

## RESEARCH ARTICLE

# Dietary Habits Contributing to Breast Cancer Risk Among Iranian Women

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### Abstract

**Background:** The aim of this study was to investigate demographic features, dietary habits, and some possible risk factors for being susceptible to breast cancer in Iranian women. **Materials and Methods:** A study of dietary habits and breast cancer was conducted among 53 Iranian women with histological confirmed disease and 40 matched controls. A dietary habits questionnaire was used to evaluate the pattern of selected food intakes. The risk of cancer was analyzed after adjustment for confounding factors. Age, weight, body mass index (BMI), waist circumference, educational status, parity, lactation, marital status, menopause, history of estrogen therapy, and family history of breast disease or cancer were assessed among participants. Special attention was given to the relationship between consumption of high fat meat, milk, yogurt and cheese as well use of frying oils for frying foods, use of olive/liquid oils for cooking, removing fat from meat and poultry, removing chicken skin and not use of mayonnaise as salad dressing and the risk of breast cancer. Moreover, salad, vegetable and fruit consumption, and eating outdoors were investigated. **Results:** Our results revealed significant lower education and higher BMI and waist circumference levels in patients with breast cancer. There was significantly increased breast cancer risk in overweight women in comparison with normal weight (OR=2.91, 95% CI 1.24 to 6.82). High intake of fat dairy products including milk and cheese was found to be a statistically significant factor for increasing breast cancer risk in models adjusting for age, BMI and education. Use of olive/liquid oils for cooking and avoidance of mayonnaise as salad dressing are related to lower risk of breast cancer. The frequency of vegetable and fruit consumption was significantly lower in patients with breast cancer compared to healthy women. **Conclusions:** Dietary habits might be risk factors for breast cancer among Iranian women. Adoption of a prudent diet could be an appropriate strategy for preventing breast cancer.

**Keywords:** Dietary habits - reproductive parameters - breast cancer - risk - Iranian women

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### Introduction

Breast cancer is the second most common cancer amongst women worldwide (Chlebowski et al., 2008; Ferlay et al., 2010), with nearly 1.7 million new cases diagnosed in 2012, that comprising about 12% of all new cancer cases and 25% of all cancers in women (Hussain M et al., 2014). Breast cancer being one of the leading cancers among women in developing countries (Rao et al., 2005), that comprised the 21.4% of female cancers in Iran (Babu et al., 2011).

The prominent variation in breast cancer incidence rates might be associated with genetic factors between populations and differences in environmental exposures, including diet (Moorman and Terry, 2004, Yoo et al., 2006, Babu et al., 2013, Yaw et al., 2014, Sangrajrang et al., 2013). Differences in eating patterns and breast

cancer rates across countries suggest that several dietary components, could affect breast cancer risk (Moorman and Terry, 2004). Mounting possible dietary habits for breast cancer were investigated (Phillips, 1975, Voon and Chelliah, 2011). Nevertheless the evidences to date are not strong enough to state whether they are accurately contribute to breast cancer, research proposed they need for further survey amongst different countries. The differences in dietary practices between countries are well established, and could contribute to the differences in breast cancer risk (Boyd et al., 2003). Although the strong evidence demonstrated the different breast cancer risk by diverse dietary habits (Pawlega, 1992; Nordevang et al., 1993; Mourouti et al., 2013; Mourouti et al., 2014), but the inconsistency of the results from various countries considering the pattern of food intake (Taioli et al., 1991) suggesting the investigation of dietary habits relationship

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to breast cancer risk in Iranian women. On the other, to our knowledge, no complete research exists addressing the relationship between dietary habits and breast cancer risk. So, we designed the current case-control study to investigate the demographic features, dietary habits, and some possible etiologic factors for being susceptible to breast cancer in Iranian women.

## Materials and Methods

### Study population

The current case-control study included 93 individuals who underwent an anthropometry assessment and a dietary habits questionnaire interview between April and May 2009 at Iranian Center for Breast Cancer, Academic Center for Education, Culture and Research (ACECR). All of women lived in Tehran city (Iran) for at least last 10 years. After obtaining the consent, subjects classified on the cases and control groups. Cases were patients with stage I to III breast cancer that their disease was diagnosed on the pathologic evidences up to 1 month. Subjects in control group were healthy women. 56.98% (n=53) were patients with breast cancer and 43.01% (n=40) were healthy. The study was approved by the local ethics committee of ACECR. Participants were selected according to the defined inclusion criteria which were: age 20-65 years, residing in Tehran, with breast cancer in patients and without any cancer in control group, maximum period of one month intervals from diagnosing of breast cancer to the beginning of the study. People with these criteria were excluded from the study: suffering from other diagnosed diseases, BMI  $\geq 40$  kg/m<sup>2</sup>, pregnancy and lactation at the time of the study, using any type of special diet in the past 2 months.

