

Breast Cancer: Causes, Risk Factors and Prevention

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ABSTRACT Cancer is the abnormal proliferation of cells, which accumulate and form tumors that may compress, invade and destroy normal tissue. In breast cancer, the malignant cells are found in the tissues of the breast. The hereditary breast cancer result from the mutations of BRCA 1 and BRCA 2 genes. The other risk factors for breast cancer include obesity, early menarche and late or no child bearing. A change in body's environment may help prevent breast cancer. Regular exercise helps alter the body's hormonal environment and possibly reduces the risk of breast cancer. The risk can also be reduced by limiting alcohol and quitting smoking, besides following a good dietary pattern.

Cancer is a group of many related diseases. All form of cancer involve out of control growth and spread of abnormal cells. Cancer is classified by the part of the body in which it began and by its appearance under a microscope. Different types of cancers vary in their rates of growth, patterns of spread and responses to different type of treatment. The risk of developing most types of cancers can be reduced by changes in a person's lifestyle e.g. by quitting smoking or eating a better diet. Cancer seems to arise from the effects of two different kinds of carcinogens. One of these categories comprises agents that damage genes involved in controlling cell proliferation and migration. Cancer arises when a single cell accumulates a number of these mutations, usually over many years, and finally escapes from most restraints on proliferation. The mutations allow the cell and its descendants to develop additional alterations and to accumulate in increasingly large numbers, forming a tumor that consists mostly of these abnormal cells. Another category includes agents that do not damage genes but instead selectively enhance the growth of tumor cells or their precursors. The primary danger of malignancies is that they can metastasize, allowing some of their cells to migrate and thus carry the disease to other parts of the body. Finally, the illness can reach and dis-

rupt one of the body's vital organs.

Prevention and Risk Factors

A risk factor is anything that increases a person's chance of developing a disease such as cancer. Different cancers have different risk factors, for example, smoking is a risk factor for cancers of the lungs, mouth, throat, larynx, bladder and several other organs. It is important to remember, however, that these factors increase a person's risk, but do not always cause the disease. Unprotected exposure to strong sunlight is a risk factor for skin cancer. Cancer risks can be reduced by limiting consumption of alcoholic beverages, quitting smoking and an overall dietary pattern, that includes a high proportion of plant foods, limited amount of meat, dairy and other high fat foods and a balance of caloric intake and physical activity.

Around the world, different cancers are common in different countries:

Breast cancer is much less common in the developing countries as compared to the developed ones. Its incidence is highest in the U.S.

The U.S. leads the world in the incidence of colon cancer because of its low fiber diet. The cancer of the esophagus is the leading killer in some parts of China. Japan has a high incidence of atrophic gastritis and stomach cancer, as does Chile.

Cancer poses great problems for India, as for any other country. On an average, one out of 13 to 16 males and one out of 10 to 13 females in India will get cancer during their life time (0 to 64) years. Among males in India, the leading cancers are of the lung, oesophagus, stomach, oral cavity (mainly buccal mucosa and tongue), pharynx, larynx, prostate and rectum. The common cancers among women in India are of the cervix, uteri, breast, ovary, mouth, oesophagus and stomach. Although the cancer of the cervix uteri is the leading cancer among all women, but

breast cancer is fast becoming the number one cancer among women in urban India.

Breast cancer, a common cancer in women, is a disease in which cancer (malignant) cells are found in the tissues of the breast. Each breast has 15-20 sections called lobes, which have many smaller sections called lobules. The lobes and lobules are connected by thin tubes called ducts. The most common type of breast cancer is ductile cancer. It is found in the cells of the ducts. Cancer that begins in the lobes or lobules is called lobular carcinoma. Lobular carcinoma is more often found in both breasts than other types of breast cancer. Inflammatory breast cancer is an uncommon type of breast cancer. In this disease, the breast is warm, red, and swollen.

Recently two genes, BRCA1 and BRCA2 have been implicated in a familial type of breast cancer. A number of other predisposing factors have been identified including obesity, early menarche, and delayed or absent child bearing. Breast cancer may occur in men as well as women, but is much more common in women.

The risk increases exponentially after age 30. The average age of women diagnosed with breast cancer is 60 years. In general, the rate of breast cancer is lower in underdeveloped countries and higher in more affluent countries (with the exception of Japan where the rate is quite low).

