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Dietary patterns and breast cancer risk among Iranian women: A case-control study

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A R T I C L E   I N F O

A B S T R A C T

Aim: Breast cancer is the most common cancer among women worldwide. Most previous studies focused on individual nutrients or foods rather than overall dietary patterns. We aimed to assess the association between major dietary patterns and breast cancer risk.

Method: In a hospital-based case-control study, 134 women diagnosed as breast cancer and 267 controls were recruited from referral hospitals in Tehran, Iran. Dietary intakes were evaluated by using a validated 168-item food frequency questionnaire. Dietary pattern were identified by factor analysis. Odds ratios (OR) were estimated using logistic regression.

Results: Two dietary patterns were extracted: healthy and unhealthy. The "Healthy" dietary pattern was loaded for high consumptions of fruits, vegetables, seeds, legume, fish and sea foods, whole grains, liquid oils, olive oils and olive and lack of salt intake. "Unhealthy" dietary pattern was characterized by high factor loadings for sweets, soft drinks, mayonnaise, solid oils, processed meat, fried and boiled potato and salt intake. In multivariate logistic regression analyses, the healthy dietary pattern was not associated with breast cancer risk (OR: 0.83; 95%CI: 0.36, 1.89; P-trend = 0.50), while women in the highest quartile of the unhealthy dietary pattern had a significantly increased breast cancer risk (OR: 2.21; 95%CI: 1.04, 4.690; P-trend = 0.009). When stratified by menopausal status, unhealthy dietary pattern showed inverse association with breast cancer risk only among post-menopausal women (OR: 3.56; 95%CI: 1.16, 10.95; P-trend = 0.008).

Conclusions: Our findings showed that an unhealthy dietary pattern might be associated with higher risk of breast among Iranian women.

Introduction

Breast cancer (BCa) is the most common cancer among women worldwide representing the second leading causes of cancer death in this population [1–4]. Along with an increasing global incidence trend of breast cancer, substantial increases in prevalence of this cancer have been occurred among Iranian women between 1965 and 2000, making it first ranked cancer among all types of diagnosed cancers [4]. In Iranian women, age-standardized incidence rate of BCa was 27.4 (per 100 women) during 2000 to 2010 [4,5]. Moreover, Iranian women who are diagnosed with BCa are 10 years younger than their female counterparts in western countries [6,7].There are several proven risk factors for breast cancer including age, early menarche, late menopause, use of oral contraceptive, hormone replacement therapy, family history of breast cancer in first degree relatives, history of benign breast disease, smoking, obesity and overweight [8,9]. Diet is a recognized modifiable factor associated with most cancers [10]. Prior studies has been examined the association between diet and BCa which most yield an inconsistent results [9,11–16]. Most epidemiological studies on diet and BCa have largely centered on single food items or nutrients. Defining the overall dietary patterns (DPs) may be more important in BCa etiology than assessing the effects of nutrients in isolation due to complexity and potential synergistic interactions between individual nutrients and foods [14]. Recent findings have shown that Healthy eating patterns might reduce the risk of BCa [17]. However, dietary patterns are likely to vary according to socio-economic status, cultural practices, geographic region and food preferences and availability [18]. Especially, dietary intake of the Middle-Eastern population has its own unique characteristics, being recognized by high consumption of hydrogenated fats and refined grains (bread and white rice) and a higher percentage of energy from carbohydrates [18].

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To our knowledge, only one previous study has explored the association between DPs and BCa in Middle-Eastern population [19]. Considering breast cancer as one of the major public health concern in Iran, more studies are required before any firm conclusion can be drawn. The main purpose of our study was to examine the association between DPs and BCa in a case-control study of Iranian women. Furthermore, we aimed to assess this relation by menopausal status.

Materials and methods

Study population

We conducted a hospital-based case-control study among Iranian women above 30 years of age who were admitted to the 2 referral hospitals in Tehran city (capital of Iran) between September 2015 to February 2016. Cases were women with a histopathologically confirmed diagnosis of BCa within the past 6 months. The control subjects were patients admitted in other sections of same hospitals for a wide spectrum of non-neoplastic disease that were unrelated to alcohol abuse, smoking and long-term diet modification. The hospital controls were matched according to age (± 5 years) and menopausal status. Conditions among controls included such as traumas and orthopedic disorders, disk disorders, acute surgical conditions, eye, nose, ear, or skin disorders. In this study, two controls were recruited randomly within the same medical center for each case. Participation rate of the study was 92%.408 eligible cases and controls took part in this study (136 cases and 272 controls). However, after excluding 5 controls and 2 cases with their reported energy intakes more than 5284 kcal/d (Mean $\pm$ 3SD), a total of 134 cases and 267 controls (n = 401) remained in the final analysis. This study was approved by the ethics board of the National Nutrition and Food Technology Research Institute of Shahid Beheshti University of Medical Science. All participants signed the written informed consent before enrollment.

