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Review Article

Role of Diet and Lifestyle in women with Breast Cancer

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Abstract

Breast cancer is the second most common type of cancer across the globe causing higher numbers of mortality. There are both modifiable and non modifiable risk factors associated with its occurrence. It is curable if diagnosed at an early stage.

Present review article was shown with analysis and comparison of methodology and results of six researches conducted. It is found that being physically active and doing regular exercise helped in reducing the risk of breast cancer. Similarly, a healthy diet also plays an equally important role in reducing the chances of developing breast cancer.

All the researches and studies presented have epidemiological evidence about how a healthy lifestyle, physical fitness and exercise and diet can affect breast cancer and post treatment life as well. Therefore it can be concluded that no matter due to which reason breast cancer is caused, risk can be reduced by following a healthy lifestyle and maintaining an ideal body weight.

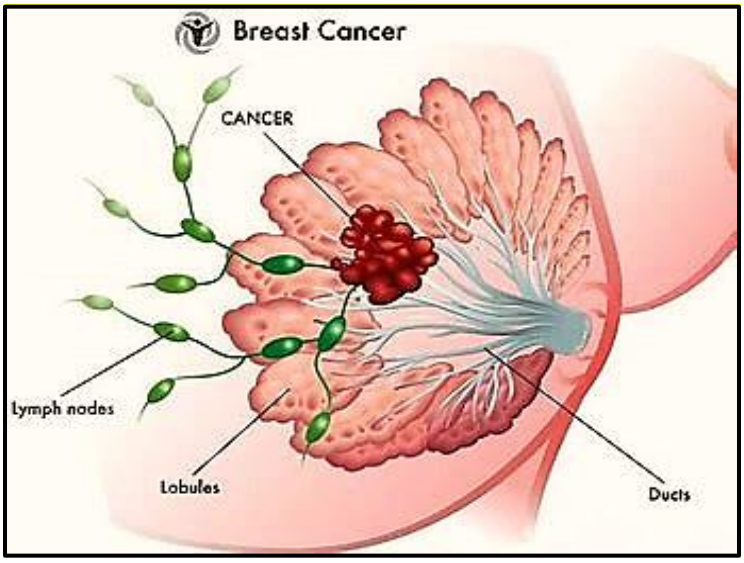
Keywords

Breast cancer, stages, modifiable risk factors, diet, exercise, lifestyle

Introduction

Cancer covers a broad spectrum of diseases that have one characteristic in common i.e. uncontrolled growth that engulf healthy cells also. Metastatic tumor in Breast tissues is identified as Breast Cancer[1].

Breast cancer initially affects the epithelium lining of the duct that converts into gross metastasis and causes death[2].



Prevalence of deaths due to breast cancer was 6,85,000 out of 2.3 million diagnosed cases at the end of 2020. It is the world's most prevalent type of cancer. Females are more affected than males. Associated risk factors include increasing age, obesity, alcoholism, family history, exposure to radiation or postmenopausal hormonal treatment[3].

Stages

Breast cancer has been divided under following stages -

1. Stage 0: This stage also known as DCIS, is a type of non invasive as the abnormal tumor is located just in the lining of the milk duct
2. Stage 1: In this although the cancer is evident still the tumor is contained to the area only from where it was started. it is also highly survivable just like stage 0
3. Stage 2: In this stage, growth of tumor extends to nearby lymph nodes. Treatment includes chemotherapy followed with surgery and radiation therapy

4. Stage 3: In this stage, the tumor extends beyond the region of origin to the nearby lymph nodes and muscles, but distant organs are still safe
5. Stage 4: In this stage, the cancer has been spread to the distant organs also such as brain, liver, bones etc[4]

Diagnosis of breast cancer

1. Mammogram
2. Ultrasound
3. MRI
4. Biopsy
5. Lab tests: The two most common lab tests are the hormone receptor test and the HER2 test

Treatment

Success rate of treatment of breast cancer depends primarily on the early diagnosis. Treatment generally consists of surgery and radiation therapy for control of the disease in the breast, lymph nodes and surrounding areas and systemic therapy (anti-cancer medicines given by mouth or intravenously) to treat and/or reduce the risk of the cancer spreading. Anti-cancer medicines include endocrine (hormone) therapy, chemotherapy and in some cases targeted therapy (antibodies). In the past, all breast cancers were treated surgically by mastectomy.

Role of diet, physical activity & wellness before, during and after the treatment -

It is found in many researches that more active females feel better. Strength and energy filling activities like walking, yoga, swimming etc. should be encouraged as exercises are known to relieve symptoms of nausea, pain and stress.

