

## Lifestyle changes for prevention of breast cancer

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### Abstract

Breast cancer is the second most common cause of death from cancer among women. Lifestyle changes are shown to be important in the prevention of breast cancer. Diet, physical activity, smoking, alcohol use, and vitamin and mineral use are key factors influencing the risk of breast cancer among women. Because these factors are related to each other, it is difficult to assess their individual roles in breast cancer. Some of these factors are alterable, meaning that women can decrease their risk for breast cancer by changing their behavior. Breast cancer is associated with a high rate of mortality and morbidity among women. Therefore, it is logical to try to find ways to decrease the risk of developing breast cancer. Lifestyle changes seem to be an easy, effective, and economical way to help prevention breast cancer. In women with a confirmed breast cancer diagnosis who are under radiotherapy treatment after undergoing a mastectomy, lifestyle changes are still very important. Some factors, such as smoking cessation and prevention of weight gain, may improve the long-term survival chances of these patients. Therefore, ways to increase women's knowledge about the role of lifestyle changes in the prevention of breast cancer and in the survival of patients with diagnosed breast cancer should be considered and studied.

**Keywords:** breast cancer, prevention, lifestyle

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### 1. Introduction

Cancer is a significant cause of mortality and morbidity in the world. Breast cancer is the most common cancer and the second most common cause of death from cancer in women. Breast cancer is an important topic for researchers who are focused on disease prevention. Available screening tests and known risk factors make breast cancer an interesting disease for studies on its prevention. Prevention of breast cancer is possible by changing one's lifestyle. Several important risk factors, which can be altered in the lifestyle of patients, are known to be effective in the prevention of breast cancer.

Many researchers have studied the role of lifestyle change in the prevention of breast cancer. In recent years, several large cohort studies and case control studies with high sample sizes were published. New research has studied the role of lifestyle change in the prevention of breast cancer with more details. It is necessary to review the recent

advances in this field to know where the gaps in knowledge are and to highlight controversies that require more study.

## **2. Discussion**

Lifestyle changes and suitable and on-time screening tests are the most important factors in reducing the rate of breast cancer and in early diagnosis and treatment of breast cancer. Several studies have reported the possible risk factors of breast cancer. Not all of these risk factors are alterable. To prevent breast cancer, it is necessary to know the alterable risk factors and to change them. Studies that have shown important risk factors of breast cancer seem to be adequate and, despite the diversity in the results of studies in different areas of the world, the main risk factors are similar. Although many studies have highlighted the risk factors for breast cancer, few studies have reported strategies for changing these factors. Also, it is unclear whether or not changing these risk factors is enough to decrease the risk of breast cancer. In the other words, studies have mainly focused on identifying the risk factors of breast cancer and recommending altering these behaviors to decrease the risk of breast cancer.

Advantages of alterations of lifestyle are not only limited to women who are just at risk of breast cancer, but also to women who have been diagnosed. Lifestyle change is possible and effective in breast cancer survivors for prevention of recurrence (1). Also, increased survival and improved quality of life have been reported for these women. Fortunately, several recent studies have discussed the role of lifestyle changes in female survivors of breast cancer.

In contrast to studies of healthy women, the results of studies of survivors of breast cancer are more applicable because these studies have often reported the results of their interventions. For example, group-based lifestyle change can be implemented by cancer survivors in order to change the risk factors for poor survival and recurrence (2). The main cause of the fact that stronger reports for the outcomes of lifestyle change are available in women who have survived from breast cancer in comparison to healthy women is that the outcomes can be assessed easier. This is due to the short duration between intervention and outcome. Many risk factors play a role in breast cancer and a large number are related to lifestyle. Therefore, it is impossible to discuss these factors together. Many of these factors interact and may either increase or decrease each other's influence on the risk of breast cancer. Therefore, it seems rational to discuss each factor separately.

### **2.1. Socioeconomic status**

High socioeconomic status is associated with an increased risk of breast cancer (3); several factors play a role in this association. Women with high socioeconomic status make more frequent visits to doctors and have physical examinations, for early diagnosis of breast cancer. Also the lowest number of children increases the risk of breast cancer. The role of socioeconomic status in breast cancer is complex. In some countries, it is shown that women of low socioeconomic status are at a higher risk for diagnosis of breast cancer in the later stages (4, 5). This fact not only confirms inadequate screening in this population, but also means a poorer prognosis in this population at the time of diagnosis. Although women with low socioeconomic status are at a decreased risk of breast cancer, routine screenings for breast cancer are still recommended (5). Women of low socioeconomic status have less access to health care providers in comparison with women with high socioeconomic status in the same area and with the same insurance system (6).

