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# A REVIEW ON BREAST CANCER IN A YOUNG WOMEN AND OPPURNITIES IN TREATMENT

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**Abstract**

Breast cancer is the most commonly diagnosed cancer and the leading cause of death among female patients, which seriously threatens the health of women in the whole world. The treatments of breast cancer require the cooperation of a multidisciplinary setting and taking tumour load and molecular makers into account. The incidence of breast cancer is constantly increasing in all regions of the world. For this reason, despite the progress in its detection and treatment, which translates into improved mortality rates, it seems necessary to look for new therapeutic methods, and predictive and prognostic factors. Triple negative breast cancer is responsible for more than 15–20% of all breast cancers. Future therapeutic concepts for breast cancer aim to individualize therapy and de-escalate and escalate treatment based on cancer biology and early response to therapy. The article presents a review of the literature on breast carcinoma—a disease affecting women in the world.

***Keywords:*** Breast cancer, Chemotherapy, Radiotherapy, Immunotherapy, exercise management, path morphology.

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## Introduction

Breast cancer is malignant (cancerous )growth that begins in the tissue of breast cancer is a disease in which begins the abnormal cells grow in an uncontrolled way.the3 breast cancer is approximately 12%of new breast cancer cases occur in women younger than age 45 years and the incidence of breast cancer with distant involvement in the metastatic breast cancer and breast cancer diagnosed at a younger age is also correlated with lower survival rates ,higher recurrence rates and negative prognostic variables the younger women with breast cancer commonly face chemotherapy –induced menopause decreased sexual function, infertility, diminished body images and other side effects . Breast tissue can be classified into four types: normal, benign, invasive, and non-invasive. Among them, benign breast tissue has distinct borders, only minimal changes in the breast's structure, and does not develop into cancer since they do not impair health.[1]

Breast cancer is the most commonly diagnosed cancer among female patients and is the leading cause of cancer-related death. There were 300,590 new cases and 43,700 deaths of invasive breast cancer in the United States based on the 2023 prediction, accounting for approximately 30% of female cancers. The treatments of breast cancer include surgery, chemotherapy, radiotherapy (RT), endocrine therapy, targeted therapy, and immunotherapy, and the therapeutic schedules require the cooperation of multiple subspecialties. For non-metastatic breast cancer, surgery-based treatment is the standard management, and chemotherapy-based preoperative systemic therapy can reduce tumour volume of the breast, making breast conservation possible, and decreasing the need for axillary lymph node dissection (ALND). The incidence of breast cancer is constantly increasing in all regions of the

world. For this reason, despite the progress in its detection and treatment, which translates into improved mortality rates, it seems necessary to look for new therapeutic methods, predictive and prognostic factors. [2]

In 2019, 13,050 young women were diagnosed with pre-invasive or invasive breast cancer in the USA and 1070 women died of their disease. Young women are underrepresented in clinical trials, and treatment for these women less than 40 years old is extrapolated from studies of older women. Young women face unique challenges such as decreased fertility, psychosocial issues and an extended survivorship period that impacts quality of life. Factors related to a woman's hormonal status seem to have a huge impact on the risk of developing breast cancer. The results of many studies indicate that the risk of developing breast cancer increases in proportion to the time of exposure to estrogens, which prolongs early menarche, late menopause, the age of birth of the first child and the number of children born .[3]

The incidence of invasive breast cancer has increased among AYA women in the United States since 2004, and most of this change is due to an increase in young women diagnosed with distant disease. AYAs are more likely than older women to present with aggressive subtypes and advanced disease, and they often require systemic staging at diagnosis. To provide optimal care for AYAs with breast cancer, clinicians should engage multidisciplinary teams that offer fertility preservation, genetic counselling, physical and occupational therapy, nutrition, and psychosocial support, along with medical expertise in tailoring cancer-directed therapy and symptom management toward young women. Estrogens play an important role in the pathogenesis of the development of breast cancer. Breast cancer is considered a hormone-dependent tumour in which elevated estrogens levels and longer exposure to this hormone are associated with an increased risk of its development.[4]

1. Early detection and diagnosis of breast cancer in young women.
2. Enhances quality of life and reduce long-term side effects.
3. Increase awareness about breast cancer risk factors and screening among young women.
4. Investigate genetic and environmental factors contributing to breast cancer in young women.
5. Improve access to fertility preservation options and reproductive health services.
6. Enhance the healthcare provider education and training on breast cancer in young women.
7. To develop safe and effective methods to prevent, detect, diagnosed treat and ultimately cure the breast cancer.
8. Raise awareness of breast cancer, educate the public about its symptoms and prevention and fund research into its causes, treatment and cure.

