



Effect of Lifestyle Modifications and Awareness Program as Primary Prevention for Breast Cancer Among Women – A Systematic Review

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(Received: 14 April 2024

Revised: 1 May 2024

Accepted: 18 June 2024)

KEYWORDS

Breast cancer, awareness, prevention, Breast models, physical activity

ABSTRACT:

Women's health plays a crucial role in developing countries like India. Actual scenario showcase that women in India have spectrum of health issues and among which Breast cancer stand out. Breast cancer is a silent and growing health issue that prevails and affects women inevitably. This systematic review aimed to examine the hazards of modifiable risk factors of breast cancer and effectiveness of interventional package on preventive aspects among women. A broader search of articles was conducted using several databases such as PubMed, Scopus, Web of Science, Google scholars, and Proquest. An intense search was done in English language among scholarly publications from several countries with peer reviewed content from January 2019 to January 2024. A total of 40 articles were evaluated and after excluding the articles that did not met the inclusion criteria, 18 articles were analyzed in depth. Four primary themes emerged related to breast cancer and its prevention. The findings emphasized that breast cancer is frequently discovered in advanced stages, early detection is crucial for improving breast cancer outcomes and survival. It's high time to improve the women's awareness by incorporating Information Education and Communication (IEC) packages about breast cancer using Audio Visual Aids and Breast models, improving the physical activity and consuming healthy foods to live healthier and happier.

1. Introduction

Cancer is a disease that starts in any tissue or organ in the human body. Abnormal cells grows irrepressibly exceeding their margins to occupy or extent to the adjacent body parts. Globally, the cancer burden is still rising, placing a great deal of physical, psychological, and financial pressure on people, families, communities, and health systems. Many low- and middle-income

nations' health systems are ill-equipped to handle this load, and many cancer patients worldwide lack access to prompt, high-quality diagnosis and treatment. [1] Global Cancer Observatory (GLOBOCAN) projection for 2020 showed that there were 19.3 million incident cases of cancer worldwide. India ranks third after the United States of America and China in cancer incidence. According to GLOBOCAN's prediction, the number of cancer cases in India is expected to rise to



2.08 million by 2040, representing a 57.5 percent increase from 2020. In Indian females, 2022 report showed that the predicted top five sites of cancer incidence were breast (28.8%), cervix (10.6%), ovary (6.2%), corpus uteri (3.7%) and lung (3.7%).^[2] Real cancer incidence in India is estimated to be 1.5 to three times higher than reported incidence.

^[3] The Top 5 Leading Sites of Cancer in Pondicherry Union Territory Regional Cancer center were Cervix Uteri, Breast, Mouth, Ovary and Stomach among women^[4] Breast cancer is the most prevalent cancer diagnosed in women and the primary cause of cancer-related deaths. In the vast majority of the countries (157 out of 185), breast cancer is the most frequent malignancy among women. 20 million new instances of cancer and 9.7 million deaths from the disease were predicted in 2022. One among five persons may have cancer in their lifetime, among them one in nine men and one in twelve women may die out of the condition.

^[5] Several clinical and epidemiological research findings unequivocally demonstrate how lifestyle choices affect the onset and prophylaxis of cancer. A poor diet, primarily consisting of processed foods and saturated fats, leading to weight gain, together with sedentary lifestyles, alcohol use, and smoking, has raised the prevalence of breast cancer. Adopting prevention strategies, particularly the use of healthy lifestyles, such as maintaining a healthy weight, adhering to a healthy diet, exercising regularly, abstaining from alcohol, smoking, and sun exposure, as well as vitamin D supplementation, could be one way to combat the growing spread of breast cancer. These changeable risk variables are linked to this illness and influence its onset, course, and severity.^[6] The research evidences and American Cancer society guidelines proposes that encouraging the women to indulge in physical activity regularly, maintaining ideal weight, educating about breast cancer, encouraging for screening tests, consuming nutritious foods, adequate sleep, reducing the level of stress can prevent them from breast cancer by 30%.^[7] In conclusion, the increasing occurrence of breast cancer has led to a huge impact on the women's health and ultimately affecting the health status of the country. The health care professionals play a vital role in addressing this issue. It is imperative to launch widespread awareness programs that prioritize effective preventive strategies and enable

greater screening coverage as the first line of defense against this growing problem.