Dietary habits questionnaire included the terms of high fat meat, milk, yogurt and cheese consumption as well use of frying oils for frying foods, use of olive/ liquid oils for cooking, removing fat from meat and poultry, removing chicken skin and not use of mayonnaise as salad dressing, salad, vegetable and fruit consumption, and eating outdoors of the participants. Information on other potential breast cancer risk factors such as family history of breast cancer, marital status, parity, age at first birth, menopausal status, hormone use, educational status, parity and number of lactation was collected in the questionnaire.

### Anthropometry measurements

For each participant accomplished anthropometric parameters including height (to the nearest 0.5cm), weight (to the nearest 0.1kg) and waist circumference (to the nearest 0.1cm) were measured while the subjects were fasting and measured in light covered clothing without shoes. Waist circumference (WC) is now accepted as a practical measure of adipose tissue distribution (Wang et al., 2003). The measurement tape was placed in a horizontal plane around the abdomen at the level midway between above the uppermost lateral border of the iliac crest and below the lowest rib. BMI was calculated for all patients. As a relative indicator of body weight, BMI was calculated as weight in kilograms divided by the square of the height in meters (kg/m<sup>2</sup>). The World Health

Organization (WHO) classifies the degree of adiposity in terms of the BMI as overweight, 25.0-29.9 kg/m<sup>2</sup>. While BMI is usually associated with general obesity, WC has been used as a measure of central or intra-abdominal obesity, defined as equal or more than 0.80 for females. Accordingly, we estimated the risk of breast cancer based on classified group for BMI (less than 25, equal or more than 25) and WC (less than 0.80, equal or more than 0.80).

### Statistical analyses

All statistical analysis was performed using PASW Statistics 18 (SPSS, Chicago, IL, US). The values were expressed as mean $\pm$ standard deviation. The student t-test and analysis of variance were used to compare the differences between the means of variables. Chi-square test was used to compare the frequency of variables between two groups. Logistic regression model was used to determine of odds ratio after adjustment for all confounding variables. Statistical significance was defined as p<0.05.

## Results

### Study population characteristics

A total of 93 participants were recruited in the current case-control study, from which 56.9% (n=53) were patients with breast cancer and 43.1% (n=40) were healthy. Study population characteristics and body dimensions in patients with breast cancer and healthy women groups are summarized in Table 1. As shown in this table, we found no statistically significant differences in terms of parity and mean of age between groups. The means for number of lactation was not significant between groups as well. Our results revealed the significant lower education level in patients with breast cancer (p=0.01). We found also significantly higher level of BMI and WC in patients with breast cancer (p=0.008 and p=0.002 respectively).

### Breast cancer- related traits between patients with breast cancer and healthy women

Table 1 demonstrates the frequency of breast cancer-related factors between patients with breast cancer and healthy women. As shown in this table, there was not a significant difference in marital and menopause status between case and control groups. However, the proportion of history of estrogen therapy and family history of breast disease or cancer was higher in patients with breast cancer, but was not significant between two groups (p>.05).

### Breast cancer risk and fatness status of women

As shown in Table 2, we found significantly increased breast cancer risk in overweight women in comparison with normal weight (p=0.008, OR=2.91, 95%CI 1.24 to 6.82). We also found the significantly increased risk of breast cancer in women with higher WC in comparison with lower one (p=0.02, OR=2.78, 95%CI 1.16 to 6.65).

### Dietary habits and risk of breast cancer

Risk of breast cancer associated with dietary habits demonstrated in Table 2. Our results exhibited the significant increased risk of breast cancer among women

**Table 1. Study Population Characteristics, Frequency of Breast Cancer- Related Factors and Some Dietary Habits in Patients Between Breast Cancer and Healthy Women**

	N	Cases <sup>†</sup>		N	Controls <sup>‡</sup>		p <sup>¶</sup>
		Mean (SD)/Number (%)			Mean (SD)/Number (%)		
Age (year)	53	40.02 (10.01)		40	39.78 (11.21)		0.91
Education (year)	53	11.08 (4.6)		40	13.63 (4.5)		0.01
Parity	43	2.77 (1.49)		27	2.93 (2.18)		0.71
Number of lactation	53	1.7 (1.51)		40	1.43 (1.79)		0.42
Weight (kg)	53	69.94 (14.51)		40	64.91 (11.85)		0.07
BMI (kg/m <sup>2</sup> )	53	27.87 (5.74)		40	24.89 (4.54)		0.008
Waist circumference (cm)	53	90.89 (12.94)		40	82.43 (12.21)		0.002
Marital Status (married)	53	38 (71.7)		40	24 (60)		0.57 <sup>§</sup>
Menopause	53	10 (18.9)		40	10 (25)		0.15 <sup>§</sup>
History of estrogen therapy	52	17 (32.1)		40	7 (17.5)		0.15 <sup>‡</sup>
Family history of breast disease or cancer	42	15 (35.7)		32	11 (34.4)		0.9 <sup>‡</sup>
Salad *	53	60.51(130.97)		40	17.27 (9.84)		0.73 <sup>‡</sup>
Vegetables*	53	10.45 (13.22)		40	12.18 (8.55)		0.02 <sup>‡</sup>
Fruits*	53	28.66 (23.52)		40	42.58 (27.53)		0.004 <sup>‡</sup>
Eating outdoors*	52	35.69 (67.67)		40	38.5(109.57)		0.29 <sup>‡</sup>

