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Awareness and Management of Breast Cancer in Women

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Abstract: *Women have faced many challenges such as higher risk of breast cancer due to lack of awareness. The formation of hard mass or lump is a common sign. There are 4 stages of the breast cancer, and it is divided into two types, invasive and non-invasive. The common type is invasive ductal carcinoma which spread easily and also occur in men. The stage 3 cancer is known to be Inflammatory breast cancer and it can appear as metastatic cancer. Some risk factors can be controlled like breastfeeding can reduce chances of cancer. Different alternate options are selected for the treatment like full removal of breast or lump by the mastectomy or lumpectomy respectively. To destroy remaining cancerous cells, radiations are given, and chemotherapy reduces the size of tumor cell. In advance methods, gene therapy or immune system modulation is done to get rid of cancer.*

Key Words: Breast Cancer, Metastasis, BRCA Gene, Carcinomas, Genetic Mutations, Lumpectomy, Mastectomy

Introduction

Majority women have skin cancer while breast cancer is on second number. Breast cancer targets the tissues present in the breast. When the cells start dividing uncontrollably, cancer originates. In breast cancer a lump develops that is mostly visible on x- ray. It is a common assumption that breast cancer only effects women, but it can also develop in men.

It is critical to remember that the majority of the lumps found in breast are not cancerous. Tumors present in breast cells that aren t cancerous are actually abnormal growths that don t spread outside of the breast. Although benign breast lumps do not cause death, they increase the chances of having breast cancer. If you feel any lump or change in your breast, you should immediately consult a specialist so that proper diagnosis can be done to find out whether the tumour is malignant or benign or if it will alter your risk of developing cancer in future (Henry, 2020).

Occurrence of Breast Cancer

Breast cancers can develop in a variety of locations on the breast.

- Some cancers start in the milk ducts that

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are responsible for carrying milk to the nipples and known to be a ductal cancer, others start in the glands producing breast milk and form lobular cancer.

- Phyllodes tumor and angiosarcoma are two less prevalent kinds of breast cancer.
- A few malignancies begin to start in other breast tissue as well. These are known as sarcomas and lymphomas. Sarcomas and lymphomas are malignancies that are typically not considered as breast cancers.

Lumps do not occur in every kind of cancer. Most of the breast cancers are found on screening mammography, which can discover malignancies at an early stage, frequently before development of any sensation or symptoms appear (Jagsi, 2019).

Breast Cancer Signs and Symptoms

Having the knowledge of your breast appearance and texture is crucial for breast health. Although mammograms are useful for early detection of breast cancer, they do not detect every case. This implies you should be alert of changes in your breasts and be knowledgeable about breast cancer signs and symptoms.

The development of a lump is a common sign of breast cancer. Breast cancer is mostly a painless, hard mass with uneven borders, but it can be painful, soft, or round. They can be excruciating.

Common symptoms for breast cancer include:

i. Inflammation of most or some part of a breast
ii. Pitting or uneven skin of breast (just like peel of an orange)
iii. Discomfort/ pulling in the breasts or nipples (or sensation of pain)
iv. Inward movement of the nipple.
v. Sore, parched, scaly, or condensed nipple or breast skin.
vi. The release from nipples (except breast milk).

Swollen lymph node (may be tumor present in breast) can spread to lymph nodes which are present in armpits or the ones surrounding collar bone, and it may result in swelling or lump formation there, before the initial tumor in the breast becomes a large mass to be felt.

The symptoms mentioned can be the result of something other than breast tumor, if you observe any of these symptoms, then there is urgent need to see a doctor to find out what's causing them (Sabel, 2020).

How Breast Cancer Starts?

Normal breast cells can become malignant due to changes or mutations in their DNA. Certain DNA alterations are inherited from your parents and it can increases your chances of developing cancer in breast Similarly various other factors like the the type of lifestyle we are living, what are we eating, how much exercise we are doing can increase the chances of cancer although it is not clear that how some of these daily activities converts healthy cells into cancerous cells normal cells to become cancerous. Sometimes hormones are also responsible for breast cancer development, but its exact mechanism is not known. Major factors include:

Inherited Versus Acquired DNA Mutations

DNA mutations can convert healthy cells in the breast to cancerous cells. Our genes are made up of DNA, a molecule found in our bodies. Genes are the blueprints that suggests how will a cell work.

There are few DNA mutations which passes down from one generation to the next. This means that when you are born, the mutations are present in all of your cells. Particular tumours can be considerably exacerbated by certain mutations. They mutations are the cause of many malignancies that are running in the families generation after generations and frequently cause cancer in children.

However, the majority of breast cancer-linked DNA alterations are not inherited**.** This demonstrates that the alterations which are occurring in the breast cells actually happens during the life of person and are not hereditary or existing at birth. These acquired DNA alterations which are observed in breast cancer cells are

responsible for many malignancies that are running in families generation after generations and frequently cause cancer in children.

Genes can be mutated as a result of mutated DNA. Our cells' growth, division, and death are all controlled by genes. Changes in these genes have been associated to cancer as these changes cause cells to lose normal regulation (Bager, 2019).

Proto-oncogenes

These genes help in proper growth of cell. When these particular genes undergo mutation (changes) or several mutated versions of these genes are available, they significantly transform themselves into "bad" genes and can become functional or remain operational when they shouldn't. When this happens, the cell become uncontrollable and produces more uncontrollable cells. This has the potential to cause cancer. An oncogene is a type of harmful gene (Hopper, 2008).

Tumor Suppression Genes

These genes are responsible for slowing down the cell division (cell growth), fix different DNA errors occurring in cells, and also warn various cells that when they should undergo apoptosis. When tumour suppressor genes malfunction, it results in uncontrolled cell division, and these uncontrolled cells produce more out-of-control cells, which fails to die when they should, leading to cancer (Byrnes, 2008).

