REVIEW

NUTRITION AND BREAST CANCER RISK: REVIEW OF RECENT STUDIES

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ABSTRACT

The association between nutrition and cancer in general had been a controversial issue between scientists in the last three decades, because some argued that there is a relationship and some nutrients can help in preventing cancer occurrence, although this has not been a consistent finding by other studies. Studies were identified through a systematic review of literature available on PubMed in between 1st January 2010 to 31st December 2013. We included all studies that assessed nutrition or diet with occurrence or mortality of breast cancer. Out of 42 articles, we included 8 articles in our screening and discussion. Among these 8 studies, there were 2 case-controls, 3 cohort and 3 randomized control trials (RCT) studies. Although most studies reported that nutrition is associated with decreased risk, some reported the contrary, whereas others reported no relation. It was demonstrated a conflict between the included papers in regards of the association between nutrition and breast cancer. These finding needs to be re-evaluated in future studies.

***Keywords**: Nutrition, Breast cancer, Food intake, Diet*

INTRODUCTION

Nutrition and related factors such as physical activity, obesity believed to contribute crucially to cancer occurrence. To some extent it's considered the second most affective risk factor after smoking[1]. But unfortunately, after decades of epidemiological studies and investigations the relationship between nutrition and cancer still not clear yet, and no firm conclusion established[1].

According to a report published by the world cancer research fund panel in 2007[2], concluded that specific nutrient may be involved in breast cancer aetiology based on epidemiological studies conducted on selected nutrients and their roles in epigenetic processes. Other important factors that may be related to breast cancer development are energy balance, the interplay of caloric intake, physical activity, body mass index (BMI) and metabolic rate.

Based on meta-analysis was published in 2012 by Cheraghi et al. showed an increased risk of postmenopausal breast cancer and a decreased risk of premenopausal breast cancer associated to increasing BMI (body mass index)[3]. Another meta-analysis done recently by Zheng et al. 2013 concluded that high intake of W-3 polyunsaturated fatty acids (PUFA) from marine sources is associated with a 14% reduction of risk of breast cancer[4].

Till now, it is poorly understandable how the nutrition and breast cancer are associated or related to each other. According toAmadou et al. 2013 the importance of ethnicity, fat distribution and related specific markers of insulin resistance in the association with premenopausal breast cancer risk has been suggested[5].

METHODS

Search was done using PubMed engine, with words like nutrition, diet and breast cancers. The period was from 1st January 2010 to 31st December 2013.42 papers were matched, after applying our inclusion criteria, only8Papers remained.

Selection criteria

Clinical trials, cohort and case control studies that specifically described "nutrition and breast cancer 2010 to 2013" were included in our study. Those describing other types of cancers, full text are not available, cross-sectional study design as it cannot establish a causation relationship and reviews were excluded.

