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Association of Weight Indicators, Dietary Habits, and Physical Activity With Common Benign Breast Diseases

An Observational Case-Control Study

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Benign breast diseases (BBDs) are 10 times more common than breast cancer, and fibroadenoma (FA) and fibrocystic disease (FCD) are the most frequent. The association of BBD with physical activity (PA), weight indicators, and diet was investigated. Eligible women were entered in the FA, non-FA, FCD, and non-FCD groups. A PA and a food questionnaire were completed and anthropometric measures were taken and 779 women were studied. There was no significant difference regarding weight indicators and PA between the groups. Contrary to the general assumption, chocolate, tea, and coffee do not increase BBD, while chicken may elevate the risk. **Key words:** *BMI*, *body composition*, *fibroadenoma*, *fibrocystic*, *food*, *IPAQ*, *lifestyle*

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All methods were performed in accordance with the guidelines and regulations of the Ethics Committee of Tehran University of Medical Sciences, Tehran, Iran, and in accordance with the Declaration of Helsinki. The Ethics Committee of Tehran University of Medical Sciences approved the 2 studies (codes: IR.TUMS.VCR.1397.357 and IR.TUMS.VCR.REC.1397.358). An informed consent was signed by all participating women.

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BENIGN BREAST DISEASES (BBDs) constitute the most common breast condition in women. Although they are around 10 times more common than breast cancer, they have been studied much less frequently.[1] Fibroadenoma (FA) and fibrocystic disease (FCD) of the breast are the most frequent BBDs; the former is seen in 25% and the latter in up

to 50% of women.[2] Around 30% of the cases of BBD need treatment at some point.[1] The association of BBD and breast malignancies has been widely disputed, and recent studies have confirmed that BBD is a risk factor for breast cancer, although the risk is not very high and varies depending on the type of BBD.[3-5]

In addition to the slightly increased risk for malignancy, BBD has several negative impacts: patient anxiety in fear of misdiagnosis or future malignant transformation,[4,6] troublesome symptoms such as breast pain and tender nodules, occasional problematic clinical differentiation from malignant and premalignant lesions, and concealing malignant masses due to nodularity and breast density.[7]

Various local and systemic factors affect breast tissue, especially hormonal factors such as estrogen. Conditions that modify estrogen levels can affect BBD and among them, reproductive factors play a major role.[7] However, increased body fat mass also has been recognized as a risk factor, because of the role of adipose tissue in estrogen production.[8] Contrary to this expectation, a higher body mass index (BMI) has been shown to decrease the risk of BBDs.[9] Actually, intra-abdominal fat or visceral fat is the major adipose component that is related to the risk of noncommunicable diseases, including breast cancer.[10]

Lifestyle factors might influence the development of BBD in women. Physical activity (PA) or inactivity can be considered as one of these issues; it could therefore be a modifiable factor affecting the BBD incidence. Higher PA in childhood and adolescence has been shown to decrease the probability of BBD in adulthood.[11] Yet, no link has been demonstrated until now about the association of PA in adulthood and BBD.[5] More people live sedentary lives because many work and leisure activities are carried out virtually.[12] Therefore, the relationship between PA effect on breast disorders, including BBD, increases in importance. Dietary habits are also important components of lifestyle and can be related to BBD risk in women. Traditionally, some dietary recommendations are provided to women with BBD, based on some experimental evidence,[13] but are mostly related to the historical experience about the effect of some dietary nutrients on mastalgia.[14-16] However, it is still unknown whether dietary habits can influence BBD. The aim of this study was to investigate the association of FA and FCD, as the most common BBDs, with PA and some dietary habits.

METHODS

This study was carried out in Arash Women's Hospital of Tehran University of Medical Sciences (TUMS), Tehran, Iran, among women attending the breast clinic from October 2018 to August 2020 according to protocol numbers 97-01-218-37716- 97-01-218-37719. All methods were performed in accordance with the guidelines and regulations of the Ethics Committee of TUMS and in accordance with the Declaration of Helsinki. Informed consent was signed by all participants.