Inherited Gene Alterations

Many cancers that run in families are linked to specific inherited DNA abnormalities, and these DNA alterations greatly increases the likelihood of developing certain malignancies. BRCA genes (BRCA1 and BRCA2), are the examples of tumour suppressor genes. If any of this gene stops functioning properly i.e.: (malfunctions), it stops suppressing aberrant cell growth, increasing the risk of cancer. A mutation in one of these genes can be handed down from one generation to the next.

Advancements in the genetic underpinnings of tumour have already begun to assist women suffering from breast cancer. Some women with hereditary alterations in these genes (or genes like PALB2, ATM, CHEK 2) can be identified by genetic testing. These advancements have aided women to become more conscious of their breasts and are helping them in following different screening procedures to detect cancer at an earlier and easily treatable stage. Because alterations in genes like BRCA1 and BRCA2 have been linked to a variety of malignancies (not just breast cancer), so if a women is suffering from these genetic alterations she should immediately go for early screening and precautionary measures for many other malignancies as well.

Any change in tumor suppressor gene, e.g., BRCA genes will be referred as high penetrance gene, because it will ultimately lead to cancer. While mostly women with increased penetrance alteration have been diagnosed with cancer, still there are many cases (including breast cancer) which are not the result of these mutations.

Low-penetrance alterations or the gene variants are more typically a factor in the development of cancer. In case of single person these variants have a minor impact on cancer, but people have mostly more than one mutation at the same time (as these mutations are frequent), so the aggregate impact on the population can be significant. The genes implicated can influence hormone levels, metabolism, and other variables that influence breast cancer risk. These genes can also be the risk factors for many breast tumors possibilities running in families (Caddo, 2020).

Acquired Gene Alterations

Instead of being inherited, the majority of breast cancer-linked DNA alterations in breast cells of women are occurring during her lifetime. Other stressors like radiation or cancer-causing substances can trigger the alterations in oncogenes or tumor suppressor genes. However, the majority of these alterations that can lead towards the formation of breast cancer have not yet been identified. Several acquired gene alterations are

found in the majority of breast tumor (Stadler, 2020).

Spread of Breast Cancer

Blood or lymphatic system carries cancerous cells and transferred them to various lymph nodes and other locations in body which results in the spread of breast cancer.

Lymphatic system is composed of various veins. These veins are connecting different lymph nodes all through the body. Tissue debris, waste products, antibodies, as well as various cellular content are found in clear fluid that fills the lymph veins. Lymphatic vein helps in carrying the lymphatic fluid from breast to other side. In doing so, several cancerous cells move into lymphatic veins, and then start proliferating in lymph nodes. Mostly lymph veins that are present in the breast move into:

i. Axillary lymph nodes (present in human armpits).
ii. supraclavicular and infraclavicular lymph nodes.
iii. Internal mammary lymph nodes.

If cancer is metastasized, it will begin to spread in various lymph nodes as well as many other organs in the body. If the lymph nodes identified with cancerous cells are greater in number, then there are more chances of spread of cancer to surrounding tissues and various other organs. As a result, tumor identified in the lymph nodes can have a significant impact on your treatment approach. Mostly surgery is done in order to remove the cancerous lymph node and to avoid the spread of tumor (Morrow, 2014).

TNM System for Breast Cancer

T, N, or M are the letters commonly used by oncologists to classify the cancer. These letters give us information about how malignant the tumor is.

T:

The letter T indicates tumor, which refers to a cancerous mass in the breast. The larger or wider the mass, the higher the number put after it.

Tx: Here at this stage, primary tumor cannot be assessed.

Tis: Ductal carcinoma in situ (pre-cancerous lessons).

T1: Breast carcinoma is less than 2cm in size.

T2: Breast carcinoma is 2 to 5 cm in size.

T3: Breast carcinoma size is greater than 5cm.

T 4: This stage us divided into four substages:

T4a: Extension into chest wall

T4b: Extension into skin

T4c: It is a combination of T4a and T4b.

T4d: Inflammatory carcinoma.

N:

N stands for nodes or lymph nodes. These nodes are tiny filters and are usually present in the whole body but are more abundant in the breast and the region surrounding the breast. These nodes trap unhealthy (cancerous) cells, so that spread of tumour can be avoided. Roman numerals (0-III) give information that to what extent the cancer has spread to the nodes.

No; Means tumor is not present in lymph nodes

N1: tumor is metastasized to 1 to 3 axillary lymph nodes.

N2: The tumor mass is metastasized to 4 to 9 axillary lymph nodes.

N3: Tumor has been moved to 10 or more axillary nodes.

M:

Here letter M represents Metastasis. It means cancer has started spreading and is now moving to other organs (metastasis in one or more organs) (Narod, 2018).

Mo: it means no spread of the tumor.

M1: Means tumor is now metastasized (begins to spread).

Stages and Grades of Breast Cancer

If a person has been diagnosed with breast cancer, then check the severity i.e: stage and grade of the cancer which will further help the doctor in making the treatment plan for that patient.

Variety of methods are used by doctors to diagnose the stage of breast cancer patient is suffering from. Physical exams, various biopsies, X-rays examinations, scanning and other imaging machine, blood samples testing, all these techniques help us in diagnosing the stage of breast cancer. Tissue samplings of breast and lymph nodes are done by pathologists for more and better understanding. Each breast cancer case is assigned a particular stage by the doctor or specialist. It is done based on these results obtained by stringing letters and numbers together. It may appear to be a bizarre code, but it's simply a means to figure out what's wrong with the tumor (Dunning, 2008).

