncommon kind that affects the nipple and areola after beginning in the breast ducts.^[1,2]

GLOBAL STATISTICS

Breast cancer is the most prevalent cancer in women diagnosed globally and the primary cause of cancer-related deaths in this population. Data from the Global Cancer Observatory (GLOBOCAN) 2020 show that there were around 685,000 deaths from breast cancer, or 6.9% of all cancer fatalities, and nearly 2.3 million new instances of the disease, or 11.7% of all cancer cases.^[3]

INCIDENCE AND MORTALITY RATES WORLDWIDE

- Incidence Rates:** Developed regions have the highest incidence rates of breast cancer. For instance, the incidence rate is around 128.3 per 100,000 women in North America and 131.6 per 100,000 women in Western Europe. Conversely, the incidence rates in Africa and some regions of Asia (such as Eastern Asia) are much lower, with about 29.3 and 40.0 cases per 100,000 women, respectively.
- Mortality Rates:** There is variation in the death rates as well, with greater rates seen in areas with less access to healthcare. The mortality rate for women is around 19.6 per 100,000 in North America and 20.3 per 100,000 in Western Europe. On the other hand, despite lower incidence rates, sub-

Saharan Africa and South-Central Asia have greater fatality rates, at around 16.5 and 17.5 per 100,000 women, respectively.^[4,5]

DIFFERENCES IN PREVALENCE ACROSS REGIONS

- **North America and Europe:** Because of efficient screening systems, early identification, and cutting-edge treatment options, these regions have high incidence rates but comparatively low fatality rates. In the United States, for example, the 5-year survival rate is around 90%
- **Asia:** South Korea and Japan are reporting increasing incidence rates; Japan's incidence rate is around 89.4 per 100,000 women. Southeast Asian nations like Indonesia, on the other hand, have greater death rates but lower incidence rates (around 40.3 per 100,000).
- **Africa:** Due to late-stage diagnosis and inadequate access to healthcare facilities, African nations like Nigeria have low incidence rates (about 26.3 per 100,000) but extremely high fatality rates (about 20.1 per 100,000).
- **Latin America:** Disparities in healthcare access and treatment are reflected in this region's moderate incidence rates and comparatively high death rates. Brazil, for instance, has a death rate of around 14.0 per 100,000 people and an incidence rate of almost 62.9 per 100,000 people.^[6,7]

HISTORICAL TRENDS

Changes in Breast Cancer Rates Over the Past Decades

- **Rising Incidence:** Worldwide, the incidence of breast cancer has increased within the last few decades. For example, in industrialized nations, the age-standardized incidence rate rose from over 50 per 100,000 women in the 1980s to over 80 per 100,000 women in the 2010s.
- **Shifting Age Patterns:** Especially in wealthy nations, there has been a discernible rise in instances among younger women. Over the previous 20 years, the incidence rate for women in the United States between the ages of 20 and 39 has climbed by around 0.2% year.^[8,9]

Impact of Early Detection and Treatment Advancements

- **Early Detection:** Early detection rates have increased dramatically since mammography screening programs were put in place. Research indicates that among women aged 40-69, mammography screening lowers breast cancer mortality by 20–30%. For instance, the death rate from breast cancer has decreased by 31% in Sweden as a result of extensive screening.
- **Treatment Advancements:** Higher survival rates have been largely attributed to advancements in therapy, including hormone medications (like tamoxifen) and targeted medicines (like trastuzumab

for HER2-positive breast cancer). Personalized treatment has also helped many patients get better results.

- **Survival Rates:** The survival rate has increased as a result of these developments. Compared to about 75% in the 1970s, the 5-year survival rate for breast cancer in industrialized nations is currently above 90%. On the other hand, because of differences in healthcare treatment and availability, underdeveloped nations continue to have lower survival rates.^[10,11]

AGE TRENDS IN BREAST CANCER

Incidence Across Different Age Groups

The incidence of breast cancer varies greatly with age, usually rising as women age. Breast cancer is more common in women 50 years of age and older, and its risk increases with age. Nonetheless, there are discernible patterns and fluctuations in the incidence rates across various age groups.