Inclusion and exclusion criteria

Inclusion criteria for the FA group included women between 18 and 50 years of age with 1 or several unilateral or bilateral FAs according to histology and/or ultrasonography, and history of inclusion criteria for the non-FA group included women between 18 and 50 years of age without any FAs on breast ultrasound. Inclusion criteria for the FCD group included women between 18 and 50 years of age diagnosed with FCD based on history, physical examination, and ultrasonography. Inclusion criteria for the non-FCD group included women between 18 and 50 years of age without any FCD in breast examination and ultrasonography. Exclusion criteria for all the groups consisted of women who were pregnant or lactating, vegetarians, those with a BMI of more than 29.9 kg/m^2, and/or a history of breast

cancer, diabetes mellitus, thyroid dysfunction, and/or metabolic syndrome.

Tests and measurements

We have previously published 2 studies on FA (approved by the Institutional Research Board code: 97-01-218-37716- and the Ethics Committee ID: IR.TUMS.VCR.1397.357- of TUMS) and on FCD (approved by the Institutional Research Board code: 97-01-218-37719- and the Ethics Committee ID: IR.TUMS.VCR.REC.1397.358- of TUMS).[17,18] During those studies, an International Physical Activity Questionnaire (IPAQ) was completed for all participants. This questionnaire has previously been translated to Farsi and validated in Iran.[19] Based on standard Food Frequency Questionnaires (FFQs), we designed a short questionnaire including items that have been introduced as probably harmful or protective for BBD, including (in alphabetical order) banana, cabbages, celery, cheese, chicken, chocolate, cocoa, coffee, cola, fish, fresh vegetables, nuts, red meat, sausages, soy, spices, and tea. Spices that are more common in Iranian food were considered, including cinnamon, cumin, curry powder, ginger, garlic powder, paprika, pepper, thyme, and turmeric. These questionnaires were also completed by women without FCD as controls of FCD patients (non-FCD group) and without FA as controls of FA (non-FA group). Participants' interviews for completing the IPAQs and FFQs and measurements of anthropometric variables including height, weight, waist, and hip circumference were carried out by a trained research staff. BMI was calculated as weight in kilograms divided by height in meters squared and classified according to the World Health Organization classification of obesity for BMI of 30 kg/m^2 or more, overweight for BMI of 25 kg/m^2 or more but less than 30 kg/m^2, and normal for BMI less than 25 kg/m^2. Waist-to-hip ratio (WHR) was calculated as waist circumference divided by hip circumference and classified as normal for WHR less than 0.8 and high for WHR more than 0.8.[20,21] The amount of participant PA was calculated and classified according to the guidelines for data processing and analysis of the IPAQ.[22] Therefore, 3 PA levels were considered including inactive, minimally active, and highly active classes.

Statistical methods

The statistical analysis was performed using SPSS version 24.0 (IBM, Armonk, New York). Data in the study groups were summarized using descriptive statistics, mean ± SD, or median (interquartile range for continuous variables and frequency [percentage] for categorical variables). As appropriate, case and control groups were compared using 2-tailed t tests, Fisher exact tests, or χ^2 tests. Univariable and multivariable logistic regression models were fitted to assess the association of PA and dietary habits with BBD. Covariates with a P value of .2 or less were included in the multivariable model as a potential confounder. Results were presented as crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs).

RESULTS

A total of 779 women were entered in the study, including 216, 196, 152, and 215 participants in the FA and non-FA, FCD, and non-FCD groups, respectively. The anthropometric and reproductive characteristics of women in the 4 groups are presented in Table 1. The mean ± SD age of participants in the FCD group was lower than in those in the non-FCD group (43.2 ± 8.1 vs 46.9 ± 10.1 years of age, respectively; $P = .002$). There was a nonsignificant difference between these 2 groups regarding BMI and WHR. Also, the participants were younger in the FA than in the non-FA groups (40.1 ± 9.9 vs 46.9 ± 10.1 years of age, respectively; $P < .001$) and had a lower BMI (25.4 ± 4.4 vs 27.1 ± 4.5 kg/m^2, respectively; $P = .020$). The WHR was similar between the 2 groups. BBD groups compared with their relevant control groups had a lower frequency of irregular menstrual patterns and history of oral contraceptive use but a higher prevalence of family