## Epidemiology of Breast Cancer

Breast cancer is the most common malignant tumour in women in the world. Breast cancer patients account for as much as 36% of ontological patients. An estimated 2.089 million women were diagnosed with breast cancer in 2018 . The incidence of this malignant tumour is increasing in all regions of the world, but the highest incidence occurs in industrialized countries. Almost half of the cases on a global scale are in developed countries. This trend is mainly due to the so-called Western lifestyle, associated with a poor diet, nicotinic, excessive stress and little physical activity. [15]

Carcinogenesis might occur in every cell, tissue, and organ, leading to the pathological alternations that result in a vast number of cancers. Carcinogenesis is a multifactorial process that is primarily stimulated by both—genetic predispositions and environmental causes. The number of cancer-related deaths is disturbingly increasing every year ranking them as one of the major causes of death worldwide. Breast cancer is currently one of the most prevalently diagnosed cancers and the 5th cause of cancer- related deaths with an estimated number of 2.3 million new cases worldwide according to the GLOBOCAN 2020 data. Deaths due to breast cancer are more prevalently reported (an incidence rate approximately 88% higher) in transitioning countries (Melanesia, Western Africa, Micronesia/Polynesia, and the Caribbean) compared to the transitioned ones (Australia/New Zealand, Western Europe, Northern America, and Northern Europe).[16]

Breast cancer is the most common cancer type among adolescents and young adults (AYAs) of age 15-39 years at diagnosis, accounting for 30% of cancers among AYA women. The incidence trend predicts that more than 12,000 AYA women will be diagnosed with invasive breast cancer in the United States during 2020. AYAs are more likely than older women with breast cancer to present with unfavourable biology and advanced disease, translating into poorer survival. [17]

## Types of Breast Cancer

There are many types of breast cancer

1. Ductal carcinoma in situ (DCIS)
2. Invasive ductal carcinoma
3. Inflammatory breast cancer.
4. Metastatic breast cancer.

### 1. Ductal carcinoma in situ (DCIS):

Ductal carcinoma in situ is also called as non –invasive breast cancer .is very early cancer that is highly treatable, but if it's left untreated or undetected it can spread in to the surrounding breast tissue.

### 2. Invasive breast cancer

Invasive breast cancer is also called as in filtrate ductal carcinoma and it is the most common type of breast cancer making up nearly 70-80%of all breast cancer diagnosis .the milk ducts ,the tubes that carry milk from the lobules to nipple .

### 3. Inflammatory breast cancer

The inflammatory breast cancer is a fast growing breast cancer cells in filtrate the skin and lymph vessels of the breast. It often produces no distant tumour or lump that can be felt and isolated within the breast.

### 4. Metastatic breast cancer

Metastatic breast cancer is spread to other parts of the body, they usually includes the includes the lungs, liver, bones are brain.[19]

## Identification of Breast Cancer

Breast cancer in women diagnosed through different technologies .breast tumours typically starts as begin tumours

or even metastatic carcinoma due to ductal hyper proliferation the breast cancer in women is diagnosed by

1. MAMOGRAPHY
2. BIPOSY
3. ULTRA SOUND
4. THERMOGRAPHY

### 1. Mamography

Diagnostic mammography is an x-ray that creates an image of the breast using low radiation doses. It is used to follow up on unexpected findings from a clinical breast exam or a screening mammogram. It is also possible to use mammography during a biopsy to identify an abnormal area

### 2. Biposy

Breast cancer can only be accurately identified through a biopsy. The purpose of a biopsy is to remove tissues or cells from the patient's body for laboratory testing. The pathologist's report will determine whether or not cancer cells were discovered in the sample.

### 3. Ultra Sound

An ultrasound creates images of various body parts using high-frequency sound waves. It is used to determine whether a lump in the breast is a solid tumour or a cyst. Additionally, ultrasound can be used by medical professionals to direct them to the biopsy site.

### 4. Thermography

Breast thermal image examinations have a lower cost and no ionizing radiation than breast mammography images. But at a certain depth, infrared thermograph is not very useful. In addition, from a horizontal dimension of 90°, the dataset had images from 141 patients, of which there were 3534 images. However, since the publication of the paper, the dataset has increased [20].