Stages of Breast Cancer

Different stages in cancer are designated by Roman numerals (I, II, III, IV) subsequently followed by English alphabets A, B and C. Here if the number is higher, it means the cancer is at more advanced stage (Scott, et al. 2008).

These stages include:

Stage 0: It is noninvasive stage.

Stage I:

Stage 1A: Size of tumor at this stage is small about 2 cm and is confined only to breast.

Stage IB: Size of tumor is 2cm, and still their is no evidence of cancer in lymph nodes.

Stage II:

Stage IIA: Here at this stage, there are 2 possibilities, either tumor is approximately 2cm, cancer is detected in 1 to 3 lymph nodes. Or tumor size is 2 to 5cm and no cancer is present in lymph nodes.

Stage IIB: Tumor is 2 to 5 cm in size and cancer cells are present in more than 3 lymph nodes or other possibility is that size of tumor is greater than 5 cm and no cancer is detected in the nodes.

Stage III

Stage IIIA: Size of tumor not exactly known; cancer cells are present in 4 to 9 lymph nodes. Or other possibility is that the tumor size is more than 5cm and cancer mass is present in more than 3 lymph nodes.

Stage IIIB: Tumor begins to spread in other body areas, like skin or the walls of the chest cavity. Here cancer cells can be detected in more than 9 lymph nodes.

Stage IIIC: Here at this stage, tumor may move to 9 lymph nodes, axillary lymph nodes, supraclavicular and infraclavicular lymph nodes and internal mammary lymph nodes.

Stage IV

Tumor begins to move and starts spreading to other body parts such as lungs, liver, bones etc.

Breast Cancer Grades

It is important to find grade of your cancer in addition to the stage. This is a method of determining how the cells seem and how quickly they grow in comparison to healthy cells. It will also helpful in finding the likelihood of the cancer spreading to other places of your body. Knowing grade and stage of cancer will help doctor to find best possible treatment for the patient (Joggi A, 2014).

Grade 1 (Well Differentiated)

The cells have the appearance of normal breast tissue and are sluggish developing.

Grade 2 (Moderately Differentiated)

The cells have a somewhat distinct appearance and are growing at a higher rate than normal cells.

Grade 3 (Poorly Differentiated)

The cells do not resemble normal cells at all. They're rapidly expanding and can spread easily.

Survival Rates in Breast Cancer Stages

At Stage 0: chances of complete recovery are 100 % so survival rate is also 100 %.

At Stage 1: it is observed that survival rate is about 98 %

At Stage 2: rate of people survived is 93%.

At Stage 3: it appears to be 72%.

At Stage 4: chances of survival are 22%.

Types of Breast Cancer

Generally, we can differentiate breast cancer into the following given types based on the kind of cells being affected:

Non-invasive Types of Breast Cancer

Ductal CARCINOMA in situ (DCI)

Ductal carcinoma in-situ intraductal carcinoma is an early stage (stage 0) breast cancer which includes abnormal cell growth along breast milk duct lining. The cells are non-invasive, and are localized at one site. If detected earlier, it is recommended to perform mastectomy or breast conserving surgery (BCS) in order to remove it thereby preventing its spread. (literal meanings: cancer occurring at the original place) (National Breast Cancer Foundation, 2020).

Lobular Carcinoma In-situ (LCIS)

This type of carcinoma invades the lobules (milk glands) of breast where it remains localized and don t spread to nearby tissue. It can be treatable. There are chances of its spread if this type is present in one breast to the other side (American Cancer Society, 2019).

Invasive Types of Breast Cancer

Invasive Ductal Carcinoma (IDC)

Invasive or Infiltrative ductal carcinoma is considered as the most typical form of breast cancer (occur in more than 79% of diagnosed patients) that can affect men also, consists of abnormal cells forms in milk ducts and that can diffuse to the other parts of the same tissue or to the whole body. It differs from the DCI type as this type of cancer can invade the surrounding tissue. This type is further classified as Tubular, Medullary, Mucinous, Papillary, and Cribriform carcinoma of the breast (Akram et al., 2017).

Invasive Lobular Cancer (ILC)

If the cancer from the milk glands (lobules), through bloodstream or lymph spreads to the surrounding tissue or other body part, it is known as invasive lobular cancer. The 2nd most common type of invasive type carcinomas occurs in more than 10% of diagnosed patients. It is challenging to detect ILC by imaging or mammograms that s why, it can only be detected using MRI technique (Weigelt, et al. 2010).

Triple Negative Breast Cancer (TNBC)

It is named so because of the fact that the three most common receptors involved in breast cancer growth are absent here means the diagnostic tests show negative results for the presence of ER (Oestrogen receptor), PR (progesterone receptors), and HER 2 (epidermal growth factor receptor 2). Due to this reason, targeted hormone therapy is ineffective to treat triple negative type breast cancer. However, chemotherapy, immunotherapy and platinum therapy have shown positive impact in treating TNBC. New treatment regimens research is going on to treat this type effectively. It occurs in about 15% of the diagnosed patients and more likely to affect younger women (<40 years) and those with a BRCA1 gene mutation (Sharma, et al. 2010).

Inflammatory Breast Cancer (IBC)

The stage 3 rapidly growing carcinoma in which the abnormal cells invade the lymphatic vessels and breast s skin without producing distinguishable tumor growth that can be isolated in the breast. The signs and symptoms begin to appear when the cancerous cells bock the lymph vessels completely. The symptoms are same as for the mastitis like itching, rash, redness, thickening of breast skin that looks like an orange peel along with pores dilation of the breast skin.