Other risk factors include having a family history of breast cancer, particularly in mother or siblings; a past medical history of breast cancer, ovarian cancer, uterine cancer, or colon cancer; early menarche (start of menstruation before age 12) and/or late menopause (after age 55); no pregnancies or a first pregnancy after age 30; and radiation exposure.

A person's diet may affect the chances of getting some types of cancer. Breast cancer appears to be more likely to develop in women whose diet is very high in fat. Older women who are overweight also seem to have a greater risk. Some scientists believe that a low-fat diet, eating well-balanced meals with plenty of fruits and vegetables, and maintaining ideal weight can lower a woman's risk.

Breast cancer is considered a multi-factorial disease and many of these factors are still as yet, unknown. Therefore, there are no sure ways to prevent breast cancer. An attempt can be done

to reduce the risk. The following phases are involved:

- Risk factor
- Risk assessment
- Life style changes
- Environmental factors
- Medical treatment

Risk Factor

A risk factor is anything that increases a person's chance of getting a disease. Different cancers have different risk factors, e.g., unprotected exposure to strong sunlight is a risk factor for skin cancer, and smoking is a risk factor for cancers of lung, mouth, larynx, bladder, kidney and several other organs.

Risk factors that cannot be changed for breast cancer:

Gender: For breast cancer, simply being a woman is the main risk factor. Breast cancer can affect men, but this disease is about 100 times more common among women than men.

Aging: A woman's risk of developing breast cancer increases with age. About 77% of women with breast cancer are over age 50 at the time of diagnosis.

Genetic Risk Factors: Recent studies have shown that 5 to 10% of breast cancer are hereditary and result from mutations (changes) of the BRCA 1 and BRCA 2 genes. Normally, these genes help to prevent breast cancer by making proteins that keep cells from growing abnormally. However, if a person has inherited a mutated gene from either parent, this cancer preventing protein is less effective and chances of developing cancer increase.

Mutations of the p53 tumor suppressor genes can also increase a woman's risk of developing breast cancer as well as leukemia, brain tumors and sarcomas (cancer of bones or connective tissue).

Risk Assessment: Risk assessment represents the first step in taking control of personal health. For breast cancer, the level of risk is different for everyone, but there is not yet a "no risk category". Among the many factors, that influence risk, age and family medical history of breast cancer have a significant impact.

Levels of Risk

High Risk: Someone with at least three or

more first or second-degree relatives (first degree is a mother or sister, second degree is a cousin) with breast cancer or ovarian cancer, particularly if the onset of breast cancer was before menopause.

Moderate Risk: Someone with one or two relatives with breast cancer or ovarian cancer.

Average Risk: Someone with no family history of breast or ovarian cancer.

Life Style Changes

Breast cancer is a biological process, which results, in part, from powerful but subtle effects of hormones. Therefore, a small change in the body's environment may help prevent breast cancer. Exercising regularly helps alter the body's hormonal environment and possibly reduces the risk of breast cancer.

Environmental Factors

Environmental carcinogens are substances in the environment that may cause or promote the growth of cancer; e.g., sunlight (skin cancer), asbestos (lung cancer). Breast cancer is considered a multi-factorial disease and therefore, may be influenced by the environment. The effects of most environmental carcinogens are likely to be subtle and inter connected.

Medical Treatments

If the possibility of breast cancer has been suggested by screening tests or by a woman's symptoms, the physician will use one or more methods to be certain that the disease is present and to determine the stage of the cancer.

The first step is a complete medical history and physical examination. Personal and family medical history will provide information about symptoms and risk factors for breast cancer and benign breast conditions. In addition to the medical history and physical examination, imaging tests and biopsies may be done.

Imaging Tests for Breast Disease Diagnosis

Diagnostic Mammography: Diagnostic mammography is an X-ray examination of the breast of a woman who has a breast problem (e.g., a breast mass, nipple discharge etc.).

Breast Ultra Sound: Ultra sound also known as sonography uses high frequency sound waves

to outline a part of the body. Breast ultra sound is used to evaluate breast abnormalities that are found during mammography or physical examination. Ultra sound is useful for some breast masses, and is the easiest way to tell if a cyst is present without placing a needle into it to draw out fluid.

Nipple Discharge Examination: If there is a nipple discharge, some of the fluid may be collected and examined under a microscope to see if any cancer cells are present.