<sup>†</sup>Patients with Breast Cancer; <sup>‡</sup>Healthy Women; <sup>§</sup>Student's T-Test; <sup>¶</sup>Fishers' Exact Test; <sup>‡</sup>Chi-Square Test; <sup>¶</sup>NPar Tests (Mann-Whitney); \*Intake (Times/Month)

**Table 2. Risk of Breast Cancer Associated with Fatness Status of Women and Comparison of Some Dietary Habits in Patients with Breast Cancer and Healthy Women**

Characteristics/Dietary Habits	Total	Number (%)	p-value <sup>‡‡</sup>	OR	95%CI	p-value	
Body Mass Index(kg/m <sup>2</sup> ) ≥25	Cases <sup>¶</sup>	53	35(66.0)	0.008 <sup>‡</sup>	2.91	1.24-6.82	0.03*
	Controls <sup>§</sup>	40	1 (6/40)				
Waist circumference (cm) ≥80	Cases	53	43(81.1)	0.02 <sup>‡</sup>	2.78	1.16-6.65	0.04*
	Controls	40	24 (60)				
High fat meat intake	Cases	52	2 (3.8)	0.61 <sup>‡</sup>	1.48	0.12-16.94	0.77**
	Controls	38	1 (2.6)				
Use of olive/ frying/ liquid oils for cooking	Cases	53	32(60.4)	<0.001 <sup>‡</sup>	0.03	0.005-0.307	0.03**
	Controls	40	39(97.5)				
Use of frying oils for frying	Cases	53	39(73.6)	0.08 <sup>‡</sup>	9.39	0.13-1.21	0.12**
	Controls	40	35(87.5)				
High fat milk intake	Cases	49	16(32.7)	<0.001 <sup>‡</sup>	17.45	2.19-138.98	0.01**
	Controls	37	1 (2.7)				
High fat yogurt intake	Cases	48	21(43.8)	<0.001 <sup>‡</sup>	6.8	2.08-22.17	0.17**
	Controls	39	4(10.3)				
High fat cheese intake	Cases	47	13(27.7)	0.006 <sup>‡</sup>	6.88	1.44-32.77	<0.001**
	Controls	38	2 (5.3)				
Removing fat from meat and poultry	Cases	53	30(56.6)	0.007 <sup>‡</sup>	0.27	0.10-0.73	0.31**
	Controls	40	33(82.5)				
Removing chicken skin	Cases	53	45(84.9)	0.21 <sup>‡</sup>	0.45	0.11-1.84	0.58**
	Controls	40	37(92.5)				
Not use of mayonnaise as salad dressing	Cases	51	24(47.1)	0.02 <sup>‡</sup>	0.36	0.14-0.88	0.02**
	Controls	38	27(71.1)				

<sup>†</sup>Fishers' exact test; <sup>‡</sup>Chi-square test; <sup>¶</sup>Patients with breast cancer; <sup>§</sup>Healthy women; \*P-values were from models adjusting for age and education; \*\*P-values were from models adjusting for age, BMI and education

who ate the high-fat dairy product including milk and cheese compared to those who did not after adjusting for age, BMI and education in regression models. However, the high-fat meat consumption was more frequent in patient with breast cancer, but there was no significant difference in risk of breast cancer between groups with high fat vs. low fat intake of meat. Our results demonstrated that subjects who used of olive/ liquid oils for cooking and did not use of mayonnaise as salad dressing had the lower risk of breast cancer. In last analyses, we also compared the some dietary habits in patients with breast cancer and healthy women that tabulated in Table 1. As shown in this table, the frequency of vegetable and fruit consumption was significantly lower in patients with breast cancer compared to healthy women.