If symptoms persist after one-week usage of antibiotics against mastitis infection, it is recommended to consult breast specialist. The diagnosis is done through breast ultrasound, breast MRI or breast skin biopsy and the presence of cancerous cells in skin or in lymphatics of dermis confirms the presence of cancer. Aggressive treatment recommendations include both local as well as systemic treatment plus radiation therapy, chemotherapy, surgery, hormonal treatment have improved survival rate among cancer patients (Sharma, et al. 2010).

Metastatic Breast Cancer

When the cancer cells move with blood from breast and invade other body tissues/organs like brain, liver or lungs, it is known as metastatic breast cancer. They invade surrounding healthy tissues, get penetrated or lodged into the circulatory system and start growing as small tumor growth. The sign and symptoms of metastatic cancer depends upon the organ being invaded by the cancerous cells. If metastasis occurs in bones, it results in swelling and severe progressive pain. If metastasis occurs in brain, the ailments like optic dysfunction, seizures, changes in behavior will occur. If liver is being invaded by the cancer cells, it results in jaundice and abdominal pain. Towards lungs, it results in chronic cough, chest pain and shortness of breath (National Breast Cancer Foundation, 2020).

Breast Angiosarcoma

An exceptional type of breast cancer in which the cells of blood vessels/lymph vessels get abnormality, and they start growing and cause changes in skin coloration particularly purple-colored nodules in breast. In order to diagnose this type of cancer, breast tissue biopsy is done. Usually, it happens after certain time period in patients who received radiation therapy as a mean for curing the carcinomas of the breast.

Breast Paget Disease

It is another distinctive type of carcinoma related to breast which involves skin of nipple and areola (dark circle around the nipple). Mostly, it occurs in presence of DCIS or IBC and usually one breast is affected (Banerjee, 2018).

Phyllodes Tumors

It occurs in the breast connective tissues and mostly affect those people with an inherited genetic Li-Fraumeni syndrome. On a scale, 25% of phyllodes tumors are cancerous (Cancer Treatment Centers of America, 2021)

Breast Cancer in Men

A person with a pedigree of having BRCA2 gene mutation is most likely to develop IDC or ILC type breast cancers. In US, 1 in 100 breast cancer patients is male (Banerjee, 2018).

Breast Cancer Molecular Subtypes

Primarily, breast cancer has following molecular subtypes:

Luminal A

It is the most common type which grows slowly. It is HR positive means that they express hormone receptors (ER, PR) and HER2 (a protein normally produced by our body play role in cell growth/repair)-negative means that the person is expressing usual volume or aggregate of HER2 protein (Cancer Treatment Centers of America, 2021).

Luminal B

It grows more quickly than luminal A and is aggressive in nature. They are positive for both the hormone receptors and the HER2-positive as both are expressed at critically raised level (Cancer Treatment Centers of America, 2021).

HER2-positive/HER2-enriched

This type is HR (ER and PR) negative and HER2-positive with multiple copies of HER2-gene. Routinely, HER2 is involved in division, repairs, and breast growth with respect to the healthy cells. Under the phenomenon of proliferation, cells begin to grow rapidly and exponentially without

any control. For the treatment of such type of cancer, usually, it is achieved through implementing targeted therapy i-e, the use of Trastuzumab which is a monoclonal antibody-based medication sold under the brand name of Herceptin (Li, 2005).

Triple-negative Type Breast Cancer

It is called this because of absence of few receptors.

Risk Factors and Prevention of Breast Cancer

Risk Factors

A risk factor is termed as something that will amplify the chances of getting a disease. But it is not necessary that if you have a risk factor you will surely get the disease. For breast cancer, there are two types of risk factors, one which cannot be controlled like family history and aging. While the second category involves those risk factors that can be controlled. There is no proper way by which we can avoid breast cancer, but some things can be done to decrease the risk.

Factors that cannot be Controlled

Following are the breast cancer risk factors that cannot be controlled:

Being Female

This is the main factor that cannot be controlled. Women have a risk of getting breast cancer to a greater extent, but men can get it too.

Aging

As your age increases, your probability of experiencing breast cancer also increases. This risk is greatest in women aged 55 years and older (Balducci, et al. 2000).

Family History

It is not necessary that every woman gets breast cancer due to a family background of it, however, females with close blood relatives having breast cancer are at a higher risk of getting it. First degree relatives of women with breast cancer, for example mother, sister or daughter may have a double risk of getting it. 15% of women getting breast cancer have a family background of it (Colditz, et al. 1996).

Personal History

There is a greater risk of getting breast cancer in a breast if a woman had a cancer in the other breast in past. She can also develop it in some other part of the same breast.

Race and Ethnicity

Race and ethnicity also play a part in the advancement of breast cancer. The probability of the development of breast cancer in the African American women is less comparative to white women but they have a higher risk of dying from it at any age. The risk of having breast cancer is also low in Asian and Hispanic women (Salehiniya, et al. 2019).

Being Taller

A study shows that chances of having breast cancer in shorter women is lesser than in taller women. There is no valid logic that can justify this but maybe it depends on the early growth factors, the diet and nutrition, hereditary or hormonal changes.

Dense Breast Tissue

Breasts are made of distinct tissues, such as glandular, fatty and fibrous tissues. These tissues are present in the required density in the breast tissues. Breasts will be denser if they have a higher density of fibrous or glandular tissue as compared to the fatty tissue. There is a greater risk of having breast cancer in women with denser breasts and the dense breast tissues also make it difficult to visualize cancers on mammograms. Breast density can be increased by a number of reasons like age, menopause, some medications or menopausal hormone therapy, pregnancy etc (Schreer, 2009).

Early Menstrual Periods

If a woman starts getting periods early, like before the age of 12, there will be a higher risk of getting

breast cancer in her because she will be more exposed to hormones like estrogen and progesterone (Kelsey, et al. 1993).