Research has shown that side effects of disease and its treatment as well as recurrence has been reduced by yoga. Speedy recovery is seen in patients who did exercises between 150-320 minutes per week.

However, no single food can prevent breast cancer, but a combination of food choices can bring a difference. Although there are many uncontrollable factors like genetics and age, diet and lifestyle are controllable factors[5].

Favourable foods

Cancer cells respond well towards certain kinds of foods like fruits and vegetables, fibre rich cereals and pulses, low fat dairy products, soya based products, spices and anti inflammatory and antioxidant rich foods.

High fibre foods keep away oestrogen to interact with cancer cells by making bonds with this and elimination of excess oestrogen. Besides being rich in fibre as well as in antioxidants, fruits, vegetables, whole grains and legumes help reduce free radicals in the body.

Although high fat foods are known to increase the occurrence of breast cancer, but some fats are good that are basically polyunsaturated and monounsaturated found in dry fruits (almonds, avocado, nuts, seeds, olive, egg white, flaxseeds, yogurt and cold water fishes etc.) help reduce the risk of breast cancer.

Soy is another healthy food known to reduce the risk of breast cancer. It is rich in protein, healthy fat and many protective nutrients. It is isoflavones in abundance and it is observed that a higher dietary intake of isoflavone was associated with reduced all-cause mortality.

Soy is found to reduce low-density lipoprotein (LDL), consequently risk of heart diseases is also reduced. Soy is present in various traditional fermented foods like tofu, tempeh (fermented soy product), soy milk, soy nuts and whole soyabean.

Vitamin D rich foods & exposure to sunlight protect against breast cancer. Antioxidant rich green tea is also known to increase immunity and protect against breast cancer. Turmeric is also known to limit the growth of tumours due to its antiinflammatory properties[6].

Unfavourable Foods

Regular alcohol consumption is known to increase risk of breast cancer as it increases levels of oestrogen and causes damage to DNA.

Fat obtained from processed foods increases the risk of breast cancer, especially trans fats like fried foods, doughnuts, cookies or pastries.

Red meat cooked at high temperatures can trigger the release of toxins. Besides this, processed meats and cold cuts are usually high in salt and preservatives[7].

Exercise

As it is evident from various studies that obesity is one of the risk factors for breast cancer and exercise is beneficial to achieve and maintain ideal body weight. According to the report published by The National Cancer Institute, exercise for 4 hours weekly significantly lowered the risk of breast cancer. It was documented in a roundtable (American College of Sports Medicine in 2010) that physical functioning improved and cancer related fatigue relieved from exercise. Sleep is also improved from exercise. It is also beneficial for mental health. Improvement in mobility and physical strength in postoperative patients has been seen after physiotherapy. Patients were found to have a better quality of life who was physically active postoperatively[8].

Positive impact of exercises in breast cancer patients

1. Maintain body weight
2. Exercise is helpful in the reduction of oestrogen levels
3. Immune system is improved from exercises.
4. Exercise are stress relievers and good for mental health and to maintain a positivity in life

After going through the comprehensive details of breast cancer, it's treatment and role of diet and exercise in breast cancer, some research articles were reviewed and were compared with each other in a tabular manner for better understanding and then their results were discussed as follows.

	Article 1	Article 2	Article 3	Article 4	Article 5	Article 6
Publication	Breast Cancer Research (2021) Vol 23	Lipids Health Dis. (2019) 18(1), 161	Breast Cancer Research (2018) 20:81	BMC Cancer (2020) 20(1), 708	BMC Medicine (2021) 19: 81	Breast Cancer Research (2020) 22:5
Topic/ Objective	Adolescent and early adulthood inflammation – associated dietary patterns in relation to premenopausal mammographic density	Vitamin D receptor gene polymorphisms affecting changes in visceral fat, waist circumference and lipid profile in breast cancer survivors supplemented with vitamin D3.	Effect of exercise and/or reduced calorie dietary interventions on breast cancer-related endogenous sex hormones in healthy postmenopausal women	Dietary Approaches to Stop Hypertension (DASH) diets and breast cancer among women: a case control study	Dietary intake of trans fatty acids and breast cancer risk in 9 European countries	Nutrient-wide association study of 92 foods and nutrients and breast cancer risk
Author's names	Nichole A. Garzia et al.	Kazemian et al.	Martijn et al.	Heidari et al.	Matta et al.	Heath et al. 2020