Table 1. Characteristics of Participants by Study Group

Variable	FA (%)	Non-FA (%)	P[a]	FCD (%)	Non-FCD (%)	P[a]
Age, mean (SD)	40.1 (9.9)	46.9 (10.1)	**<.001**	43.2 (8.1)	46.9 (10.1)	**.002**
BMI (kg/m^2) mean (SD)	25.4 (4.4)	27.1 (4.5)	**.020**	26.6 (5.0)	27.1 (4.6)	.551
Waist-to-hip ratio >0.8, N (%)	79.4% (170)	68.8% (11)	.314	84.1% (127)	68.8% (11)	.123
Age of menarche, mean (SD)	13.3 (1.4)	13.2 (1.6)	.789	13.3 (1.3)	13.2 (1.6)	.782
Irregular menstrual pattern, N (%)	16.9% (33)	28.6% (18)	**.044**	15.9% (21)	28.6% (18)	**.039**
Gravidity, N (%)						
0	24.5% (53)	12.5% (11)	**.006**	12.5% (19)	12.5% (11)	**.004**
1-3	63.0% (136)	62.5% (55)		78.3% (119)	62.5% (55)	
>3	12.5% (27)	25.0% (22)		9.2% (14)	25.0% (22)	
History of abortion	22.2% (48)	26.1% (23)	.464	19.7% (30)	26.1% (23)	.249
Breastfeeding	72.2% (156)	81.8% (72)	.080	84.2% (128)	81.8% (72)	.632
History of infertility	9.3% (20)	8.0% (7)	.717	11.8% (18)	8.0% (7)	.342
History of OCP use	29.8% (64)	47.7% (42)	**.003**	25.0% (38)	47.7% (42)	**<.001**
History of HRT use	8.3% (18)	23.9% (21)	**<.001**	23.0% (35)	23.9% (21)	.883
FH of BBD	39.8% (86)	11.4% (10)	**<.001**	34.9% (53)	11.4% (10)	**<.001**

Abbreviations: BBD, benign breast disease; BMI, body mass index; FA, fibroadenoma; FCD, fibrocystic disease; FH, family history; HRT, hormone replacement therapy; OCP, oral contraceptive; SD, standard deviation.
[a]Bold values indicate significant ($P < .05$).

history of BBD. In addition, participants in the FA group reported a history of hormone replacement therapy less frequently than those in the non-FA group (all P values <.05). BBD case groups and their relevant control groups were similar regarding the age of menarche, history of abortion, breastfeeding, and infertility status.

The status of participant PA in each group is shown in Table 2. There was a nonstatistical difference between women in BBD case groups and relevant control groups regarding PA levels ($P > .05$). The crude and adjusted ORs and 95% CI for the development of FA and FCD regarding level of PA are demonstrated in Table 3. Association between PA and each BBD was statistically nonsignificant in both crude and adjusted models.

The average weekly amount of intake of the studied foods for each group is presented in Table 4. The crude and adjusted ORs and 95% CI for the development of FA and FCD regarding the use of the investigated nutrients are shown in Table 5.

Table 2. Amount of Physical Activity by Study Group

Group	Physical Activity			P
	Inactive	Minimally Active	High Active	
FCD	38.2% (58)	55.9% (85)	5.9% (9)	.291
Non-FCD	28.4% (25)	65.9% (58)	5.7% (5)	
FA	34.8% (72)	61.4% (127)	3.9% (8)	.489
Non-FA	28.4% (25)	65.9% (58)	5.7% (5)	

Abbreviations: FA, fibroadenoma; FCD, fibrocystic disease.

Table 3. Association Between Physical Activity and the Risk of Benign Breast Diseases: Logistic Regression Analysis

Variables		FA Group				FCD Group			
		Crude Model		Adjusted Model[a]		Crude Model		Adjusted Model[b]	
		OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
Physical activity	Inactive	Reference	. . .	References	. . .	Reference	. . .	References	. . .
	Minimally active	0.76 (0.44-1.32)	.330	0.74 (0.37-1.50)	.406	0.63 (0.35-1.12)	.118	0.58 (0.32-1.06)	.077
	High active	0.56 (0.17-1.86)	.340	0.57 (0.10-3.08)	.512	0.78 (0.24-2.55)	.676	0.70 (0.21-2.36)	.561

Abbreviations: CI, confidence interval; FA, fibroadenoma; FCD, fibrocystic disease; OR, odds ratio.
[a]Adjusted for age and body mass index.
[b]Adjusted for age.

DISCUSSION

In this study, the association of weight indicators, PA, and dietary habits with BBD was evaluated. We detected no association with weight indicators and PA, but a significant association with selected foods including cabbage, celery, and chocolate for FA, and coffee, tea, banana, spices, and chicken for FCD was detected.