- **Young Women (Aged 20-39):** Only 4-7% of all instances of breast cancer occur in this age range, making it a very uncommon age group. Nonetheless, there has been a little rise in younger women's occurrence in recent years. Genetic predispositions (such BRCA mutations), lifestyle choices, and postponed childbirth may all be contributors in this rise.
- **Middle-Aged Women (Aged 40-49):** This age group has a notable increase in the incidence of breast cancer. The 40-year-old female population is one in which the influence of hereditary and environmental variables intensifies.
- **Older Women (Aged 50 and Above):** This age group exhibits the greatest incidence rates. The majority of diagnoses occur in women between the ages of 50 and 69, partly because of increasing screening and the increased risk that comes with aging. Incidence rates are as high for women over 70, however at a less rapid rate than for those in the 50–69 age range.^[12,13]

Incidence Rates and Age

To show the trends, the following age-specific incidence rates are provided (per 100,000 women):

- **Aged 20-29:** Approximately 1.9
- **Aged 30-39:** Approximately 11.8
- **Aged 40-49:** Approximately 56.4
- **Aged 50-59:** Approximately 146.0
- **Aged 60-69:** Approximately 245.5
- **Aged 70-79:** Approximately 360.0

Comparison of Incidence Rates in Premenopausal vs. Postmenopausal Women

- **Premenopausal Women:** The incidence rate peaks in the late 40s, with a lower risk among younger women.
- **Postmenopausal Women:** Incidence rates rise gradually with age, reaching a peak between the

ages of 60 and 70. As people age, they may stabilize or even slightly fall.^[14,15]

Age-specific Risk Factors

Comprehending age-specific risk variables contributes to the explanation of why the incidence of breast cancer differs among age groups:

- **Genetic Predispositions (e.g., BRCA1/BRCA2 mutations):** These include mutations in the BRCA1/BRCA2 gene, which greatly raise the risk of breast cancer and frequently cause the illness to manifest early.
- **Hormonal Influences and Reproductive History:** Breast cancer risk is increased, especially in premenopausal women, by factors such as early menarche, late menopause, nulliparity, and late age at first full-term pregnancy.
- **Age at Diagnosis:** Younger women are frequently faced with more aggressive types of breast cancer, and this can have an impact on treatment options and prognosis.

Age at Diagnosis

- **Typical Age at First Diagnosis:** Around 62 years old is the typical age at which breast cancer is diagnosed.
- **Differences in Age at Diagnosis Across Populations:** A population's age at diagnosis might differ greatly depending on lifestyle, environmental, and genetic variables. For instance, compared to underdeveloped nations with limited access to screening and healthcare facilities, industrialized nations with early detection programs frequently identify breast cancer at earlier stages and younger ages.^[16,17]

Mortality Rates and Age

Age-related variations in breast cancer mortality rates are also seen; in general, older women's treatment options may be less aggressive and their incidence rates are greater, contributing to an increase in mortality from the disease. However, because of improvements in early discovery and treatment, survival rates have increased in all age categories.

- **Young Women (Aged 20-39):** Although the prevalence of breast cancer is relatively low, younger women are more likely to develop aggressive forms of the disease, which can lead to greater death rates than other age groups.
- **Middle-Aged Women (Aged 40-49):** Because of good therapies and excellent survival rates, mortality rates start to climb in this age range but are still comparatively low.
- **Older Women (Aged 50 and Above):** Women over the age of 70 had the greatest death rates. This is caused in part by the higher incidence rates in this age group as well as the co-existence of other disorders that make treatment more difficult.

Historical Changes in Age Trends

The age-specific incidence and death rates of breast cancer have changed over the last few decades:

- **Increasing Incidence in Younger Women:** A few studies have found a marginal rise in the incidence of breast cancer in women between the ages of 20 and 39. This increase may be the result of genetics, lifestyle modifications, and more knowledge that enables earlier identification.
- **Improved Survival Rates Across All Ages:** The percentages of survival for women across all age groups have increased dramatically because of advancements in early identification and treatment. For example, in many industrialized nations today, the 5-year survival rate for breast cancer has grown from around 75% in the 1970s to over 90%.
- **Screening and Early Detection Impact:** Age patterns have been significantly impacted by mammography screening. Women between the ages of 50 and 69 are the primary focus of screening programs, which helps this age group receive earlier diagnosis and treatment and accounts for the observed rise in incidence and fall in death rates.

Implications for Screening and Treatment

Developing successful screening and treatment plans requires an understanding of age patterns in breast cancer:

- **Screening Guidelines:** Mammography screening guidelines are based on age-specific patterns. For instance, while some guidelines propose starting at age 40, especially for women with greater risk factors, many guidelines urge routine screening starting at age 50.
- **Tailored Treatment:** Age-specific information aids in the development of treatment plans. Due to the increased risk of aggressive tumors, younger women may need more aggressive therapy, whereas older women may need treatment that takes into account comorbidities and general health.
- **Prevention Strategies:** As a result of age trends, there is a greater need than ever for focused preventive measures, such as lifestyle changes and genetic counseling for younger, high-risk women.^[18,19,20]

IMPORTANCE OF STUDYING AGE TRENDS AND PREVALENCE IN BREAST CANCER

It is essential to research age trends and breast cancer prevalence in order to comprehend the disease's epidemiology and create successful public health initiatives. The importance of looking into these areas is explored in detail in this review, which also shows how age-specific statistics influence therapy, prevention, early diagnosis, and survivorship care.