Socioeconomic status changes other factors such as using screening tools, parity, diet, smoking, and alcohol use, which are important factors in the evaluation of the risk of breast cancer in women (3). Therefore, the role of socioeconomic factors in breast cancer is difficult to evaluate independently (7). Individuals with different socioeconomic statuses have some variation in their lifestyles, which changes their risk for breast cancer. Lifestyle changes could be different in women with high and low socioeconomic status. In women with high socioeconomic status, the focus should be on changing dietary habits, smoking cessation, and discontinuation of alcohol consumption. Women with low socioeconomic status may benefit more from regular doctor visits, physical examinations, and screenings for breast cancer.

### **2.2. Geographical variables**

The epidemiological studies in different areas of the world have reported different incidences of breast cancer. The incidence of breast cancer is different even in different areas in the same country. It seems that, in addition to genetic factors, some socioeconomic factors and differences in lifestyle cause variations in the incidence of breast cancer in different areas of the world. North America, Australia/New Zealand, and Western and Northern Europe are

reported to be areas with the highest rates of breast cancer. The rate of breast cancer is lower in Asia and Africa (8, 9). Also, there are variations in mortality rates of breast cancer in different geographical areas (10). The differences in the rate of breast cancer and its mortality are correlated with the development of countries. Therefore, dietary habits, culture, and socioeconomic status are possible explanations for the higher rates in industrial and developed countries. Also, a recent increase in the rate of breast cancer in developing countries confirms this hypothesis.

### **2.3. Height and weight**

The role of body size in the risk of breast cancer is assessed in several studies. Taller women have an increased risk of breast cancer (11, 12). The mechanisms are unclear, but some hormonal factors may be effective. Therefore, tall women should be screened more carefully for breast cancer. In postmenopausal women, high weight is associated with an increase in the risk of breast cancer. This association is more prominent when they do not use hormone therapy. Absence of this association in premenopausal women is in favor of the role of hormones in this association. Obesity is associated with insulin resistance, which seems to be important in assessing the risk of breast cancer. Therefore, hormone therapy in postmenopausal women with a high weight may decrease their risk of breast cancer. Significant weight gain during middle adulthood is associated with an increased risk of breast cancer (13). Some studies have also shown that individuals with a higher weight in premenopausal ages have a lower risk of breast cancer. Studies have controversial results and the mechanisms of this relationship are unclear. Although some studies have shown the beneficial effect of diet and physical activity on weight loss (14), some cohort studies have reported that weight loss and weight gain in women who are diagnosed with breast cancer are associated with limitations in the physical function of women (15). In women with confirmed breast cancer, weight gain is an issue of concern. Several factors such as age, ethnicity, and smoking seem to play a role in this issue (16, 17).

In summary, high height, high weight, and weight gain during middle adulthood are associated with increased risk of breast cancer. However, evidence concerning the role of weight loss in women who are at risk or are diagnosed with breast cancer is inadequate. Therefore, more studies are needed to reach the best intervention in women with high height and high weight.

### **2.4. Physical activity**

Some studies have reported that the risk of breast cancer decreases with increased physical activity (18). Exercise's role in prevention of breast cancer is complicated. The results in premenopausal women are controversial, but, in postmenopausal women, exercise and physical activity decreases the risk for breast cancer by changing the estrogen, insulin, and insulin-like growth factor 1 (IGF-1)(19-21). Women can decrease their risk of breast cancer by engaging in regular exercise. Also, exercise can positively affect other risk factors such as obesity and insulin resistance. It has been shown that post-diagnosis physical activity in women with breast cancer can improve the survival chance of the patients (22, 23). However, it has also been shown that, while the majority of women who are diagnosed with breast cancer will change their diet, they usually do not increase their physical activity (24). It is not clear whether increasing women's knowledge about the role of physical activity in breast cancer will change their level of physical activity or not. A sedentary lifestyle is associated with weight gain and an increased risk of breast cancer. Therefore, physical activity should be recommended to women who are at an increased risk of breast cancer. Women should also be educated about the advantages of physical activity for reducing the risk of breast cancer (25). Physical activity should be recommended to women not only for its role in the prevention of breast cancer, but also for its beneficial roles in managing obesity and insulin resistance. Increasing knowledge may be an effective way to change their physical activity level.

### **2.5. Smoking**

Smoking is an important risk factor for breast cancer. Both active and passive smokers are at an increased risk for breast cancer (26-30). Although other factors of lifestyle and alcohol consumption can alter the relationship between smoking and breast cancer, the evidence is strong enough for a causal relationship between smoking and breast cancer (31). Therefore, smoking is another behavior that can be altered. It is recommended that women stop smoking in order to decrease the risk of breast cancer. Also, smoking increases the chance of other cancers (32) and smoking cessation can decrease the risk of both breast cancer and other cancers.