Late Menopause (after 55 Years)

It is also the same. If a woman gets her menopause late, she will have more menstrual cycles and will have more estrogen and progesterone exposure, hence she will have a greater risk of getting breast cancer.

Radiation Exposure

If a woman is exposed to radiations for any other cause, she can have a greater risk of getting breast cancer. This risk increases if she gets radiations in her teenage because at that time the breasts are still developing. But the old age women if they get radiation therapy does not get increased breast cancer risk (John, et al. 2007).

Factors that can be Controlled

These factors are also called lifestyle related risk factors for breast cancer. They are as follows.

Alcoholism

Breast cancer risk increases if a woman is an alcohol consumer. It depends on the quantity of alcohol being taken every day. Alcohol can cause other types of cancers too. 7-10% risk rate increases in women who take 1 alcoholic drink a day and 20% in women who take 2-3 drinks a day than women who do not drink at all (Coronado, et al. 2011)

Obesity

The risk of breast cancer rise if women gain weight after their menopause. The hormone estrogen is produced by ovaries as well as fat tissues. Ovaries made estrogen before the menopause but after menopause most of it comes from the fat tissues. So greater the amount of fat tissues, greater will be the production of estrogen and greater will be the risk of getting breast cancer (Engin, 2017).

Sedentary Lifestyle

It is obvious that a sedentary lifestyle will increase body weight that will lead to higher chances of having breast cancer. Physical activity is very important in reducing this risk specially in post-menopausal women. Being active will not only reduce body weight but also keeps the hormones and energy levels in balance therefore risk of breast cancer will be reduced (Toklu, 2018).

Not having Children

Having no children or having them after crossing 30 years of age, will slightly increase their chances of having the breast cancer. Whereas being pregnant at the early age or having multiple pregnancies decrease this risk.

Avoiding Breastfeeding

According to some studies, breastfeeding is a great method to lessen the risk of having breast cancer, especially if this practice is done for a year or longer but in countries like US this practice is not really common. Breastfeeding can lessen the risk of breast cancer by decreasing the total number of menstrual cycles in a woman or causing an early menopause (Stuebe, 2009).

Birth Control

Most of the times birth control processes involve hormones which can increase the risk of breast cancer.

Oral Contraceptives

The birth control pills increase the chances of getting breast cancer in women who use these. But the risk subsides in 10 years if the pills are stopped.

Shots for Birth Control

Some hormonal injections like Depo-Provera (type of progesterone) is to be administered after every three months and it may increase the chances of birth control.

Intrauterine Devices or skin PATCHES

These devices and patches increase the chance of having breast cancer as well, because they release hormones that can potentiate the development of breast cancer (Yuan, et al. 2018).

Hormone Therapy

Mostly hormone therapies are done after menopause to help reduce the symptoms of menopause and risk of osteoporosis. Estrogen and progesterone are mostly used; the risk of breast cancer can also be increased (Howell, et al. 2003).

Factors which do not have Clear Effects on Breast Cancer Risks

Something may be termed as a factor of risk for breast cancer, but the research didn t prove it whether they can cause breast cancer or not.

Diet and Vitamins

Relationship between diet and breast cancer is unclear. Some studies show that diet can directly increase the chances of breast cancer whereas some other studies show that there is no connection between diet and breast cancer. Some research on women carried out in USA indicate that there exists no relation between breast cancer and the diet you have whereas conclusion of other studies are totally opposite. These studies also concluded that the countries in which the diet has low saturated fat, total fat and polyunsaturated fat have less prevalence of breast cancer. The researchers are unable to explain this relation. There are also other factors which can complicate the studies carried out to see the connection between breast cancer and diet. Such factors include genetic variations and related factors, consumption of different nutrients and person s own activity level.

High fat diet can cause obesity and it is a significant breast cancer risk. Not only breast cancer, but high fat diet can also lead to other kinds of cancer and different heart diseases too. The diets which are usually high in calcium-rich dairy products and fruits and vegetables but low in red meat can significantly decreases the chances of getting a breast cancer.

Some studies carried out on women of Asia shows that diet which have a high soy content can reduce breast cancer risk but we cannot relate these studies to the women of western countries because women of western countries don t consume soy products. There is also no strong evidence of link between diet rich in vitamin and probability of breast cancer.

Chemicals Present in the Environment

Several academic works have been carried out to study the influence of environment on the risk of breast cancer. Some chemicals which are present in environment possess properties similar to estrogen. These chemicals present in some plastics, different kinds of cosmetic and daily personal care product, polychlorinated biphenyls (PCBs), and pesticides show estrogen like properties and can possibly affect the breast cancer risk. These researches are not enough to link the influence of environment to breast cancer risk. More researches are required in order to study the health-related effects of these substances.

Tobacco Smoke

A small number of studies have indicated that smoking too much for long duration can possibly lead to danger of breast cancer. Several researches depict that women who smoke put them to possibility of having a breast cancer before having their first born. The report of US Surgeon General s published in 2014 shows that there exists a compelling but not adequate proof that the risk of having breast cancer is rising due to smoking.

Research have been carried out in rodents to study the effects of second-hand smoking. This mainstream and second-hand smoking contains some chemicals which when inhaled in large quantity can amplify the chances of having breast cancer. The chemicals which are present in tobacco can reduce the breast tissues and these chemicals were also present in breast milk of rodent.

Whereas in humans the link of breast cancer and second-hand smoking is not clear. It can be found in a few studies that it can increase the chances of getting a breast cancer particularly in premenopausal women (Johnson, et al. 2011).

Night Shift Work

Some studies have shown that the working women, particularly the women who work at night, for example, nurses working on a night shift are more prone to breast cancer. According to some researchers, this is due to variations in the melatonin level which is a hormone in the body that is affected by the sunlight exposure (Ijaz, et al. 2013).