While prevalence refers to the percentage of people with breast cancer in a community at any one moment, age trends describe how the incidence and features of breast cancer change across different age groups. By examining

these variables, one may get understanding of the dynamics and burden of the illness in different populations.

Epidemiological Insights

- 1. Risk Stratification:** Recognizing age patterns facilitates the identification of high-risk age cohorts. For instance, screening programs should be tailored to women aged 50-69, as they are more susceptible.
- 2. Public Health Planning:** Age-specific prevalence data helps ensure that healthcare services are age-appropriate by providing effective resource allocation.
- 3. Global Health Comparisons:** International health policy and resource distribution are guided by differences in the burden of breast cancer, which are highlighted by comparing age trends and prevalence across areas.

Early Detection and Screening

- 1. Screening Guidelines:** Mammography and other screening procedures are recommended based on age patterns. For instance, routine screening is generally suggested beginning at age 50, while high-risk women may benefit from it sooner.
- 2. Resource Allocation:** By determining which age groups are most impacted, screening resources may be more effectively planned for and distributed, increasing the likelihood of early diagnosis.
- 3. Customized Screening Programs:** Age-specific data allow the creation of customized screening plans that cater to the particular requirements of various age groups, boosting the efficacy of early detection initiatives.

Treatment and Clinical Management

- 1. Personalized Medicine:** Treatment choices for breast cancer are influenced by age trends. Due to the generally increased aggressiveness of tumors, younger women may need more aggressive therapies, whereas older women may need treatments that take comorbidities and general health into account.
- 2. Treatment Efficacy:** By evaluating the effectiveness of various treatment methods, knowledge of the behavior of breast cancer at different ages contributes to the development of better clinical recommendations and patient outcomes.
- 3. Clinical Trials:** To assure broad representation in clinical trials and increase the generalizability of research findings, age-specific prevalence data is crucial for trial design.

Prevention Strategies

- 1. Risk Factor Identification:** By examining age patterns, specific preventive initiatives may be informed by the identification of age-related risk factors, such as alterations in hormone levels and lifestyle choices.

- 2. Public Awareness Campaigns:** Information particular to age groups informs the creation of public health initiatives that raise awareness and encourage early intervention.
- 3. Lifestyle Interventions:** Information on age patterns can help develop age-appropriate lifestyle interventions, such as encouraging exercise and eating a balanced diet, to lower the risk of breast cancer.

Survivorship and Quality of Life

- 1. Tailored Survivorship Care:** Based on age-specific statistics, survivorship care plans are created to meet the distinct social, emotional, and physical requirements of breast cancer survivors in a range of age groups.
- 2. Support Services:** Knowing how common breast cancer is in different age groups makes it easier to develop support services, such as counseling and rehabilitation, that are appropriate for both younger and older survivors.
- 3. Long-term Monitoring:** Based on age trends and risk profile, long-term monitoring measures make sure survivors receive the right follow-up treatment.

Socioeconomic Implications

- 1. Healthcare Costs:** Age trends and prevalence statistics are useful in estimating the financial impact of breast cancer, which helps inform insurance planning and healthcare budget allocation.
- 2. Workforce Impact :** Knowledge of how breast cancer affects working-age women guides workplace adjustments and support programs for impacted persons.
- 3. Policy Development:** Age-specific knowledge aids in the creation of health policies that cater to the requirements of various age groups, ensuring fair access to and use of healthcare services.

RESEARCH AND INNOVATION

- 1. Focused Research:** Research endeavors are directed on comprehending age-related biological systems and creating age-specific therapies by examining age trends and prevalence.
- 2. Technological Advancements:** New technologies for treatment and diagnostic tools customized for different age groups are created based on insights from age-specific data.
- 3. Policy and Advocacy:** Detailed age trend data aids in the creation of policies and financing for breast cancer research.^[21 to 25]

AGE-RELATED VARIATIONS IN CLINICAL PRESENTATION

Age-related changes in breast cancer clinical presentation and outcomes point to important variables that affect patient prognosis, treatment choices, and diagnosis. Comprehending these variances is crucial in order to deliver tailored and efficient treatment to varying age cohorts.