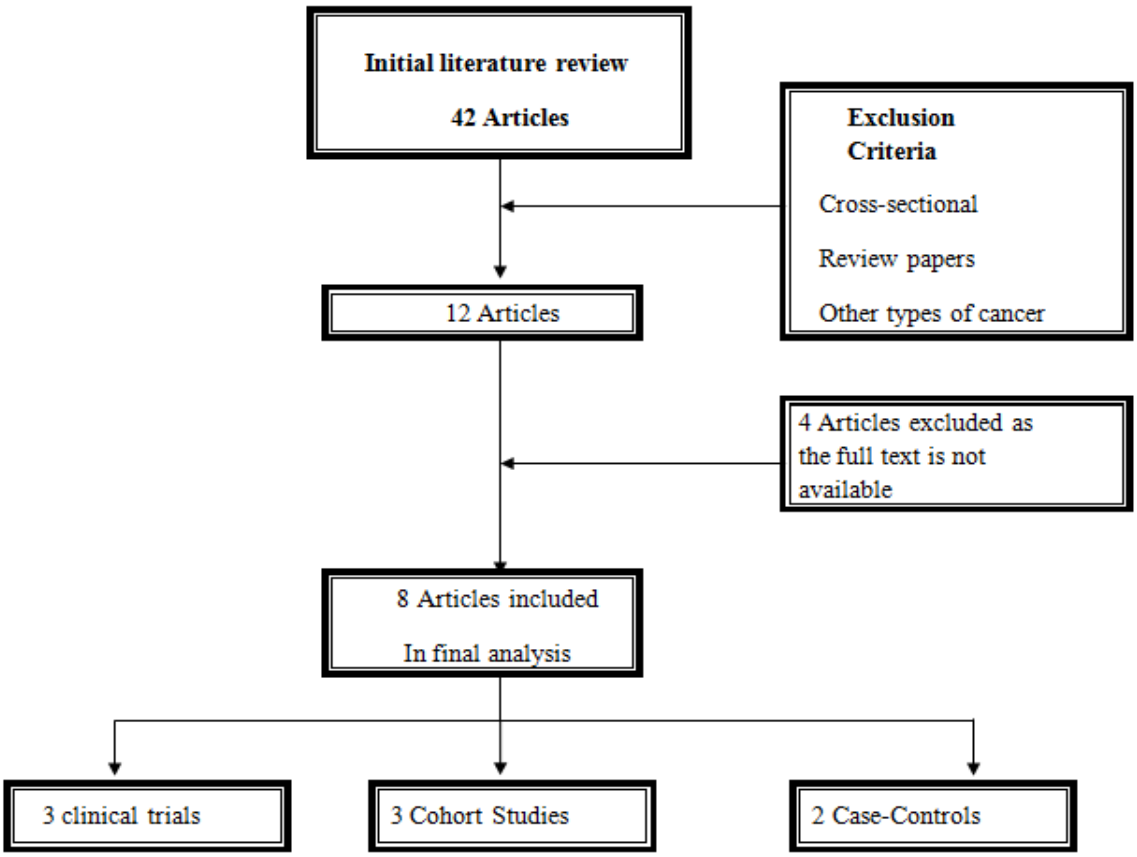

Figure 1: Flow chart of article selection process.

RESULTS & DISCUSSION

Worldwide, some chronic diseases affect people due to changing their way of eating and live. It has been hypothesized that nutrition may be associated with increase the risk of breast cancer. However, the association between nutrition and risk of breast cancer is still conflicting. We therefore conducted this review study to summarize and demonstrate the evidence from various epidemiological studies of nutrition and its association with the risk of breast cancer. The risk of developing certain types of cancer such as colorectal, breast and bladder cancers may be reduced by maintaining a good quality of life including the nutrition status and health body.

A total of 42 articles was screened from the initial review, 30 of them were excluded as they do not meet the inclusion criteria, then 4 of them were excluded as the full text of the paper are not available online (only abstract available). In the final step, we included 8 articles to be fully screened and discussed. The chosen articles represent both observational and clinical study designs, 5 of them were observational studies (2 case-control and 3 cohort studies), and 3 of them were clinical trials. The location of studies varies between Middle East (Saudi Arabia), Latin America (Mexico), Europe and USA as shown in table 1.

Case control studies

Two case-control studies from the included papers reported the association between some nutrients intakes with breast cancer. In one of them, Chajes et al (2012)[6]found that no association was determined between w-3 PUFA intakes with an increase of risk breast cancer while an association was found with increasing of w-6PUFAintake particularly among premenopausal women. The study also demonstrated that no significant of an inverse association between estimated w-3PUFA intake and breast cancer risk, which support one of the previous meta-analyses of prospective studies[7].However,the study shows a significant result for obesity status, which had an impact on risk estimates for w-3 PUFA intake. Also it was reported that increasing w-3 PUFA intake most likely decreased the risk of breast cancer in obese women, whereas no significant inverse association was detected in normal weight and overweight women[6].

The second study conducted by Alshatwi et al.(2010)[8] concluded that no overall relationship between MTHFR genotype and breast cancer. On the other hand, it was found a stronger inverse association of breast cancer among Saudi women with the TT genotype and folate food intake. The relationship between folate metabolism and carcinogenesis is likely to be a complex biological sum of genetic and nutritional differences. In this study, when intakes of diet rich vitamin B12, B6, or methionine were low for

all genotypes, the association of folate rich diet and breast cancer was similar[8].

Cohort studies

The association of the role of antioxidants with breast cancer is still unclear[2, 9, 10]. Previous researches suggested that diets high in antioxidants can protect against cancer, but the analysis of the European Prospective Investigation into Cancer and Nutrition (EPIC) cohort[11]concluded that no association between fruit and vegetable intake and breast cancer risk can be confirmed. On the other hand, a cohort study showed an association between b-carotene, vitamin C intake and lower breast cancer risk among postmenopausal women using exogenoushormones[12.] These findings are in conflict with former research[2, 10, 13]that showed no association between b-carotene, vitamin C and E intake and breast cancer risk. Discrepancies in the associations between dietary antioxidants and breast cancer risk may due to differences in the adjustment variables, sample size, subgroups included in the study, study design and hormone receptor status of the tumour[14-16]. Protective effects of antioxidants were predominantly reported in some case-control studies[17, 18] which are susceptible to recall bias.