PICOT Question

In women, what is the effect of lifestyle modifications and awareness programs compared with standard practices on prevention of breast cancer during their lifetime?

Methods

This study serves as a scoping review, giving a general overview of the developed strategy. The following six steps made up this approach, each of which was taken from the framework developed by Arksey and O'Malley (2005)^[8]: deciding on the research question; determining which studies are relevant to the query; deciding which study to carry out; recording the information; gathering, compiling, and disseminating the results; and communicating with the stakeholders.

Search strategy

The search approach was developed using four step strategies that systematically identified relevant literature and studies from January 2019 to January 2024. Preliminary searches were conducted on several databases including the PubMed, Scopus, Web of Science, Google scholars, and Proquest. Studies published in English were considered. Peer review articles from the selected database were included. Reference lists of included studies were overviewed for additional relevant literature as a final step. Duplicate studies were removed. Two reviewers independently extracted data from eligible studies onto a customized data extraction form and populated it with variables about the study population and phenomena of interest. The other three authors double-checked and verified extracted articles. Specific study details were captured, including the Author /s name, setting of the study (country), aim of the study, design, sample, Instrument and results/ conclusion. The keywords used to search the studies were modifiable risk factors of breast cancer, awareness on breast cancer, physical activity and breast cancer, nutrition and breast cancer.

Inclusion criteria for selected articles

- International and National open access articles published in peer review journals



- Article and thesis published from January 2019 to January 2024
- Review articles and Quantitative Studies pertaining to awareness, risk factors and nutrition about breast cancer among pre-menopausal healthy women

Exclusion criteria for selected articles

- Qualitative Studies
- Studies involving only post-menopausal women
- Studies involving breast cancer patients
- Studies involving cancer drugs and its treatment sequelae for breast cancer

Quality evaluation of the selected articles

Extraction of data followed by tabulation of data was done. The collected data has been checked for its quality using the rating method developed by Hawker et al (2002).^[9] Each study was analyzed for its components such as abstract, introduction / aim, research methodology which includes instrument, sampling method / technique, data analysis & ethical considerations), results and implications. A score of 5 was given for each component and the total score was 45 (5*9 components). A score higher than 40 were considered good and it was included for the review [Table 1]

Search Results

Modifiable risk factors of breast cancer

Research studies have showed various modifiable risk factors of breast cancer. Burch et al. (2024) found that patients with sleep disorders are more likely to be diagnosed with prostate cancer, colorectal cancer and breast cancer and authors suggested that sleep disturbance is a risk factor for cancer.^[10] Chowdhry et al. (2023) reported that the most often reported risk factor of breast cancer was an elevated body mass index (BMI), physical inactivity (24%) and alcohol intake (16%).^[11] Sinclair J et al.(2019) stated that only 19% identified alcohol consumption as a modifiable risk factor and there were poor levels of alcohol health literacy among women and health care staffs.^[12] In addition to that Fentie H et al. (2023) highlighted that women with older age group, breastfeeding for shorter duration, following sedentary lifestyle and previous history of chest radiation were additional risk factors

and Interventions should aim at breastfeeding guidance and physical activity promotion.^[13]

Awareness on breast cancer and practice of screening methods for prevention

Various studies reported that women's awareness about breast cancer and practice regarding Breast self-examination was very low. Abdul Rahman SA et al. (2023) pointed that women's awareness about breast cancer risk factors was inadequate and factors like smoking, marital status and family history of cancer were significantly correlated with awareness level.^[14] Shoukat and Shah (2023) stated that women lacked knowledge about breast carcinoma, screening methods and mammography. More than 50% had no idea about modifiable risk factors of breast cancer.

^[15] Zhu L et al (2024) highlighted that awareness about breast cancer and risk factors were 68% and 62% respectively.^[16] The previous findings was supported by Uruntie RO et al (2024) by stating that only 51.3% were aware of Breast self-Examination (BSE) and educational intervention was effective in increasing the posttest level of knowledge, attitude and practice about BSE.

^[17] In contrast Maitanmi JO et al. (2023) found that 78.12% were aware of breast cancer and 96.9% had adequate knowledge but practice about BSE was extremely low. The authors also stated that adequate knowledge and positive attitude should not be assumed for practice readiness.