Women who start smoking at early ages are more susceptible to breast cancer (33). Therefore, teenage girls should be informed of the risk of smoking regarding breast cancer. Parents should also be made aware about this risk. Women who started smoking at early ages should be encouraged to undergo regular screenings for breast cancer. The role of smoking is shown in survivors who have been diagnosed with breast cancer. Women who were smoking

at the time of their diagnosis have weaker outcomes and poorer survival (34, 35). However, it still isn't clear that smoking cessation improves the survival of the women who were smokers at the time of the diagnosis of breast cancer. In female smokers who have undergone a partial mastectomy due to breast cancer, the chance for recurrence is about 6.7 times higher than that of women who have never smoked (36). However, more studies are needed to confirm the role of smoking in the recurrence of breast cancer in women who are undergoing radiation therapy after a partial mastectomy. Smoking and being a passive smoker are some of the most important risk factors for breast cancer and other cancers. It is a risk factor both for breast cancer and its recurrence. Therefore, smoking cessation should be recommended to all women. Enough studies have shown the role of smoking cessation in decreasing the risk of breast cancer, but smoking cessation is difficult and more studies are needed to work on effective strategies of smoking cessation in women who are at risk of breast cancer or who are diagnosed with breast cancer.

## **2.6. Alcohol**

Alcohol consumption is a risk factor for breast cancer; several large studies have shown this association in women (37-39). The risk for breast cancer increases with the amount of alcohol use but is still present with light to moderate alcohol intake (40). The largest cohort study on the relationship between alcohol and breast cancer was done on 105,986 women. Based on the results of this study, small amounts of alcohol use (10 g per day) is associated with a ten percent increase in the risk of breast cancer (41). Similar results were reported in a similar study conducted on 322,000 women. The linear increase in the risk of breast cancer with alcohol consumption is reported in this study (42).

Some studies have reported that folic acid intake attenuates the risk of breast cancer with alcohol consumption (43). More studies are needed about the role of folic acid in prevention of breast cancer in alcoholic women. However, in women who are using alcohol, recommendation to use folic acid is logical. In contrast with smoking, alcohol intake after the diagnosis of breast cancer may not play an important role in survival of the patients (44, 45). However, it is recommended to discontinue alcohol use because the evidence is not enough for a conclusion and because alcohol consumption has other adverse effects on the health (46, 47). Enough evidence is available concerning the risk of breast cancer with alcohol intake. However, more studies are needed to reveal the role of folic acid use and alcohol discontinuation. Therefore, it seems that the recommendation to discontinue alcohol is logical and, in women who are not able to discontinue alcohol, folic acid may be beneficial.

## **2.7. Fat intake**

Fat intake is associated with an increased risk of breast cancer. But there are variations in the results of different studies. Some variables such as amount of fat consumed, reproductive variables, and menopausal age are variables that alter the relationship between fat intake and breast cancer (48-51). Although some cohort studies have reported an increased risk of breast cancer in postmenopausal women with a high fat diet, interventions to reduce fat intake have reported no significant decrease in the risk of breast cancer in healthy postmenopausal women.

The results of studies reporting the role of weight and BMI in the risk of breast cancer are more consistent in comparison to results of studies reporting the role of fat intake in breast cancer. Considering the relationship between fat intake and weight, it seems that the role of weight and BMI is more important than that of fat intake. Although it seems that weight and BMI play a more important role in the risk of breast cancer in comparison to fat intake, there is no difference in the behavior and lifestyle changes that should be recommended to women. Reducing the amount of fat intake reduces the weight and BMI in women, but more studies are needed to show their role in reducing the risk of breast cancer.

## **2.8. Meat, caffeine, minerals, and vitamins**

Some studies have reported an increase in the risk of breast cancer with an increase in the consumption of red meat and caffeine (52-54). The results of studies about caffeine use are inconsistent; some studies reported no association between caffeine consumption and risk of breast cancer (55). It is difficult to assess the role of one specific agent in the risk of breast cancer because of associations between different food materials in different cultures. Breast cancer risk also decreases with an increase in calcium and vitamin D intake (56). This association does not exist with other vitamins and most studies do not support the role of vitamin E and vitamin C in decreasing the risk of breast cancer (57). More studies about the role of vitamins in breast cancer are recommended. There is inadequate evidence about the role of vitamins, minerals, meat, and caffeine in the risk of breast cancer. More research is recommended to increase vitamin intake and restrict meat and caffeine intake.

