RESEARCH COMMUNICATION

Is There an Influence of Dietary Habits on Breast Density as Seen on Digital Mammograms?

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Abstract

The purpose of this study was to evaluate the influence of dietary habit on breast density, which is an important risk factor for breast cancer. This cross-sectional study was performed on 64 Malaysian women of all races between the age of 35 to 70 years. All subjects underwent mammography and the breast density was analyzed from the images using BI-RADS by two independent radiologists. A validated food-frequency questionnaire was used to evaluate the nutrient intake. The data were analyzed using Chi-square test to evaluate the association of dietary habits to breast density. Based on the results, mutton, pork, vegetables, sweets, snacks, soy bean and eggs intake showed associations with increased breast density ($p < 0.05$) while grains, meat, beverages, oil and fruits, did not show any association ($p > 0.05$). As a conclusion, this study showed diet may make changes to the breast density as a risk factor for breast cancer.

Keywords: breast density - dietary habit - breast cancer - BI-RADS - mammogram

Introduction

Breast density actually refers to the amount of white area on a breast that otherwise appears black on a mammogram. The balance of white and black reflects the breast composition and relative amount of glandular tissue, connective tissue, and fat. Different methods of estimating the proportion of white area on the mammogram exist and vary from the perception of the radiologist to using a software program to outline the white area and compare it to the total breast area (Byrne & Spernak, 2005). Breast density decreases during menopause in a process called breast involution, where the milk-glands and ducts atrophy and connective tissue disappears. But in some women, these tissues persist into older age, and these are the women for whom the risk is a real concern. Breast density is an informational marker for breast cancer risk due to its strong association with breast cancer (Tseng et al., 2007).

According to Boyd et al. (2007), women with breast density more than 75% are more likely to obtain breast cancer either detected during mammography or less than 12 months after a negative mammography result. The average breast glandularity of Malaysian women was 48.9% ± 18.7% with no significant difference seen between ethnic groups (Noriah et al., 2004). Breast cancer is the most common form of cancer among Malaysian women of all races. As for National Cancer Registry 2003 report, Chinese women have the highest incidence rate with age standard incidence (ASR) 59.7 over 100,000 populations, followed by Indian with ASR 55.8 over 100, 000 populations and Malay with ASR 33.9 in 100, 000 populations (Lim & Halimah, 2003).

According to Edefonti et al. (2008), dietary habit could also influence the risk of breast cancer. A reduction in nutritional intake, including micronutriens and other food components that are high in starch may decrease breast density (Edefonti et al., 2008). Animal proteins can also cause increment in breast density due to the higher amount of minus one growth factor which mimics insulin as well as risk of breast cancer among premenopause women (Tseng et al., 2007). The adoption of healthy life styles and eating habits should be practiced to reduce the risk. Research is ongoing to provide appropriate dietary recommendations as to minimize the increase of breast density and to reduce the increase of breast cancer. Thus, a study on influence of dietary habits to breast density is important in identifying the categories of food that can enhance or reduce the density of the breast that is certainly one of the risk factors for breast cancer.

Materials and Methods

Subjects

This cross-sectional study at a breast clinic, Kuala Lumpurwas conducted from December 2010 till Mac 2011 among Malaysian women aged 35-75 years, The exclusion criteria were pregnancy and previous history of breast cancer. A total of 64 women were recruited through convenience sampling and gave informed consent. Prior instituitional ethical approval was obtained.

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Data Collection

A dietary intake questionnaire was developed in Bahasa Melayu and validated by an expert on the field. This questionnaire was self administered and the respondents' were required to complete the frequency of food intake. Questionnaire consists of several food groups that includes, grains, meats, vegetables, fruits, snacks, sweets, beverages, oil and eggs with division of food frequency to less than two times per week or more than than times per week intake. In addition, the respondent was required to undergo mammography examination. Interpretation of mammogram was done using Breast Imaging Report and Data system (BI-RADS) method which adopted four categories of breast tissue densities; almost entirely fat (I), scattered fibroglandular tissue (II), heterogeneously dense (III), or extremely dense (IV) by two independent radiologist. With a minimum of five years experience. Both groups I and II BI-RADS will be categorized as low breast density while groups III and IV in high breast density.