Data collection

Information on known and potential risk factors for BCa were obtained using questionnaires by trained dietitians. Participants reported their socio-demographic characteristics, reproductive history, hormone-replacement therapy, family history of cancer among first-degree relatives, vitamin D supplements use, day and night bra use and smoking status. Physical activity was measured by a validated questionnaire and was expressed as metabolic equivalents hour/day (METs-h/d) in which nine different MET levels were ranged on a scale from sleep/rest (0.9 METs) to high-intensity physical activities (>6 METs) [20]. The time spent per day in a variety of physical activities was reported by the participant. The time spent in each activity was multiplied by its typical energy expenditure, expressed in terms of metabolic equivalents (METs). The resulting values were added together to yield a MET-hours/day score. Weight was measured using a digital scale (Seca, Germany) to the nearest 0.5 kg with the participants wearing light clothes and no shoes. Height was measured to the nearest 0.2 cm using the tape meter fixed to a wall. By dividing weight in kg by the square of height in meter, body mass index (BMI) was calculated.

Dietary assessment

Dietary intakes of all participants were obtained by a validated 168 item semi-quantitative food-frequency questionnaire (FFQ), by asking their frequency of intake based on standard serving size during 1 year before cancer diagnosis or before hospital admission for the controls. This FFQ has previously shown relative validity and reproducibility for evaluating either food and nutrient intakes or deriving major DPs among Iranian adults [21]. Intakes of the 168 FFQ food items were reclassified into 28 food groups according to the similarity of their nutrient contents (Table 1). Daily consumption in grams was computed by dividing the reported amount of food intake by the frequency of consumption during a given period of time (e.g., divided by 7 if once a week). For each participant, the daily intake of each food group was calculated by summing the intakes of individual food items within that group.

Statistical analysis

All analyses were performed using the Statistical Package for Social Sciences software version 18 (SPSS Inc., Chicago, IL, USA), and a two-sided p-value < 0.05 was considered significant. Principal components analysis (PCA) was used to extract major DPs based on 28 predefined food groups [22,23]. Varimax rotation was used for the rotation of the factors by an orthogonal transformation.

The number of components to retain for rotation was based on examination of scree plots and interpretability of the components [24]. A factor loading of ≥ 0.3 was used to identify the primary factor on which the items are loaded. Two DPs scores were categorized into quartiles categories and the lowest quintile was considered as the reference category. To compare participants' general characteristics

Table 1
Food groupings used for the principal components analysis

Food group	Food item
Red meat	Beef, lamb
Processed meat	Sausages, lunch meat, hamburgers
Organ meat	Beef liver
Poultry	Chicken
Fish and sea foods	Fish
Egg	Egg
Low fat dairies	Skimmed milk, low fat milk, low fat yoghurt, dough (yoghurt drinks), white cheese, curd
High fat dairies	Whole milk, high fat milk, chocolate milk, high fat yoghurt, cream yoghurt, strained yoghurt, cream, cream cheese, ice cream
Fruits	Apples, raisins or grapes, bananas, cantaloupes, watermelons, oranges, lemons, grapefruit, kiwis, pears, apricots, cherries, strawberries, peaches, nectarines, tangerines, mulberries, plums, persimmons, pomegranates, pineapples, fresh figs, dried figs, dried dates, dried mulberries, other dried fruit, fruit juices
Vegetables	Green leafy vegetables, spinach, lettuce, cucumber, mixed vegetables, eggplant, celery, cabbage, cauliflower, Brussels sprouts, kale, carrots, corn, tomatoes, green peas, green beans, green pepper, turnip, squash, mushrooms, onions, garlic
Whole grains	Iranian breads (barbari, sangak, taftun, lavash), barley bread, wheat germ, bulgur, popcorn
Refined grains	Baguette bread, toasted bread, Pasta, rice, milled barley, sweet bread, white flour, starch
Legumes	Beans, lentils, peas, lima beans, broad beans, mungs
Nuts and seeds	Peanuts, almonds, walnuts, pistachios, hazelnuts, roasted seeds
Olive oil and olive	Olive oil, olives
Liquid oils	Vegetable oils
Solid oils	Hydrogenated fats, butter, margarine, animal fats
Boiled potatoes	Boiled potatoes
Fried potatoes	Fried potatoes
Mayonnaise	Mayonnaise
Sweets	Chocolates, cookies, cakes, confectioneries, candies, gaz (Iranian confectionery), jam, jelly, honey
Pickles	Pickles
Salt	Salt
Snacks	Biscuits, chips, cheese snacks
Condiments	Turmeric, pepper, others
Pizza	Pizza
Coffee	Tea, coffee
Soft drinks	Soft drinks