Younger Women (Under 40)

- **Clinical Features:** Higher-grade tumors, greater tumor sizes upon diagnosis, and more frequent involvement of lymph nodes are among the aggressive aspects of breast cancer that younger women frequently face.
- **Histological Types:** Triple-negative breast cancer (TNBC) and other aggressive subtypes, which proliferate and spread more quickly, may be more common in younger women.
- **Symptoms:** Palpable lumps, changes in breast appearance, and breast discomfort are examples of symptoms that may require an early medical assessment.

Middle-Aged Women (40-60)

- **Clinical Features:** The combination of hormone receptor-positive and HER2-positive tumors is common in breast cancer cases in this age range, but individual cases vary greatly. Menopause and hormone receptor status might affect the prognosis and available treatments.
- **Screening:** Compared to younger women, this age group's mammography screening becomes more commonplace, perhaps improving outcomes and enabling earlier detection.

Older Women (60 and Above)

- **Clinical Features:** Hormone receptor-positive tumors that may develop more slowly are a common feature of breast cancer in older women. Comorbidities and age-related weakness, however, might make treatment choices more difficult.
- **Screening Challenges:** Age-related changes in breast tissue density and decreased screening program participation might cause delayed diagnosis and perhaps worse outcomes.^[26,27]

ADVANCEMENTS IN EARLY DETECTION AND SCREENING METHODS

The diagnosis and treatment of breast cancer have been transformed by developments in early detection and screening techniques, which have had a profound effect on age-specific prevalence rates. Important developments and their ramifications for various age groups are examined in this overview.

1. Mammography and Digital Breast Tomosynthesis (DBT)

- **Traditional Mammography:** For the detection of breast cancer, mammography is still the gold standard. It uses low-dose X-rays to provide fine-grained pictures of the breast tissue, which helps identify microcalcifications and early-stage cancers.
- **Advancements with DBT:** Digital breast tomography (DBT) improves mammography accuracy by taking many pictures from various perspectives. This lowers false positives, enhances the identification of tiny tumors, and produces

sharper images especially in women with thick breast tissue.

2. Breast MRI and Molecular Imaging

- **Breast MRI:** For women who are at high risk or have thick breast tissue, magnetic resonance imaging (MRI) is performed in addition to mammography. It provides in-depth pictures of breast tissue, which help with precise staging and early diagnosis.
- **Molecular Imaging:** New methods including contrast-enhanced spectral mammography (CESM) and positron emission mammography (PEM) offer more functional and molecular data, enhancing early detection and diagnostic precision.

3. Screening Guidelines and Risk Stratification

- **Age-specific Guidelines:** Screening recommendations for mammography start at age 40 or 50 and continue every 1-2 years, depending on the nation and organization. Guidelines also take into account personal health history, genetic predisposition (such as BRCA mutations), and family history as individual risk factors.
- **Risk-based Screening:** Women are categorized into average, moderate, and high-risk groups using tailored screening techniques that include risk assessment instruments (such as the Tyrer-Cuzick model and Gail model). People who are considered high-risk could benefit from earlier or more frequent screening.

4. Impact on Age-specific Prevalence Rates

- **Younger Women:** Because of their thicker breast tissue, younger women have historically had poorer mammography sensitivity. However, advances in screening have increased early detection rates in this demographic. In this age bracket, early identification enables fast intervention and maybe less invasive therapy.
- **Middle-Aged Women:** By detecting smaller, more localized cancers, routine mammography screening beginning at age 40–50 has improved outcomes and reduced death rates in this age range.
- **Older Women:** Because of age-related characteristics including slower tumor development and more comorbidities, ongoing screening for older women has made it easier to discover clinically important malignancies that may have gone undetected.^[28,29]

TREATMENT MODALITIES AND AGE CONSIDERATIONS IN BREAST CANCER

Many factors influence the choice of treatment modalities for breast cancer, such as the features of the tumor, the stage at diagnosis, general health, and most crucially, age. Selecting the best course of action for treatment involves taking age-specific factors into account in order to maximize benefits and reduce negative effects. The main treatment techniques and their

effects on various age groups are described in this review.

Surgery

1. Younger Women (Under 40)

- **Treatment Approach:** Because aggressive tumor subtypes are more common and patients want a conclusive course of therapy, treatment often entails more invasive surgical choices, such as mastectomy.
- **Breast Reconstruction:** Younger women are more likely to have urgent breast reconstruction taken into account, including both psychological and esthetic factors.