^[18] With regard to screening practices of breast cancer Mohan R and Thulaseedharan JV (2023) reported that nearly 73% were practicing BSE and only 25% underwent Clinical Breast Examination (CBE) screening and they also reiterated to educate the importance of BSE and CBE especially to marginalized women.

^[19] Though Alnaqrani F et al. (2024) stated that 71% of women had good knowledge, they found few knowledge gaps about the association between obesity, long term use of hormonal contraceptives and advancing age.

^[20] Archana, Srikanth, Arthi (2019) informed that only very few knew about BSE and nobody was aware of



proper steps of BSE and reiterated need for educating women about BSE. [21]

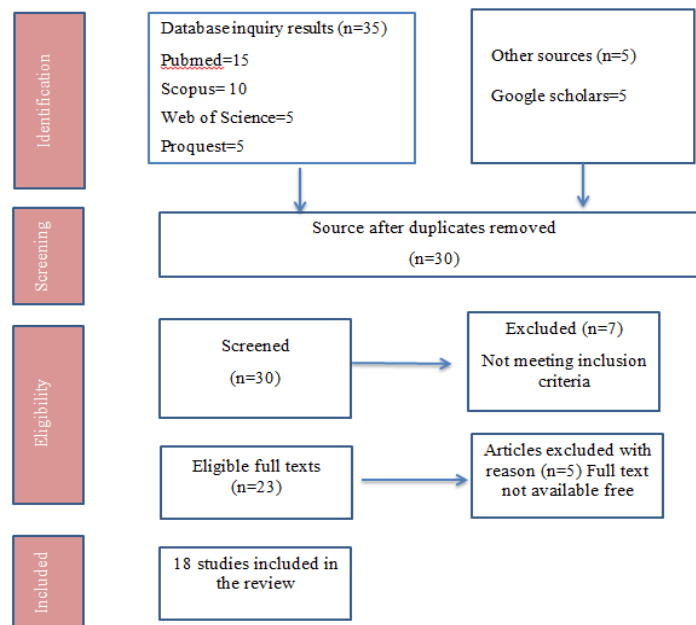


Figure 1: Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) Flowchart Diagram of included studies adopted from (Moher et al., 2009) [29]

Physical activity and breast cancer prevention

Jurdana M (2021) highlighted the relationship between physical activity and risk of cancer. The review stated that physical activity reduces systemic inflammation, hyperinsulinemia, insulin-like growth factor (IGF-I), sex hormones, pro-inflammatory leptin and other obesity-related cytokines, and a marked increase in anti-inflammatory adiponectin levels. There was compelling evidence that moderate-to-intense physical activity guards against breast and colon cancer. [22] It was supported by Boraka Ö et al (2022) that physical activity >1 h daily walking/week reduced 23% of breast cancer risk. [23] Timmins IR et al. (2023) supported the previous authors by mentioning that leisure time physical activity reduced breast cancer risk among premenopausal women by 6% and 10% reduction in risk if BMI is maintained. [24] Guo W (2020) reinforced that leisure time physical activity decreased 21% of breast cancer risk among premenopausal women and 16% among postmenopausal women. [25]

Nutrition and Breast Cancer prevention

Researchers suggest that eating more whole grains, pulses, vegetables and fruits could improve the survival rate following breast cancer but 90% of women live only for 5 years after diagnosis. There are also evidences that healthy diet patterns have a decreased risk of breast cancer. [26] Sasanfar B et al. (2022) found that women had inadequate knowledge about nutrients, healthy methods of cooking and food pyramids. They also showed poor attitude and low practice of consuming food that prevents cancer before intervention. Nutritional educational package changed the women's KAP and it was suggested as a cost effective tool for promotion of women's health. [27] Varkanesh HK et al (2020) found that comprehensive healthy diet rich in fruits, vegetables, whole grains, dairy products, unsaturated fatty foods are strongly correlated with breast cancer reduction. [28]