## Discussion

Our findings revealed the significantly increased

breast cancer risk in overweight women in comparison with normal weight. High fat dairy products intakes was found to be statistically significant factors for increasing breast cancer risk. Dairy products are a diverse food group in terms of the factors that could potentially influence cancer risk. Some dairy products, such as whole milk and many kinds of cheese, have a relatively high saturated fat content, which may increase breast cancer risk (Moorman and Terry, 2004). There are several postulated mechanisms through which dairy products could influence breast cancer risk. A high consumption of high fat dairy products may reflect an overall high dietary fat intake, particularly saturated fat, which in turn has been associated with breast cancer risk (Smith-Warner et al., 2001; Boyd et al., 2003; Moorman and Terry, 2004; Ganmaa and Sato, 2005)

Compelling evidences on the risk of breast cancer related with dietary fat intake suggests that a higher intake of fat is associated with an increased risk of breast cancer (Smith-Warner et al., 2001; Boyd et al., 2003). The

biological plausibility of an association between dietary fat and breast cancer risk is shown that dietary fat intake could influence on carcinogenesis pathway in animals mammary cells (Freedman et al., 1990; Welsch, 1994), which appears to be distinct from the effect of calories, as well as by the known biological effects of fat. Potential mechanisms include the generation from fatty acids of eicosanoids, the generation of free radicals and mutagenic compounds such as malondialdehyde by lipid peroxidation and the modulation of genes that are involved in mammary carcinogenesis (Cohen et al., 1986).

It has been demonstrated that a 100 g increase in daily total fat intake could increase 1.35 times the risk of breast cancer (Howe et al., 1990). Findings of recent prospective study revealed the 33-36% increase in risk for breast cancer for the highest compared with the lowest quintile of intake of high-fat dairy foods (Cho et al., 2003). On the other hands, it has been demonstrated that low fat dietary counseling may improve cancer outcomes in women with breast cancer (Chaudhry et al., 2013).

However, the consumption of high-fat meat was frequent in patient with breast cancer, but there was no significant difference in risk of breast cancer between groups with high fat vs. low fat intake of meat. Consistently, results from two pooled analyses have found no significant association between meat intake and breast cancer risk (Missmer et al., 2002; Alexander et al., 2010).

Consistent with previous study, current study's results also shown the significantly increased breast cancer risk in overweight women in comparison with normal weight (OR=2.91, 95%CI 1.24 to 6.82) (Park et al., 2014). It has been found that each 5 kg increase in body weight is associated with a 13% increase in breast cancer specific mortality (Rodriguez San Felipe et al., 2013). The results obtained show that overweight and obesity are directly linked to breast cancer and age of diagnosis. Breast cancer was diagnosed earlier in women of normal weight (Aguilar Cordero et al., 2012). There are evidences that weight gain and consequent overweight/obesity are combined risk factors for breast cancer among postmenopausal women (Suzuki et al., 2013). Our results revealed the significant higher BMI and WC levels in patients with breast cancer. Epidemiological evidence has shown that anthropometric factors are implicated in breast cancer development. Overall consistent positive associations have been observed between high BMI and WC and the risk of breast cancer among postmenopausal women, while conflicting results persist for premenopausal breast cancer, both for BMI and for other anthropometric parameters as well as across ethnic groups (Amadou et al., 2013). A meta-analysis of some of studies conducted observed an overall 12% increase in breast cancer risk per 5 kg/m<sup>2</sup> increase in BMI (Renehan et al., 2008).

Current study's results demonstrated significantly lower consumption of vegetable and fruit in patients with breast cancer compared to healthy women. There are controversial findings consider to association between vegetable and fruit intakes and risk of breast cancer (Van Gils et al., 2005, Jung et al., 2013). Some studies reported the no significant associations between vegetable or fruit intake and breast cancer risk (Van Gils et al., 2005, Jung et

al., 2013), but others revealed a reduction in risk of breast cancer by high intake of fruits, vegetable (Sangrajrang et al., 2013) and fruits and vegetables combined (Aune et al., 2012) especially among women who were low or most physically active (Kruk, 2014). It has been suggested that phytochemicals in vegetables could decrease the level of cyclin E (Nguyen et al., 2008) and nuclear factor-kappaB (Johnson, 2007; Ahmad A et al., 2011) and consequently, reduce the risk of developing breast cancer.

To our knowledge, this is the first investigation of the dietary habits for being susceptible to breast cancer in Iranian women. However, a number of caveats need to be considered in interpretation of our findings. Briefly, a limitation of the study was the relatively small sample size. In addition, confounding might exist and influence our analyses. However, we did carefully adjust for the important factors that may affect breast cancer risk, such as age, BMI and education. We acknowledge that replication in diverse populations is needed to verify our findings.

In conclusion, dietary habits might be the risk factors for breast cancer among Iranian women. Prudent diet could be appropriate strategy for preventing the breast cancer.

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