### **2.9. Breast feeding**

Breastfeeding decreases the risk of breast cancer. Twelve months of breastfeeding is associated with a 4.3 percent decrease in breast cancer risk (58-61). One study in Turkey has reported that shorter durations of breastfeeding can be an important factor that can increase the risk of breast cancer in women. Postmenopausal women who had more than forty-eight months of lactation are at a reduced risk for breast cancer (62). However, there are other factors, such as parity, that can alter the association between lactation and breast cancer. Even so, it seems that the association is strong enough to recommend breastfeeding in women. Also, breastfeeding has other beneficial effects for both mother and infant.

### **2.10. Night shift work**

Night shift work is known to increase the risk of breast cancer by increasing melatonin levels (63, 64). However, the results of different studies are varied (65). Still more evidence is needed to prove an association between night shift work, melatonin, and breast cancer.

### **2.11. Stress**

While the relationship between stress and other psychological factors and the risk of breast cancer is not strong, it seems that major life events do play a role in the risk of breast cancer (66). It is shown that perceived stress can increase the risk of breast cancer when combined with other risky behaviors such as inadequate physical activity, alcohol intake, smoking, low green tea intake, and high meat and seafood intake (67). Therefore, it is more important for individuals who are in high stress situations to consider nutritional changes and physical activity in order to reduce their risk of breast cancer. In individuals with a breast cancer diagnosis, the level of stress may be higher and the effect of this stress and its control on breast cancer risk may be the subject of future studies in this regard. Also, other psychiatric conditions such as depression may play a role. There are few studies available that assess the role of psychiatric disorders on breast cancer risk.

### **2.12. NSAID use**

The role of NSAIDs in the prevention of breast cancer is not strong, but it seems that NSAID use does decrease the rate of breast cancer (68-70). Some observational studies have reported a decrease in the risk of breast cancer in women who are using NSAIDs, but one randomized controlled trial on the role of aspirin use for prevention of breast cancer reported no significant effects on a 10-year follow up in the study population (71). Research findings do not support the role of NSAIDs in the survival of patients with a definite diagnosis of breast cancer (72), and it seems that the benefits of NSAIDs are limited to individuals who have not been diagnosed with breast cancer. However, more studies are needed to investigate the role of NSAIDs in women who are diagnosed with breast cancer. Although some studies have reported the role of NSAIDs in the prevention of breast cancer, different results were reported in women who were diagnosed with breast cancer. Also, NSAIDs have several side effects affecting the gastrointestinal tract, liver, and kidney. Therefore, using NSAIDs is not recommended for the prevention of breast cancer.

### **2.13. Digoxin**

Several researchers have reported an increase in the risk of breast cancer in patients who are using digoxin (73-75). Women should be informed about this risk before starting digoxin (76). Women who are using digoxin should undergo regular screenings for breast cancer since it is often not possible to discontinue digoxin in patients who are candidates for using it. It seems that digoxin use does not change the risk of recurrence in women with breast cancer who are undergoing treatment (77). Therefore, digoxin can be used in women with breast cancer who need digoxin treatment. They should have regular examinations to watch for possible recurrences. Also, all women should be informed of the risk of digoxin use for breast cancer.

### **2.14. Importance of education**

As noted above, several nutritional changes, physical activity, and alcohol and smoking cessation can reduce the risk of breast cancer in women. Therefore, educating women about these factors and their importance in the risk of breast cancer plays an important role in the prevention of breast cancer (78). Some studies have reported that only giving information about lifestyle changes may not be enough to change the behavior of the female students. A consultancy service may be required in order to change the behaviors of the female students (79). However, it is not clear how useful consultancy service could be. Special strategies, such as group-based education, should be applied to increase the efficacy of women's knowledge in changing their behavior. More studies are needed to show the useful strategies in changing women's behavior. Also, it is important to start this education in early adolescence.

**3. Conclusion**

As discussed in this review, lifestyle changes are an important factor for prevention of breast cancer. Such changes include reducing weight, adopting a suitable diet, changing unnecessary drugs, etc. Also, in women who are diagnosed and are under treatment for breast cancer, lifestyle changes can reduce the recurrence rate and increase the chance of survival. Women should be informed about the role of lifestyle changes in the prevention of breast cancer and their role in the survival and recurrence rate in patients with breast cancer. More studies are needed to assess the role of education in lifestyle changes, to decrease the incidence and recurrence of breast cancer, and to increase the survival rate.

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**Conflicts of interest**

The authors of this paper declare that they have no conflicts of interest.

**Authors' contributions:**

All of authors contributed to this project and article equally. All authors read and approved the final manuscript.

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