## Risk Factors for Breast Cancer

The main risk factors for breast cancer are genetic factors ,specifically family history ,diet and obesity ,as the quality of life in our country improves ,women are getting more and more obese and their diet tends to be more and more high –fat ;smoking and drinking ;the other is ionizing radiation, age ,gender , menstrual periods , having children ,birth control and breast feeding . Gender, age, family history, alcohol intake, smoking, menstrual period, having children, birth control, brest feeding.

## Signs and Symptoms

### Signs

- A change in the size, shape, or contour of your breast of a mass or lump, which may feel as small as a pea.
- A lump or thickening in are near your breast are in your under arm that persist through your menstrual cycle.
- A change in the look are feel of your skin on your breast nipple of your skin may look dimpled, puckered, scaly are inflamed it may look red purple or darker than others parts of your breast.

### Symptoms

- Swollen lymph nodes in the underarm area.
- Open sores or ulcers on the breast.
- Peeling or flaking skin on the breast or nipple.
- Warmth or redness of the breast.
- An enlarged breast due to tumour growth.

## Treatment of Breast Cancer

Breast cancer is the most commonly diagnosed cancer among female patients and is leading causes of cancer –related death and the breast cancer treatment of breast cancer surgery, chemotherapy, endocrine therapy, and targeted therapy, immunotherapy and gene therapy.

Table No.1: Drugs Used For Breast Cancer.

| DRUGS | FDA APPROVAL |
|---|---|
| Capivasertib | November 16,2023 |
| Abemaciclib | March 03,2023 |
| Alpelisib | April 05,2022 |
| Letrozole | October 01,2001 |
| Goserlin acetate | June 27,1997 |

## 13. Drug Used In Breast Cancer: Capivasertib

**FDA APPROVAL:** November 17,2023.

It is a serine /threoninekinase inhibitor used to treat hormone receptor – positive, HER2-negative locally advanced are metastatic breast cancer.

On November 17,2023 ,capivasertib ,under the brand name TRUQAP, was approved by the FDA for the treatment of adult patients HR-positive ,HER2- negative locally advanced are metastatic breast cancer with one are more alterations in P1K3CA/AKT1/PTEN gene (s)in combination with fulvestrant. This approval based on favourable result obtained from the CAPI tello-291trail, where the combination of capivasertib and fulvestrant reduced the risk of disease progression or deathy50%versus fulvestrant alone.

**Common Name**: Capivasertib –Truqap.

**Brand Name:** Truqap.

**Generic Name:** Capivasertib.

**Molecular Weight:** 428.915.

**Chemical Formula:** C21h25cln6o2.

**Chemical Structure:**

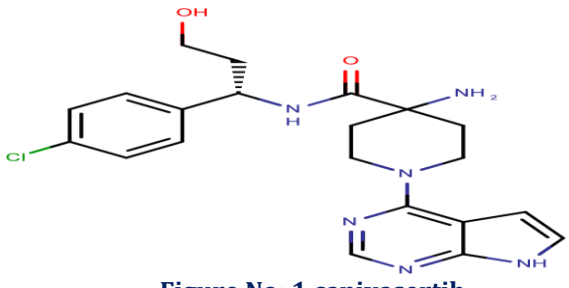


**Figure No: 1 capivasertib**

**IUPAC Name**

[(1S)-1-(4-chlorophenyl)-3hydroxy propel]-1-{7H-pyrrolo [2,3-d] pyramiding -4- yl} piperidine -4-carboxamide.

### 13.1 Pharmacodynamics

In vitro, capivasertib reduced the growth of breast cancer cell lines in including those with relevant P1K3CA or AKT1 mutations or PTEN alterations.

In vivo, capivasertib alone and in combination with fulvestrant inhibited tumour growth of mouse xenograft models including estrogens receptor -positive breast models with alterations in P1K3CA, AKT1, and PTEN.

### 13.2 Mechanism of Action:

Capivasertib is an inhibitor of all 3 isoforms of serine/threonine kinase AKT (AKT1, AKT2, and AKT3) and inhibits phosphorylation of downstream AKT substrates. AKT activation in tumours is a result of activation of upstream signaling pathways, mutations in AKT1, loss of phosphatise and tensin homo log (PTEN) function, and mutations in the catalytic sub-unit alpha of phosphatidylinositol 3-kinase (PIK3CA).