**Table 1:** Evaluation of studies' quality scoring system tool developed by Hawker *et al.* (2002).

Author/s	Author/s	Abstract	Intro & Aim	Instrument	Sampling	Data analysis	Ethics	Results	Implications	Total score (45)	Rating
Burch JB et al.(2024) ^[10]	5	5	5	4	5	5	5	5	5	44	Good
Chowdhry D et al.(2023) ^[11]	5	5	5	5	4	5	5	5	5	44	Good
Sinclair J et al.(2019) ^[12]	5	5	5	5	4	5	5	5	5	44	Good
Fentie H (2023) ^[13]	5	5	5	5	5	5	5	4	5	44	Good
Abdul Rahman SA et al.(2023) ^[14]	5	5	5	5	5	5	5	5	5	45	Good
Shoukat Z, Shah AJ.(2023) ^[15]	5	5	5	5	5	5	5	5	5	45	Good
Zhu L et al.(2024) ^[16]	5	5	5	5	4	5	5	4	5	43	Good
Uruntie RO et al.(2024) ^[17]	5	5	5	5	5	5	5	5	5	45	Good
Maitanmi JO et al.(2023) ^[18]	5	5	5	5	5	5	5	5	5	45	Good
Mohan R, Thulaseedharan JV.(2023) ^[19]	5	5	5	5	5	5	5	5	5	45	Good
Alnaqrani F et al.(2024) ^[20]	5	5	5	4	5	5	4	5	5	43	Good
Archana, Srikanth,Arthi. (2019) ^[21]	5	5	4	5	5	5	4	5	5	43	Good
Jurdana M.(2021) ^[22]	5	5	5	5	5	5	5	5	5	45	Good
Boraka Ö et al.(2022) ^[23]	5	5	5	3	3	5	5	5	5	41	Good
Timmis et al.(2023) ^[24]	5	5	5	4	3	5	5	5	5	42	Good



Guo W et al.(2020) [25]	5	5	4	5	5	5	4	5	5	43	Good
Sasanfar B et al.(2022) [27]	5	5	5	5	5	5	5	5	5	45	Good
Varkanesh HK et al.(2020) [28]	5	5	5	5	5	5	5	4	4	43	Good

Discussion

In the present review, it was found that women have various modifiable risk factors related to breast cancer. They were sleep disorders, increased Body Mass Image (BMI), lack of physical inactivity, consuming alcohol, active/ passive smoking, prolonged exposure to hormonal contraceptives, sun exposure, breastfeeding for shorter duration and previous exposure to chest therapy. [10,11,12,13] The level of awareness about breast cancer was inadequate and the screening practices were also low. [14,15,16,21] It also highlighted that physical inactivity leads to increased risk of breast cancer. Consuming nutritious foods especially fruits, vegetables, whole grains, unsaturated fatty acids are strongly associated with decrease in breast cancer occurrence. [24,25,27,28] The authors in the review found gaps related to breast cancer prevention. The first gap was that the awareness about breast cancer and its risk factors was identified but incorporating an educational package for them was done only in few studies. Majority of the studies insisted to educate but was not provided. Second gap was with physical activity and nutrition, studies have identified about physical inactivity and nutritious food habits and its link with breast cancer among women but very few studies only involved them in exercises like walking and taught them about consuming healthy diet in case of primary prevention. The interventional packages like Information Education and Communication (IEC), physical activity and healthy foods can be incorporated to women to increase their lifespan and overcome the burden of breast cancer.

Limitations

It focused only on healthy women (controls) without breast cancer. This review concentrated on premenopausal women for primary prevention of breast cancer.

Conclusion

It was concluded by various authors that women's awareness about breast cancer risk factors, symptoms and treatment modalities was suboptimal especially about the screening practices like Breast Self-Examination and Clinical Breast Examination. In contrast, there are studies which states women's awareness is adequate with poor regular practice of BSE. Despite the fact that women are aware of breast cancer, its early diagnosis, and screening technologies there exists a big gap that has to be addressed in terms of its application. The reluctance towards the practice of BSE/ CBE were shyness, lack of time, women feel that they are not having any risk factors, lack of privacy to perform, fear of finding abnormalities in breast and not convinced about the significance of breast screening. Because breast cancer is frequently discovered in advanced stages, early detection is crucial for improving breast cancer outcomes and survival. Ascertaining the fact that breast cancer is wide spread in the country, lower knowledge may lead to delay in treatment seeking among the women. It's high time to improve the women's awareness by incorporating Information Education and Communication (IEC) packages about breast cancer using AV Aids and Breast models. Improving the physical activity especially involving in 150-300 minutes of moderate intensity or 75-150 minutes of vigorous intensity each week and consuming healthy foods that contain rainbow coloured fruits, vegetables, fibers are helpful to live healthier and happier.