Controversial Breast Cancer Risk Factors

According to some rumors and misleading information, there are some factors that cause breast cancer but that is not proved by research. Some of these factors are:

Antiperspirants

Some sources like internet and emails say that the chemicals present in underarm antiperspirants can amplify the chances of getting breast cancer. They can do so because they get absorbed into the skin and can interact with lymph fluid leading to a toxins buildup in the breast that can cause cancer. But there is no such evidence to prove the above statements true (Mirick et al., 2002).

Bras

Some studies and a book have shown that bras can induce breast cancer by stopping the proper circulation of lymph fluid. But there are no scientific or clinical proves for this study. Another study was conducted in more than 1500 women in 2014 and the results found that there is no connection between the wearing of a bra and the progression of the breast cancer.

Abortion

Some people think that inducing an abortion may lead to higher risk of having breast cancer, however, studies depict that there exists no connection for having breast cancer because of induced or spontaneous abortion (miscarriages) (Rookus, 1996).

Prevention of Breast Cancer

Prevention is defined as the measures and steps you can take to stop breast cancer from occurring or reduce the risks of its occurrence.

There are no perfect ways that can stop breast cancer from developing but some things can be done to decrease the risk of development of breast cancer. Some of the preventive measures are as follows:

A Healthy Body Weight

An increased body weight is linked to increased chances of getting breast cancer specially after menopause. According to the recommendation of american cancer

society, women should maintain a healthy weight all along their life through a balanced diet and also have some physical exercise (Cortesi, et al. 2020).

Physical Activity

By staying physically active the chances of breast cancer can be reduced greatly. Any kind of moderate or vigorous physical activity should be added in daily routine to stay healthy. It can be a brisk walk or any exercise that will increase the heart rate and breathing (Verlaan, et al 2017).

Avoiding Alcohol

Alcohol surely amplifies the chances of having breast cancer even when taken in small amount. So one should refrain from its use to lessen the chances of developing breast cancer. But the females who cannot stop drinking, should limit it to only one alcoholic drink per day (Vesshia, C. et al. 2012).

Breastfeeding

The concept of breastfeeding should be promoted in women so that they can lower their chances of

getting breast cancer. They should at least breastfeed for several months to lower the risk (Woodman, 2002).

Non-Hormonal Therapy

Women should prefer non hormonal methods to reduce their menopausal symptoms and avoid the hormone therapy in order to reduce the chances of breast cancer.

For Women at higher risk of Breast Cancer

There are females who are at higher risk of having breast cancer like those having a family background of it or a gene mutation which intensifies the development of breast cancer like BRCA1 or BRCA2 gene, they can consider some of the points which are described below to reduce their chances of breast cancer.

Genetic Testing

If there are chances that one might have got a gene that can increase the chances of having breast cancer like in case of family background of breast cancer, then one should consult a doctor who may suggest genetic counselling to check if there is a requirement to undergo testing (Sopik et al., 2015).

Serving Closely

The women with higher risk for getting breast cancer should go for close observation that includes:

- They should go to a doctor every 6-12 months to get their breast exams and other ongoing risk assessments.
- Doctor can also recommend them to start screening for breast cancer like undergoing yearly mammograms at an early age.
- Doctor can also suggest another screening test that will most probably be breast MRI.

These precautions do not decrease the chances of breast cancer but may help the women to detect it earlier so that it is feasible to treat.

Taking Medicine

There exist many medicines that can help decrease the chances of breast cancer in women with greater risk. These medicines include tamoxifen and raloxifene that act by blocking the effect of estrogen hormone in the breast tissue. Tamoxifen can be used before menopause whereas raloxifene is only given to women who have already got their menopause. Another medicines called aromatase inhibitors can also be used in post menopause women. Women should know the benefits to risk ratio of these medicines because these medicines also have certain side effects.

Surgery for Prevention of Breast Cancer

Some females with elevated risk of breast cancer like those who have the BRCA gene mutation might want to undergo surgery in order to remove breasts, this should be decided after consulting a doctor. Ovaries also produce estrogen in the body so removing them may help prevent breast cancer. These surgeries can only lower the risk for breast cancer, but it will not be eliminated completely and will have other side effects too.

Choice of Treatment for Breast Cancer

Multiple alternatives for treating the cancer like disease are present. Screening is done and after the diagnosis it is confirmed that at which stage patient came and how far the disease is spread. Major 5 choices are made which include the Chemotherapy. Medications are used in order to reduce the size or kill the cancer cells. Mostly these are given in the form of intravenous injections. Another alternate option is the Hormonal therapy in which the hormones that facilitates the tumor growth are blocked using different drugs. To help your body naturally to fight with the cancer, biological therapy is used that works with the body s immune system and it prevents the side effects of other treatment options. Sometimes the surgical procedure is involved in which the part of breast which is affected by the cancer is removed or the whole breast is cut. When the high energy radiations are

used like X rays for targeting the cancer cells, we can say it as radiation therapy. It is performed to destroy the cells which are not removed by surgery.

Factors on which the Treatment is based

- Age of patient, Comorbidity or polypharmacy, menopause.
- History of patient for example if it is inherited then the presence of the known mutation in genes like BRCA 1 or BRCA 2.
- The subtype of tumor is found.
- Hormone receptor status is checked either it is ER, PR, HER2 and nodal status.
- Which cancer stage is detected?
- Genomic markers are seen in some cases like Oncotype DX or MammaPrint (Singletary, 2003).

Methods of Treatment

Surgical Procedure

The method helps to detect the axillary lymph nodes. There are two approaches after detecting the type of cancer and the level. (Sharma et al., 2010).