Data Analysis

Statistic analysis was done using "Statistical Package for Social Sciences" (SPSS) Version 17. Significant level P-value < 0.05 was used. Descriptive analysis was presented in terms of frequency and percentage. Bivariate analysis was carried out to evaluate the association of dietary intake to breast density.

Results

Breast density scores that were obtained from both radiologists were analysed for interreliability using Kappa test ($\varkappa$ = 0.837) which was almost a perfect agreement. Besides intrareliabilty test was also conducted as to measure the consistency and accuracy of each radiologist in making decision. The results were, radiologist I (r = 0.839), while radiologist II (r = 0.058). Therefore, radiologist I provided a more accurate and consistent output than radiologist II, thus, breast density evaluation made by radiologist I was used in the study. This showed that each evaluators interpretation woud be different (Elmore et al., 1994).

The respondents were divided into two groups in relation to their breast density, forty four women (68.8%) were with low breast density while twenty (31.2%) had high breast density. Consumption of meat that included beef, chicken, seafood, sausages, and nuggets showed a total of 39 (88.6%) women with low breast density while 15 (75%) with high breast density had meat intake less than two times per week as shown in Figure 1. The intake of meat also did not provide any significant difference using Pearson Chi square analysis (p>0.05) but the odds ratio was 2.6 (95% CI: 0.7, 10.3) for low breast density women. Unlike for the consumption of mutton or pork, there was significant difference (p < 0.05), with the uptake of less than two times per week for 37 (84.1%) women of low breast density and the odds ratio of 4.3 (95% CI: 1.3, 14.3).

Based on the data, intake of mutton or pork was related to breast density, elevation in mutton or pork intakes
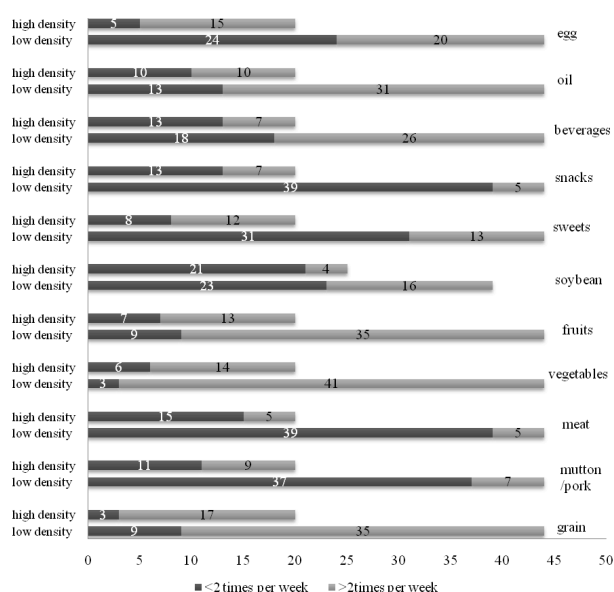
Figure 1. Numbers of Both Low and High Density Women and Food Frequency for Each Food Category

was associated with an increase in breast density. This is similar to the study that stated the amount of fat from meat or meat products shows a positive association with the total amount of fat intake and risk of breast cancer (Sieri et al., 2002). Diet rich with monosaturated fat showed no significant or positive association with the risk of breast cancer while polysaturated fat that is found in mutton or pork showed an increase in the risk in almost all studies (Wirfalt et al., 2002; Rissanen et al., 2003). It can be concluded that there was no association seen in the intake of other meat such as beef, chicken and seafoods in accordance to an article reported on eight prospective studies which showed no association with meat intake (Missmer et al., 2002). However, women with frequent uptake of red or processed meat had a higher probability in getting breast cancer (Red and Processed Meat Linked to Breast Cancer. Br J Cancer, 2007)