Ethical approval

Institutional review board approval is not required

Declaration of patient consent

Patient's consent is not required as there are no patients involved in the present study.

**Financial support and sponsorship**

Nil

Conflicts of interest

There are no conflicts of interest

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Author/s	Country	Aim	Design	Sample size	Instrument	Results / Conclusion
Burch JB, Delage AF, Zhang H, McLain AC, Ray MA, Miller A, Adams SA, Hébert JR ^[10]	United States	To assess the sleep disorders and cancer incidence : examining duration and severity of diagnosis	Retrospective cohort study	663,869 patients	Veterans Administration (VA) electronic medical record system	Of the 56,055 eligible patients, sleep apnea (46%) and insomnia (40%) were the most common diagnoses for sleep disorders. 18,181 cancer cases (41% prostate, 12% colorectal, 1% female breast, and 46% other) were diagnosed. The results suggest that sleep disturbance is a risk factor for cancer.



Chowdhry DN, Miles RC, Escamilla Guevara A, Flores EJ, Narayan AK ^[11]	United States	To assess the prevalence of modifiable risk factors of breast cancer	cross-sectional	4989 women	National Health Interview Survey	At least one modifiable risk factor was reported by 79%. The most often reported risk factor was an elevated body mass index (BMI), physical inactivity (24%) and alcohol intake (16%).
Sinclair J, McCann M, Sheldon E, Gordon I, Brierley-Jones L, Copson E ^[12]	south central – hampshire	To explore the level of knowledge and attitude towards alcohol as a breast cancer modifiable risk factor and potential challenges faced for prevention	Mixed method	205 women	Quantitative- survey approach Qualitative- Focus group sessions for women and semi structured interviews for health care professionals	19.5% identified alcohol as a risk factor for breast cancer. Qualitative data revealed concerns about how to have non-stigmatizing conversations regarding alcohol consumption and breast cancer risk factors with both women and staff. There were poor levels of numeracy and alcohol health literacy.
Fentie H, Ntenda PAM, Tiruneh FN ^[13]	Northwest Ethiopia	To evaluate the relationship between dietary patterns, socioeconomic and behavior factors associated with breast cancer	case-control study	260 women	Standard Questionnaire	The results showed that women with older age group and who breast fed for shorter duration, sedentary lifestyle have 10.53 times significantly higher risk and previous history of chest radiation have more chance for breast cancer.
Abdul Rahman SA, Kherbek H, Ismail S, Abdul Rahman A, Zahlout J, Abboud I, et al ^[14]	Syrian Coast	To assess the awareness regarding breast cancer risk factors among females	Online Cross sectional study	1305 females	Modified Cancer Research UK questionnaire	Findings indicated a strong relationship between marital status, smoking, family history of cancer and breast cancer awareness. These findings may aid in the execution of awareness initiatives and programs and thus increasing women's level of awareness which was considered as the need of the hour.
Shoukat Z, Shah AJ ^[15]	Pakistan	To examine the level of knowledge and awareness of breast carcinoma	Cross sectional descriptive study	1000 females	Breast Cancer Awareness Measure (BCAM)	63.2% lacked knowledge about breast carcinoma, 64% about screening methods and 83.2% about mammography. More than 50% had no idea about