When the lump from the breast is removed, it is termed as lumpectomy which require the removal of small mass of surrounding normal tissue or in other words the margins around the healthy tissue that are free from cancer (Fallowfield, 1997).

In cases where the cancer is capable of spreading fast then the radiation therapy is sometimes suggested specially for the patient with hormone receptor negative tumors and if tumor size is large. In Ductal Carcinoma in situ radiation is recommended by the doctor. when the whole breast is removed it is defined as mastectomy which can be used in case of noninvasive breast cancer or till the stage 3.

The mastectomy has different categories. It can be skin-sparing mastectomy if the skin can be conserved. In nipple-sparing mastectomy the nipple can be protected and is suitable for few females who have BRCA1 or BRCA2 gene mutation (Moo, et al. 2018).

In order to completely eradicate the cancer, the doctor should make sure that during surgery the tissue which was removed has margins get rid of cancer. If margins are not cleared then more tissue is taken out. In this procedure the major muscle of anterior chest wall is detach that is known as pectoralis major muscle.

More advancements are made in this regard which has gain the popularity and the method is dissection of sentinel lymph node. In this method cut the fewer lymph nodes. The accuracy of detecting sentinel lymph node is increasing due to changes in sentinel lymph node mapping from last few years. When blue dye is used separately it is 80% and 92% and 98% if using combination which decrease the risk of significant complications (Are, et al. 2016).

The breast-conserving surgery is performed in which normal tissue in surrounding area of tumor and tumor itself are removed. It is also known as breast sparing surgery.

Partial mastectomy is performed in which wide excision is made and removal of massive amount of the adjoining healthy tissue is done. If the one fourth part of a breast is get rid of then it is known to be a technique Quadrantectomy.

Lumpectomy is basically used to treat initial stage of breast cancer tumors which are small in patient and within a month, patient is recovered. The method is suitable for female with BRCA1 or BRCA2 gene mutations. If these women are newly diagnosed, they may have the moderate risk of mutation of gene for example CHEK2 and ATM (Atlanta, 2003).

The surgical procedures are performed by first giving the patient a dose of either general anesthesia or local anesthesia. This will help to relax and pain is not felt. After this entire breast or the part of breast is removed.

Radiation Therapy

When the tumor is targeted by the gamma

radiation or other type of electromagnetic radiation that uses high energy called as X-rays is used it is called as radiation therapy which is mostly perform after the surgery. The radiations help to kill remaining cancer cells after surgical procedure or target to the site from where the tumor was removed.

Brachytherapy is one of the earlier types of radiation therapy that treats the disease by placing radioactive catheters (Rath, 2010).

External-beam radiation therapy is a basic technique in which the radiations hit the human body from outside via machine. The radiation dose provided is stronger which make sure the cancer cells are eliminated. The duration of treatment is five to seven weeks and therapy is performed in five days out of seven and time taken for single treatment is about 15 minutes. This may be applied on entire breast or it can be the partial breast radiation therapy. Within few days accelerated breast radiation therapy can also be performed.

If probe is used in radiation therapy it is called as Intra-operative radiation therapy (Sharma, et al. 2010).

Radiation therapy can be either known as Adjuvant radiation therapy. In this case radiations are given after the completion of surgery. It is suitable after lumpectomy is performed or after chemotherapy. If patient has large tumor and removed by mastectomy or the cancer is in lymph nodes or external to capsule of the lymph node. In all such cases the radiation is given afterwards.

In some cases radiations are given in order to reduce the tumors that are larger in size and is done prior to surgery. It is called as Neoadjuvant radiation therapy (Cramer, et al. 2018).

Treatment VIA Chemical Drugs

The method is called Chemotherapy in which drugs that kill or treat the cancer are used. First of all patient history is taken that can be either related to drugs, comorbidities and history of disease already in family. The treatment is then given by looking at the overall health status, age of patient, cancer stage and type of cancer. In female it is also seen that women is menstruating or menopause have occurred (Cancer wellness. 2010).

The method is performed in rotation and given over a period of time until the patient is in recovery phase. It reduces the chances of mastectomy if Chemotherapy is started before undergoing surgery and help to reduce the size of tumor.

Chemotherapy is sometimes performed when surgery is done. In a dose dense fashion, it is given more frequently than normally like every second week by keeping a less time between the doses. The drugs like doxorubicin and cyclophosphamide is used. Paclitaxel is given after this weekly. When multiple drugs are used, the chemotherapy is effective more by this combination (UVA Health, 2006).

Drugs used as Adjuvant and Neoadjuvant

- The class which is Anthracyclines include doxorubicin and epirubicin for the treatment.
- The other class is Taxanes which include paclitaxel and docetaxel.
- 5-fluorouracil (5-FU) and capecitabine can be used.
- Cyclophosphamide has also the effect on cancerous cells.
- Carboplatin is used.

The drugs given above are used in combination of two to three drugs (Bartsch, 2017).

Drugs used in Advanced Breast Cancer

- Taxanes are used under the brands Taxol, Taxotere, and Abraxane.
- Anthracyclines for example: Doxorubicin is used as well as pegylated liposomal doxorubicin and Epirubicin like drugs are used.
- Platinum agents like the cisplatin agent or carboplatin agent are used.
- Vinorelbine also used in cases where chances of cancerous spread are more.
- Capecitabine is one of the choice.

- Gemcitabine can be used.
- Ixabepilone has also effect on cancer cells that spreads easily.
- Eribulin is also used.

In this case treatment can be performed by using a single agent only. However, some drugs like gemcitabine and paclitaxel can be given in combined form. Such therapy is mostly given in form of Intravenous injections. (Anderson, 2018).