It has been hypothesized that dietary fiber lower the risk of breast cancer but findings have been inconsistent[19].Dietary fiber may play a role in breast cancer risk by way ofits ability to lower circulating estrogen concentrations through the inhibition of intestinal reabsorption of estrogens excreted in the bile and by an increase in their fecal excretion[20]. Ferrari et al. (2013)[21]demonstrated that there was an inversely association between risk of breast cancer with intakes of total dietary fiber. For vegetable fiber, it was observe a stronger associations for estrogen receptor–negative and progesterone receptor–negative than for estrogen receptor–positive and progesterone receptor–positive tumors.

The third cohort study explored the physical activity association with breast cancer. Many studies have been conducted worldwide [22, 23]. It was observed that the risk of breast cancer among physically active women was reduced by 25% compared to the least active women[24]. The evidence for the inverse association of breast cancer with physical activity in postmenopausal women was classified as probable[2] while the evidence in premenopausal women was more limited. In one large prospective study conducted in Europe, it was demonstrated that there is no any evidence of an association of in situ breast cancer risk with any subtype of physical activity, nor with total physical activity. The contrast between results is due to physical activity may have stronger effects on proliferation and late stage carcinogenesis and no information on the duration and frequency of occupationalactivity[25].

RCT studies

It was reported that C-reactive protein (CRP)is associated with a higher incidence of breast cancer and a significant increase in overall cancer incidence[26].In one study, the effects of aerobic exercise training on adipokines and inflammatory markers in healthy young women was examined by Arikawa et al. In 2011and it was found that a 16-wk aerobic exercise program significantly decreased levels of CRP in young women, especially in those who were obese[27]. It was observed that risk of breast cancer and other chronic diseases in obese women in the future can be decreased by adopting an exercise routine early inlife[28].Although the relationship between inflammatory markers and breast cancer is still unclear, there is a growing body of evidence suggesting a possible link between inflammatory markers and postmenopausal breast cancer[29].

Exercise can decrease breast cancer risk by suggested mediated factor through changes in estrogen metabolism in premenopausal women[30]. Smith et al. found that an exercise regimen of 150 minutes of moderate-to-vigorousaerobic exercise per week in healthy premenopausal women for 16 weeks resulted in significant changes in estrogen metabolism in a direction consistent with reduction of breast cancer risk[31].

Moreover, another study examined the effect of soy foods on urinary estrogens and the 2-hydroxy (OH)/16a-OH estrone (E1) ratio in two dietary interventions with premenopausal women[34]concluded that soy consumption may protect against breast cancer through modification of estrogen metabolism[32].

CONCLUSION

Worldwide, the most common causes of death are the diet-related chronic diseases - such as obesity, diabetes, cardiovascular disease, cancer. The association between nutrition and risk of breast cancer is still conflicting. The breast cancer might not be developed by maintaining a healthy Body Mass Index (BMI), doing one hour a day of physical activity like fast walking, soy consumption, dietary fibers, folate rich diet, some vitamins such as E and C, decrease consuming alcohol and salt and consuming sufficient fruits and vegetables. However, yet it has not confirmed this association between these factors and risk of developing breast cancer. Therefore, we need larger studies including several countries from different region of the world with enough sample size and longer duration to have strong and proven results.

Table 1 Summary of selected studies

Authors	Year	Location	Study design	Sample size	Main Findings
Alshatwi[8]	2010	Saudi Arabia	Case-control	200	There was no association between MTHFR* genotype and breast cancer risk, But suggest that women may be at substantially increased risk of breast cancer if there diet low in folate.
Chajès et al. [6]	2012	Mexico	Case-control	2074	No significant association between w-3 PUFA* intake and breast cancer risk. There was increase in risk of breast cancer with increase in w-6PUFA intake in premenopausal women only.
Nagel et al.[12]	2010	Europe	Cohort	7,502	Breast cancer risk in both pre- and postmenopausal women was not associated with dietary intake of beta-carotene, vitamin C and E.
Ferrari et al. [21]	2013	Europe	Cohort	11,576	Diets rich in dietary fibre may be related to a small reduction in risk of Breast cancer regardless menopausal status.
Steindorf et al. [25]	2012	Europe	Cohort	283,827	No association between physical activity and in situ breast cancer were found.
Arikawa et al.[27]	2011	USA	RCT	319	The adoptation of routine exercise may decrease future risk of breaks cancer development among obese women.
Smith et al.[30]	2013	USA	RCT	319	Oestrogen changes during menopausal stage may be the explanation on how physical activity can lower breast cancer risk in future.
Maskarinecet al. [31]	2012	USA	RCT	267	High-soy diet had no effect on a panel of urinary oestrogen metabolites and the 2-OH/16α-OHE (1) ratio.

***** *MTHFR =methylene tetrahydro folate reductase, PUFA=Polyunsaturated fatty acids, RCT= Randomized Clinical Trial.*

Conflicts of Interest

The authors declare no conflict of interest

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