Biopsy: A biopsy may be done when mammography, ultrasound or physical examination finds something unusual. In biopsy, a tissue cell is examined under a microscope. A biopsy is the only way to tell if cancer is really present.

Stages of Breast Cancer

Carcinoma in Situ: About 15 to 20% of breast cancers are very early cancers. They are sometimes called carcinoma in situ. There are two types of breast cancer in situ. One type is Ductal carcinoma in situ (DCIS, also known as intraductal carcinoma); the other type is Lobular carcinoma in situ (LCIS).

Stage I: The cancer is about 1 inch and has not spread outside the breast.

Stage II: (a) The cancer is about 1 inch but has spread to the lymph nodes under the arm (the axillary lymph nodes).

(b) The cancer is between 1 to 2 inches and may or may not have spread to the lymph nodes under the arm.

(c) The cancer is larger than two inches and has not spread to the lymph nodes under the arms.

Stage III: It is divided into stage IIIA and IIIB.

Stage IIIA: The cancer is larger than 2 inches and has spread to the lymph nodes under the arm.

Stage IIIB: (a) The cancer has spread to tissues near the breast (skin or chest wall, including the ribs and the muscles in the chest).

(b) The cancer has spread to lymph nodes inside the chest wall along the breastbone.

Stage IV: The cancer has spread to other organs of the body, most often the bones, lungs, liver or brain. Or the tumor has spread locally to the skin and lymph nodes inside the neck, near the collarbone.

Inflammatory Breast Cancer: This type of

cancer is rare. The breast looks as if it is inflamed because of its red appearance and warmth. The skin may show signs of ridges and wheels or it may have a pitted appearance.

REFERENCES

- Anatomy of the Breast (date unknown: searched, March 1997). Beth Israel Health Care System, New York. (Online available): <http://www.wp.com/bicbs/html#TOP> or through their site at: <http://bimc.edu/netscape2/guides.html>.
- Baum, M.: *Breast cancer – The Facts*. Edward Arnold (Publishers) Ltd., London (1988).
- Baum, M., Saunders, C., Meridith, S.: *Breast cancer*. Edward Arnold (Publishers) Ltd., London (1994).
- Bishop, D.T. and Gardner, E.I.: Analysis of the genetic predisposition of cancer in individual pedigrees. In: *Cancer Incidence in Defined Populations*. J. Cairns, J.L. Lyon and M. Skolnick (Eds.), pp. 389-406. Banbury Report 4. Cold Spring Harbor Laboratory Press. Cold Spring Harbor (1980).
- Breast Cancer: (date unknown) Online available at <http://health.yaboo.com/health>.
- British Medical Bulletin. Genetics of malignant disease. B.A.J. Ponder (Sc, Editor). Oxford University Press, Oxford (1990).
- Hodgson, S.V. and Maher, E.R.: *A Practical Guide to Human Cancer Genetics*. Blackwell Scientific Publications, Edinburgh, Oxford (1989).
- King, M.C., Cannon, L.A., Barley-Wilson, J.E., et al.: Genetic analysis of human breast cancer: Literature review and description of family data in workshop. *Genet. Epidemiol.*, **3** (Suppl. 1): 3-13 (1986).
- Lynch, H.T. and Krush, A.J.: Carcinoma of the breast and ovary in three families. *Surg. Gynecol. Obstet.*, **133**: 644-648 (1971).
- Lynch, H.T. and Watson, P.: Mammography and hereditary breast cancer. *Breast cancer. Rest Treat.*, **15**: 63-71 (1990).
- Ottman, R., King, M.C., Pike, M.C. et al.: Practical guide for estimating risk for familial breast cancer. *Lancet*, **ii**: 556-558 (1983).
- Petrakis, N.L.: Genetic factors in the aetiology of breast cancer. *Cancer*, **39**: 2709-15 (1977).
- Smeltzer, S.C. and Bare, B.G.: Brunner and Suddarth's textbook of medical surgical nursing. 7th ed. Unit 11, Chapter 46, p. 1291. J.B. Lippincott Co., Philadelphia (1992).
- Williams, W.R. and Anderson, D.E.: Genetic epidemiology of breast cancer. Segregation analysis of 200 Danish pedigrees. *Genet. Epidemiol.*, **1**: 7-20 (1984).