2. Middle-Aged Women (40-60)

- **Surgical Options:** Tumor size, lymph node involvement, and hormone receptor status all affect treatment choices. Breast-conserving surgery known as a lumpectomy is frequently contemplated, either with or without lymph node dissection.
- **Cosmetic Outcomes:** At this age, it's crucial to have conversations on breast reconstruction alternatives and cosmetic results.

3. Older Women (60 and Above)

- **Treatment Decisions:** Decisions about surgery are greatly influenced by comorbidities and state of health. When it comes to smaller tumors, many older women choose hormone treatment alone or less invasive procedures like lumpectomies.
- **Considerations:** In this age range, it is critical to strike a balance between quality of life concerns and oncologic results.

Radiation Therapy

1. Younger Women

- **Adjuvant Therapy:** More likely for younger women to have adjuvant radiation therapy to lower the risk of local recurrence, especially following a mastectomy or breast-conserving surgery.

2. Middle-Aged Women

- **Radiation After Lumpectomy:** Usually advised following breast-conserving surgery to lower the possibility of a local recurrence, particularly in cases of bigger tumors or positive lymph nodes.

3. Older Women

- **Treatment Decisions:** In certain low-risk breast cancer patients, especially when age or concomitant conditions restrict life expectancy, radiation therapy may not be necessary.

Systemic Therapy

1. Chemotherapy

- **Younger Women:**
 - For younger women, chemotherapy is more likely to be administered, especially in cases of aggressive tumor forms (such as triple-negative or HER2-positive breast cancer). Better overall results

because of a generally improved state of health and a higher tolerance for the negative effects of chemotherapy.

- **Middle-Aged Women**

- **Decision Factors:** Menopausal status, general health, and tumor features (such as hormone receptor status and HER2 status) all affect treatment choices.

- **Older Women**

- **Considerations:** There might be a risk of undertreatment because to tolerability and toxicity worries. Nonetheless, if necessary, chemotherapy can be quite beneficial for healthy older women.

2. Hormonal Therapy

- **Younger Women**

- **Duration:** Premenopausal women may benefit from longer hormone treatment regimens since they have a higher chance of recurrence. More pertinent issues are those pertaining to the preservation of fertility and the effects of hormone treatment.

- **Middle-Aged Women**

- **Adjuvant Therapy:** Conventional care for breast cancer with hormone receptors that is positive; frequently involves aromatase inhibitors or selective estrogen receptor modulators (SERMs).

- **Older Women**

- **Duration and Selection:** For older women, shorter hormone treatment durations may be reasonable, taking into account the patient's life expectancy and comorbidities to weigh the advantages and hazards.

Targeted Therapy

1. HER2-Positive Breast Cancer

- **Younger and Middle-Aged Women:** In addition to chemotherapy, targeted treatments such as trastuzumab (Herceptin) can be beneficial.
- **Older Women:** HER2-targeted medicines are taken into account when making treatment decisions, which are based on cardiac function and general health.

Palliative Care and Supportive Therapies

1. Age-related Considerations

- **Younger Women:** Options for fertility preservation and psychosocial support, including managing treatment-related adverse effects, are the main goals of supportive care.
- **Older Women:** Priorities include preserving quality of life, controlling symptoms, and taking care of age-related issues such comorbidities and frailty.^[30 to 36]

Age-specific factors in breast cancer therapy emphasize the need of customized medication. Optimizing outcomes, minimizing treatment-related problems, and

enhancing quality of life for all age groups impacted by breast cancer need customized treatment options based on tumor characteristics, age, and individual health profiles. Technological developments in supporting care and treatment alternatives keep improving our capacity to offer patients all-encompassing care tailored to their individual requirements at various phases of life. Through an emphasis on individualized screening methods, cutting-edge early detection technology, customized treatment plans, and comprehensive survivorship care, we can improve the prognosis and quality of life for women with breast cancer in all age groups. In order to truly enhance breast cancer prevention, detection, and care in the years to come, it will be essential to translate research findings through collaborative efforts across disciplines, international locations, and healthcare sectors.^[37,38]

CONCLUSION

To sum up, this review has offered a thorough investigation of breast cancer with an emphasis on age-specific trends and prevalence. We have looked at how the incidence of breast cancer fluctuates with age, impacted by things like hormonal fluctuations, genetic predispositions, and technological breakthroughs in screening. Great progress has been achieved in improving patient outcomes and quality of life, from early diagnosis through enhanced mammography and new imaging modalities to individualized treatment plans catered to age-related factors. In the future, it will be essential to maintain research efforts in addition to providing equal access to screening and treatment options in order to further lower the incidence of breast cancer in a variety of demographics and guarantee that age-specific needs are successfully addressed in clinical practice.

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