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Method-ology	It was an on-going prospective cohort started in 1989 with 1,16,429 registered female nurses between 25–42 years of age. Questionnaires were given every 2 yearly to collect information on health conditions, family history and lifestyle factors. Digitized analog film mammograms were used to study breast density	168 women who underwent complete treatment were given 4000 IU vit D daily till 12 weeks. Details about demography, anthropometry, biochemical markers, diet, activity and sunlight exposure was measured	Impact of exercise alone, exercise & diet in combination, diet alone was observed on endogenous sex hormones	Impact of 4 types of DASH diet was recorded on questionnaire by interview for general information, medical history, vit D3 supplements.	It was an EPIC study that was a part of an ongoing multicentric cohort on 318707 patients around 35 years of age from 10 European countries. Questionnaire was filled on lifestyle patterns like smoking, alcohol, activity pattern, reproductive health issues	Pathology reports were used to get information about oestrogen and progesterone reception by the tumours. Diet was assessed using standardized country based questionnaires.

Results/ Conclusion	No impact of diet was seen but the greatest attenuation was seen with adjustment for BMI in mammogram test	It was found that hip circumference and trunk fat were significantly reduced after vitamin D3 supplementation although no significant changes were observed in BMI, WC, fat mass, muscle mass and lipid profile.	combination of exercise and reduced calorie showed a remarkable effect on endogenous sex hormones	It was found that Mellen's and Gunther's diet patterns lowered the risk of breast cancer risk in women.	It was found that higher intake of total ITFAs and RFTA both elevated risk of breast cancer	Association of alcohol intake with occurance of breast cancer while fibre in the form of fruits and vegetables was found to have an inverse relationship

Discussion

Article 1

Article 1 presents risk of breast cancer in mid and later adult life. As during adolescence, there is rapid proliferation in the mammary glands and final structure is possessed till the delivery of the 1st child, therefore this period is identified as the critical window for developing future risk for breast cancer. The study aimed to find out if there was any association between dietary pattern during adolescent and early adulthood and premenopausal mammographic density. Two dietary patterns were studied that were associated with inflammation -1. Pro-inflammatory and the Alternative Healthy Eating Index (AHEI). Association was seen between adolescent and early adulthood dietary patterns and premenopausal mammographic density. Mammograms were obtained from 80% women till the age of 54 years.

Proinflammatory pattern was identified as high intake of sweets, soft drinks, refined flour, red meat, margarine etc while antiinflammatory diet consist of fruits & vegetables, fish and coffee. The pro-inflammatory diet was found to cause 35% higher risk of breast cancer, while the AHEI diet had an inverse relationship with breast cancer. Systemic inflammation creates an imbalance in inflammatory markers, causing genomic instability and damage at cellular level. Consequent overexpression is associated with rapid proliferation and tumor formation in the breasts by increasing breast density. Impact of positive association of higher BMI with breast density was observed significantly rather than two types of diet patterns[9].

Article 2

Obesity is a major risk factor for breast cancer as it is characterized by hyperplasia and hypertrophy of adipocytes. It can be controlled by genetics and lifestyle, especially diet. Vitamin D is known to reduce obesity by inhibiting adipogenesis, enhancing fatty acid oxidation and promoting lipid mobilization. It binds with adipogenic genes (the gene that is responsible for weight gain). Therefore, the role of vitamin D on adiposity was studied to find out its indirect effect on breast cancer as obesity is a direct risk factor for breast cancer. Action of vitamin D was studied on adipose tissues to explain the role of vitamin D in cancers

It was a big trial in Tehran on 168 female patients in the age group of 25 - 65 years of age, who had received complete treatment including surgery, chemotherapy and radiotherapy. They were given 4000 IU vitamin D3 for 12 weeks daily. Risk of overdose was nullified by maintaining plasma levels of 25(OH)D in the range of 75 - 110 nmol/l. Data was collected for the patient's background information, anthropometry, activity pattern and plasma markers including lipid profile before and after vitamin D3 supplementation. Sun exposure was also studied by calculating time spent in sunlight with percentage of body surface area exposed. Physical activity was measured by the International Physical Activity Questionnaire (IPAQ). Dietary intake was calculated using 3 day's dietary recall method.

It was found that hip circumference and trunk fat were significantly reduced after vitamin D3 supplementation although no significant changes were observed in BMI, WC, fat mass, muscle mass and lipid profile[10].

Article 3

Present study was planned to aim at identifying modifiable risk factors particularly sedentary lifestyle and overweight and effectiveness of weight control by diet on postmenopausal breast cancer cases. Risk of postmenopausal breast cancer is linked to high amounts of oestrogens and androgens and lower fragments of Sex Hormone Binding Globulin (SHBG) in serum as SHBG reduces harmful fraction of estradiol and testosterone by binding them.

Peripheral fat is the main source of oestrogens and androgens in postmenopausal women by conversion of precursors. Higher ratio of serum sex hormones are seen in overweight/ obese postmenopausal women[11].