## Pharamcokinetics:

### Absorption:

The capivasertib steady-state AUC is 8,069 h•mg/ml (37%) and Cm ax is 1,371 mg/ml (30%). Steady-state concentrations are predicted to be attained on the 3rd and 4th dosing day of each week, starting week 2.Capivasertib plasma concentrations are approximately 0.5% to 15% of the steady-state Cmax during the off-dosing days.Capivasertib AUC and Cm ax are proportional with doses over a range of 80 to 800 mg (0.2 to 2 times the approved recommended dosage).T max is approximately 1-2 hours. The absolute bio-availability is 29%.No clinically meaningful differences in capivasertib pharmacokinetics were observed following the administration of capivasertib with a high- fat meal (approximately 1,000 k cal; fat 60%) or a low-fat meal (approximately 400 k cal; fat 26%).

### Distribution

The steady-state oral volume of distribution is 1,847 L (36%) Capivasertib plasma protein binding is 22% and the plasma-to-blood ratio is 0.71.

### Metabolisn

Capivasertib is primarily metabolized by CYP3A4 and UGT2B7.

### Excretion

Following a single radiolabeled oral dose of 400 mg, the mean total recovery was 45% from urine and 50% from feces.The half-life of capivasertib is 8.3 hours.

### Dosage Form

The recommended dosage of capivasertib is 400 mg orally twice daily, approximately 12 hours apart, for 4 consecutive days followed by 3 days off. This weekly schedule should be repeated until disease progression or unacceptable toxicity. When taken in combination with fulvestrant, the fulvestrant regimen typically consists of 28- day cycles. In cycle 1, 500 mg of fulvestrant is administered intramuscularly on days 1 and 15, and in subsequent cycles, 500 mg is administered on day 1.

### Uses Of Capivasertib

The AKT inhibitor capivasertib is fast showing efficacy in a wide range of oncologic diseases owing to the importance of the phosphatidylinositol-3-kinase/ Protein Kinase B (PI3K/AKT) pathway in regulating cell growth, metabolism, and cell survival. Consequently, alterations of this pathway are of utmost importance in tumour angiogenesis, metastasis, and proliferation.12 While PI3K inhibitors have already proven usefulness in a number of hematologic malignancies it stands to reason ATK.

### Side Effects of Capivasertib:

AKT inhibitor therapy with capivasertib has generally shown acceptable toxicity profiles in clinical trials. Grade >3 adverse events are similar in mono-therapy and combination studies, mainly consisting of diarrhea, maculopapular rash, neutropenia, fatigue, nausea, and hyperglycemia.6 A summary of the common side effects of capivasertib in various studies .Nevertheless, these adverse events were dealt with by dose reductions and discontinuation of therapy.

### Contraindications

Capivasertib, in combination with fulvestrant, is indicated for the treatment of adult patients with hormone receptor (HR)-positive, human epidermal growth factor receptor 2 (HER2)-negative, locally advanced or metastatic breast cancer with one or more PIK3CA/AKT1/PTEN-alteration as detected by an FDA-approved test.

### Drug Interactions Of Capivasertib

**Abametapir:** The serum concentration of capivasertib can be increased can be increased when it is combined with abametapir.

**Abemaciclib:** The excretion of abemaciclib can be decreased when combined with capivasertib.

**Acylovir:** The excretion of acyclovir can be decreased when combined with capivasertib.

**AFATINIB:** Capivasertib may decrease the excretion rate of afatinib which could result in a higher serum level.

### Clinical Studies of Capivasertib

Capivasertib is being investigated in several clinical studies, primarily focusing on its efficacy in treating various types of cancer, including breast cancer A PhasIb/III study (CAPItello-292) is evaluating the safety and effectiveness of capivasertib in combination with CDK4/6 inhibitors and fulvestrant for patients with locally advanced or metastatic HR+/HER2- breast cancer .

### Conclusion

The effect of breast cancer on HRQoL varies by age at diagnosis, time since diagnosis, and race/ethnicity. The results suggest that separate QoL adjustments for women by age at diagnosis and race/ethnicity would be important for conducting cost- effectiveness analysis of breast cancer prevention, detection, and treatment (25, 26). This study provides HSU estimates for younger women with breast cancer by race/ethnicity that can be used to model downstream health states in secondary or observational models. However, the authors acknowledge that concerns about equity and fairness could arise if minorities experienced lower HSU decrements from breast cancer, which could lead to higher incremental cost-effectiveness ratios for interventions targeted at these groups. In conclusion, the incidence of breast cancer is increasing among AYAs, who are more likely than older women to present with advanced disease at diagnosis. AYAs face unique, age-specific challenges as they confront breast cancer treatment and survivorship. As a result, they derive significant benefit from a coordinated, multidisciplinary treatment approach.

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No conflict of interest.

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## Author Contribution
Sanket J Soni, Ankitkumar N Patel both are contributed equally.

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