Use of Nanotechnology

The vast field of nanotechnology is used in targeting the cancer cells. The antitumor activity of liposomal doxorubicin was maintained and is thought to increase the conventional chemotherapy because of its improved therapeutic index and less toxicity (Tanaka, et al. 2009).

Immune System Modulation

Sometimes the immunity is enhanced against tumor by few cytokines. This give rise to gene-based approaches to stop the malignant tumor cells. Some cytokine that are expressed ectopically may reduce the extension of cancer cells. When the allotype MHC antigens are demonstrated on exterior of tumor cells it leads to immune system enhancement. The B7-1 that is also known as CD 80 and B7-2 which is CD 86 are the molecules that can activate the costimulatory pathway (Disis, et al. 2009).

Gene Therapy

It is recent approach for managing the breast cancer. Recent studies give us the idea that origin of malignancy is the proto-oncogene and tumor suppresser genes which lead to the progress of gene therapy. The tumor has quality that it can turn prodrug which is having systemic action into a toxic metabolite.

Antineoplastic treatment helps in chemoprotection when given in high dose. The anticancer drug defense mechanisms is activated by immunomodulation. Other method is the inactivation of oncogenes by blocking transcription by using adenoviral gene E1A.

In some cases, the genetic repair strategy is used for example to overcome the problem related to p53 gene therapy (Osborne, et al. 2004)

Cell-Target Suicide

The one way is incorporation of phosphorylated ganciclovir into DNA. HSV-1 Thymidine kinase gene is used along with prodrug ganciclovir. This method inhibits transcription and synthesis of DNA.

Hormonal Therapy

Endocrine therapy approach helps to prevent the cancer cells from coming back and is used as adjuvant therapy after the surgery. The treatment requires 5 to 10 years of life. This method is useful in controlling the spread of disease. When the hormones are blocked it reduce chances of cancer recurrence and mortality rate (Davies, et al. 2011).

Cancerous cell having estrogen or progesterone receptors are known to be Hormone receptor Positive. About 67%–80% of female are ER positive (Kohler, et al. 2015).

Gonadotropin-releasing hormone (GnRH) agonists are used to block the estrogen as it interferes with ovarian function. In postmenopausal female, Aromatase inhibitors are helpful as it blocks the aromatase enzyme. The drug named Tamoxifen is also given to inhibit estrogen so that it does not bind to breast cancer cells. This pill is taken orally daily for the five to ten years of life. Other drugs taken are fulvestrant which when binds estrogen receptor and give signal for destruction. The Selective estrogen receptor modulators like raloxifene decreases the chances of breast cancer about thirty eight percent (Vogel, et al. 2010).

The drug called Palbociclib is given in combine form with letrozole for treating Hormone Receptor-positive, HER 2-negative and breast cancer that is rapidly spreading in older women who have menopause (Finn, et al. 2016).

Biological Therapy

In clinical practice 6 biological agents are used. The drugs for example: trastuzumab, pertuzumab agent, lapatinib drug, trastuzumab-emtansine, bevacizumab agent and everolimus are increasing the chances of survival specially in case of cancer which is undergoing metastasis. Due to long term use there are risk of Adverse effects.

Trastuzumab:

It is a humanized monoclonal antibody which is used in HER2 as a neoadjuvant therapy or secondary in case of metastatic breast cancer but it is also causing cardiac dysfunction.

Lapapatinib

The drug is tyrosine kinase inhibitor of domains of HER2 and HER1. It is given through oral route and it is associated with causing fatigue, diarrhea and rashes.

Pertuzumab

This drug is a humanized monoclonal antibody and its binding is with second domain of HER 2 receptor. The combination form of pertuzumab drug, trastuzumab agent and docetaxel can be used as a primary therapy in patients whose cancer is spreading. Some side effects related to the use of this drug are loose motions, redness which cause rashes and febrile neutropenia (Baselga, et al. 2012).

Trastuzumab Emtansine (T-DM1

It is an antibody-drug conjugate as it is having the property of trastuzumab for example it target the HER2 receptor and the drug shows cytotoxic effect like derivative of maytansine. It is given through intravenous route and has better drug profile due to improved therapeutic index. The major side effect is hepatotoxicity.

Bevacizumab

It is Anti-VEGF monoclonal antibody against vascular endothelial growth factor A which are free flowing, and it is used as a primary treatment for progressive HER 2 negative breast cancer along with paclitaxel. It reduces the angiogenesis. The commonly occurred adverse effect of this drug is hypertension (Mourad, et al. 2008).

Conclusion

Women all over the World need to be aware about symptoms of breast cancer disease. Some cancer starts in the milk ducts, while others start in the glands producing breast milk. Angiosarcoma is less prevalent kind of breast cancer. Acquired DNA alterations cause malignancies. These are known as sarcomas and lymphomas. Inflammation of a breast, pitting or uneven skin or condensed nipples are some sign and symptoms. Stage 1 cancer is non-invasive and 98% is survival rate but it spreads to other parts in stage 4 and survival rate reduces to 22%. Breast cancer is classified into different types based on cells type and localization of cancerous cell. They are invasive or non-invasive. IDC is considered as the most common form of breast carcinoma followed by the TNBC type. IBC, which is a stage 3 cancer, its symptoms are very much alike to metastasis. Breast ultrasound, breast MRI, mammograms are commonly implemented diagnostic techniques to differentiate between the type and stage of the breast cancer.

There exist many factors like family history, genetics, menopause, and some factors are avoidable while others are not. Therefore, the females should take preventive measures like breast feeding and taking medications. Educate yourselves or the family and people around you. In October, many organizations celebrate the breast cancer awareness day. As soon as cancer is detected make a wise choice and ask a doctor about multiple treatment options. It includes surgical method, radiation, and chemotherapy. Gene therapy, hormonal therapy and biological therapy are also available.

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