Studies were from MEDLINE, Embase and the Cochrane Central Register and data was analysed to see the effect of the following interventions -

1. Exercise
2. Exercise and reduced calorie diet with no intervention
3. Reduced calorie diet
4. Exercise and reduced calorie diet vs. reduced calorie diet alone
5. Exercise and reduced calorie diet vs. exercise
6. Exercise vs. reduced calorie diet, exercise, weight loss, diet, postmenopausal sex hormones

Exercise alone showed very little impact but combination of exercise and reduced calorie showed a remarkable effect on endogenous sex hormones.

Article 4

Diet has been considered as a modifiable risk factor in breast cancer. Impact of a particular dietary pattern was seen in cancer patients. Although “The Dietary Approach to Stop Hypertension (DASH)” is recommended for hypertensive and cardiac patients that includes plenty of fibre in form of fruits and vegetables, whole grains, plant based protein, low-fat dairy products, minimal sugar and salt, but it is also seen to reduce risk of cancer as it is rich in fibre, antioxidants and lesser amount of fat. Therefore present research work was aimed at comparing the impact of 4 types of DASH diet patterns (Mellen, Fung, Dixon, and Gunther) on risk of breast cancer among Iranian women[12].

Samples were selected who were ≥30 years of age with histo-pathologically proven breast cancer with no history of treatment (hormonal therapy) during last 6 months. Questionnaire

was filled with interviews for information, medical history, reproductive history, history of hormonal therapy, vitamin D3 supplementation and dietary pattern. It was found that Mellen's and Gunther's diet patterns lowered the risk of breast cancer risk in women.

Article 5

Trans fatty acids (TFAs) are known to enhance risk of breast cancer. TFAs are found in various types of foods processed at high heat like frying oils, margarine, bakery or meat products. It was an EPIC study that was a part of an ongoing multicentric cohort on 318707 patients around 35 years of age from 10 European countries. Written consent was taken by all participants. Questionnaire was filled with lifestyle patterns like smoking, alcohol, activity pattern, reproductive health issues etc. It was found that higher intake of total ITFAs and RFTA both elevated risk of breast cancer[13].

Article 6

Although there is a lot of research on positive and negative effects of different types of foods on risk association with breast cancer, still there is no unanimous opinion. In the present study, intake of 92 foods and nutrients were evaluated for associated risk of breast cancer using a Nutrient Wide Association Study (NWAS) approach. Pathology reports were used to get information about oestrogen and progesterone reception by the tumours. Diet was assessed using standardized country based questionnaires. The present study confirmed the association of alcohol intake with occurance of breast cancer while fibre in the form of fruits and vegetables was found to have an inverse relationship[14].

Conclusion

Breast cancer is the second most common type of cancer across the globe causing higher numbers of mortality. Even after so much research, there is no definitive cure for cancer. . Genetic risk factors like gender, age, race, obesity, genetic history, reproductive health etc. cannot be changed, but other environmental and lifestyle factors like physical inactivity, overweight, radiation therapies, alcohol etc. are highly modifiable.

As such there is no complete cure available for breast cancer, but it is highly curable if diagnosed at an early stage. It is also very important to engage in a good amount of physical activity and exercise, to avoid the risk of developing breast cancer. There is scientific evidence of how physical fitness exercise helps in preventing breast cancer and also in dealing

with post treatment DALYs. With exercise, disease conditions like obesity can be prevented, which helps to maintain the hormonal levels in the body, thereby reducing the risk factors from causing breast cancer.

Similarly, a healthy diet also plays an equally important role in reducing the chances of developing breast cancer. If a healthy balanced diet is incorporated from an early age itself (adolescence), it can also reduce the risk of developing many lifestyle diseases such as obesity, hypertension, diabetes, atherosclerosis etc.

All the researches and studies presented above have epidemiological evidence about how a healthy lifestyle, physical fitness and exercise, and diet can affect breast cancer and post treatment life also. Therefore it can be inferred that no matter due to which reason breast cancer is caused, preventive measures can be taken to reduce the risk of developing cancer, and if it already persists, then try to reduce the after effects caused by the treatment methods.

Finally patient should be counseled for following modifications -

- Avoid cooking at high heat as it produces undesirable chemicals
- Cooking at low heat for lesser duration should be encouraged like baking, steaming and sautéing etc.
- Anticarcinogenic antioxidant rich foods should be incorporated in daily routine including turmeric and black pepper, fish and broccoli, tomatoes and olive oil, green tea and lemon, blueberries and walnuts, raspberries and dark chocolate

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