						modifiable risk factors of breast cancer.
Zhu L, Zhou Q, Huang Z, Yang Y, Yang Y, Du Y, et al. ^[16]	Southwest China	To investigate the present state of breast cancer awareness and examine the variables that impact breast cancer cognition	Cross sectional study	1468 rural women	Chinese version of the Breast Cancer Awareness Measure (C-BCAM)	Women's Awareness about breast cancer symptoms and risk factors were 68.8% and 62.1% respectively. The level of awareness decreased with advancing age.
Uruntie RO, Oputa CH, Peters E, Otovwe A. ^[17]	Southern Nigeria	To investigate how educational intervention affects female student's knowledge, attitudes, and practices about breast self-examination	Pretest Posttest design	103 students	Validated questionnaire	The results highlighted that only 51.3% were aware of Breast self-Examination (BSE). Pretest level of knowledge, attitudes, and practices about BSE was low and posttest level showed statistically significant after the educational intervention.
Maitanmi JO, Fadare O, Kolawole M, Aduroja DM, Faleti DM, Maitanmi BT, et al. ^[18]	Nigeria	To evaluate the awareness of breast cancer and practice of BSE	Cross sectional descriptive design	160	Structured questionnaire	78.12% were aware of breast cancer and 96.9% had adequate knowledge but practice about BSE was extremely low. The study also insisted that adequate knowledge and positive attitude does not equate practice readiness.
Mohan R, Thulaseedharan JV ^[19]	Kerala	To assess the breast screening practices of women	Multi stage cluster sampling method	320 women	Structured questionnaire	The results highlighted that 73.2% were practicing BSE and only 25 % attended clinical breast examination screening. Homemakers and women working in rural schemes had lower odds ratio than working or self-employed women.
Alnaqrani F, Almuayrifi MJ, Alhumaidan LS, Alsaeri AS, Alfantoukh AM, Alradaddi RM. ^[20]	Saudi Arabia	To examine the awareness regarding breast cancer including risk factors, symptoms and early detection	Cross sectional study	713 women	Online questionnaire	About 71.4 % had adequate level of knowledge and nearly half of them agreed use of long term hormone contraceptive as risk factor. 95% agreed that early detection is crucial for survival.



Archana Srikanth, Arthi ^[21]	Puducherry	To evaluate the Awareness and Practice of Breast Self-Examination among urban women	Community based cross sectional study	160 women	Structured Knowledge, attitude and practice questionnaire	Only 13.8% have practiced BSE and nobody knew the proper steps.
Jurdana M ^[22]	Izola, Slovenia	To find out about Physical Activity and Cancer Risk: Actual Knowledge and Possible Biological Mechanisms	Review article	-	-	Moderate-to-intense physical activity guards against breast and colon cancer by reducing systemic inflammation, hyperinsulinemia, insulin-like growth factor (IGF-I), sex hormones, pro-inflammatory leptin and other obesity-related cytokines, and a marked increase in anti-inflammatory adiponectin levels.
Boraka Ö, Klintman M, Rosendahl AH ^[23]	Sweden	To investigate the association of physical activity to menopausal status and body composition	Prospective Cohort study	15,983	Self-reported questionnaire on physical activity	Women with waist circumferences, body fat percentages, or BMIs in the upper-normal and overweight range who reported low physical activity had a 23% lower long-term breast cancer risk than women who reported high physical activity at study baseline, which corresponded to >1 h daily walking/week
Timmins IR, Jones ME, O'Brien KM, Adami HO, Auna D, Baglietto L, et al. ^[24]	England	To examine the relationship between physical activity and the risk of premenopausal breast cancer	Cohort study	5,47,601	Self-reported leisure time physical activity	Women with physical activity had 6% and 10% reduction in breast cancer risk and before & after adjustment in Body mass index respectively.



Guo W, Fensom GK, Reeves GK, Key TJ ^[25]	United Kingdom	To examine the association between self-reported physical activity and breast cancer risk.	Prospective cohort study	47,456 premenopausal women and 1,26,704 postmenopausal women	Self-reported physical activity using accelerometer data	Women involved in physical activity had reduced risk for developing breast cancer after modifying for adiposity. An increase of 5 milli-gravity accelerometer measurements showed 21% reduction in premenopausal women and 16% in postmenopausal women
Sasanfar B, Toorang F, Rostami S, Yeganeh MZ, Ghazi ML, Seyyedsalehi MS, et al ^[27]	Iran	To investigate the effect of nutritional education on knowledge, attitude and practice (KAP) for cancer prevention	Interventional study	229 women	Nutrition related cancer prevention knowledge, attitude and practice questionnaire NUTCANKAP	The results showed that three 75 minutes sessions about nutritional education based on health belief model made the participants to consume high intake of whole grain, lower fatty dairy products & nuts. It was concluded that nutritional educational program had a positive impact on KAP regarding cancer prevention.
Varkanesh HK et al ^[28]	Iran	To identify the link between healthy eating style index and breast cancer risk.	Case control study	134 cases & 256 controls	Food frequency questionnaire	It was concluded that participants in higher quartile of HEI-2015 had 46% decreased risk for breast cancer.