A total of 35 (79.5%) women with low breast density consumed grains more than two times per week whereas only 17 (85%) women had high breast density. Intake of grains include oat, barley, wheat, white rice, brown rice, noodle, bread and cereal. However, the consumption of grains to breast density was not statistically significant (p > 0.05). nevertheless, low breast density women are less likely to get breast cancer (OR: 1.5, 95% CI: 0.3, 6.1). Significant difference was also displayed by the intake of vegetables which comprises of cabbage, broccoli, carrot, tomatoes, egg plant, spinach, peas, onions and mushroom. In addition, uptake of vegetables also provided an odds ratio of 0.2 (95% CI: 0.04, 0.8) indicating the likelihood of low breast density women from not getting breast cancer. The consumption of fruits showed no significant difference (p > 0.05) with an odds ratio of 0.5 (95% CI: 0.2, 1.5).

Discussion

The result from this study is supported by Adzersen et al. (2003), which stated that consumption of vegetables

and fruits in higher quantities may reduce the risk of breast cancer. Foods rich with vitamin A is also proven to reduce the risk of breast cancer in moderate, but the result is not conclusive thus further evaluation is necessary (Holmes & Willett, 2004). Diet high in fiber had shown reduction in risk of breast cancer among post menopausal women compared to those with low fiber diet (Mattisson et al., 2004). Contrarily, in this study intake of fruits and grains did not provide the association to beast density as shown by vegetables.

As for the consumption of soy bean, 21 (47.7%) women of low breast density showed an uptake of more than two times per week. This includes the uptake of soy drink, toufu and 'tempe' with an odds ratio of 0.3 (95% CI: 0.08, 1.0). Consumption of soy bean in adolescents gives a stronger association in the reduction of risk factors in comparison to adults (Shu et al., 2001). According to Wu et al. (1996), intake of soy bean during adolescents and adult was correlated to the reduction of breast cancer risk. In support of this study as there is an association between intake of soy bean to breast density.

Twelve (60%) and seven (35%) high breast density women indulged themselves with sweets and snacks respectively with a frequency of more than two times per week. The coefficient for these food categories displayed significant differences statistically ($p < 0.05$). Risk estimate also showed preferable outcome with both sweets (OR: 3.6, 95% CI: 1.2, 10.8) and snacks (OR: 4.2, 95% CI: 1.1, 15.5). Unlike beverages, that includes coffee, tea, cocktails, carbonated drinks and sweetened drinks, it was not significantly different ($p > 0.05$) with an odds ratio of 0.4 (95% CI: 0.1, 1.1). This was also similar with oil (OR: 0.4, 95% CI: 0.1, 1.3).

Elevations in sweets and snacks intakes were associated with an increase of breast density. The result is in accordance to Potischman et al. (2002), stating that intake of products high in sugar would probably be associated with the moderate increase in breast cancer risk. It may be due to the increase in insulin. Besides most sweets and snacks products are made out of white flour, a carbohydrate source and high in fat as uptake of carbohydrate had a probability to increase the risk of breast cancer by affecting insulin defence mechanism and plasma level of insulin and glucose (Nielsen et al., 2005; Silvera et al., 2005). Nevertheless, uptake of beverages did not demonstrate any association towards breast density.

With a total of 15 (75%) high breast density women that consume eggs more than 2 times per week, the result displayed a statistical difference ($p < 0.05$) with an odds ratio of 3.6 (95% CI: 1.1, 11.6). Consumption of 100 gram addition in the uptake of eggs showed an increase by 22% of the risk of breast cancer in comparison to women who never had egg. The risk of breast cancer is lowered to those who had at least two eggs a week but increases in women who had at least one or more eggs per day (Missmer et al., 2002).

In conclusion, based on the present results, it can be concluded that intake of mutton or pork, vegetables, soy bean, sweets, snacks and eggs may make changes to the breast density and hence influence in the risk of breast cancer.

Acknowledgements

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