BBD is the most common breast problem occurring much more frequently than breast cancer[5,23] and often requires surgical intervention.[24] It is sometimes accompanied by uncomfortable symptoms, such as breast pain, and can be a source of anxiety.[25] FA and FCD are the most common types of BBD[2,26] and are, therefore, the focus of this study. The association of FA and FCD with sex hormone–dependent factors, including reproductive factors, is well known.[5,26] Obesity or adiposity may also be a risk factor for BBD because of the consequent increase in peripheral estrogen synthesis.[8] The amount of body fat is not captured in BMI, and body composition can be measured but can require expensive equipment. However, WHR has a high correlation with visceral fat level.[10] Therefore, WHR as a measure of body fat composition was used.

Chen et al[27] studied the association of body fat and FCD and found that a higher percentage of body fat and lower lean body mass may increase the frequency of the FCD. A similar finding was demonstrated by Pena et al[28] who showed a higher percentage of body fat in women with BBD. Conversely, in our study, no association was found between either BMI or WHR and FA or FCD. Ethnic differences between Brazilian,[28] Taiwanese,[27] and Iranian women might be the reason for these varied results. There may be other reasons for this dissimilarity. Both studies used validated instruments to measure body fat (Tanita Body Fat Monitor Scale and Biospace). However, Pena et al[28] included BBD cases diagnosed by a histologic examination, although women with BBD are typically diagnosed clinically or via breast imaging; therefore, their

Table 4. Dietary Habits by Study Group

	Units/Wk	FCD	Non-FCD	*P*[a]	FA	Non-FA	*P*[a]
Banana	0	40.1% (61)	33.0% (29)	.088	40.1% (83)	33.0% (29)	.262
	1	34.9% (53)	28.4% (25)		24.6% (51)	28.4% (25)	
	2	13.2% (20)	14.8% (13)		19.3% (40)	14.8% (13)	
	≥3	11.8% (18)	23.9% (21)		15.9% (33)	23.9% (21)	
Cabbages	0	45.4% (69)	48.9% (43)	.677	67.8% (141)	48.9% (43)	**.022**
	1	27.0% (41)	21.6% (19)		14.4% (30)	21.6% (19)	
	2	11.2% (17)	9.1% (8)		6.3% (13)	9.1% (8)	
	≥3	16.4% (25)	20.5% (18)		11.5% (24)	20.5% (18)	
Celery	0	68.4% (104)	71.6% (63)	.347	90.8% (188)	71.6% (63)	<.001
	1	27.0% (41)	20.5% (18)		8.2% (17)	20.5% (18)	
	≥2	4.6% (7)	8.0% (7)		1.0% (2)	8.0% (7)	
Cheese	0	9.9% (15)	2.3% (2)	.083	12.0% (25)	2.3% (2)	**.013**
	≤7	32.2% (49)	33.0% (29)		36.5% (76)	33.0% (29)	
	7	57.9 (88)	64.8% (57)		51.4% (107)	64.8% (57)	
Chocolate	0	52.3% (79)	46.6% (41)	.258	65.2% (135)	46.6% (41)	**.016**
	1	15.9% (24)	14.8% (13)		12.6% (26)	14.8% (13)	
	2	9.3% (14)	18.2% (16)		9.2% (19)	18.2% (16)	
	≥3	22.5% (34)	20.5% (18)		13.0% (27)	20.5% (18)	
Chicken	0	3.9% (6)	4.5% (4)	.761	3.4% (7)	4.5% (4)	**.002**
	1	13.2% (20)	16.2% (16)		8.7% (18)	18.2% (16)	
	2	19.7% (30)	15.9% (14)		24.5% (51)	15.9% (14)	
	3	32.9% (50)	18.2% (16)		34.6% (72)	18.2% (16)	
	≥4	30.3% (46)	43.2% (38)		28.8% (60)	43.2% (38)	
Cocoa	0	63.6% (96)	69.3% (61)	.342	72.6% (151)	69.3% (61)	.849
	1	18.5% (28)	11.4% (10)		10.1% (21)	11.4% (10)	
	≥2	17.9% (27)	19.3% (17)		17.3% (36)	19.3% (17)	
Coffee	0	80.3% (122)	78.4% (69)	.731	86.6% (187)	78.4% (69)	.077
	≥1	19.7% (30)	21.6% (19)		13.4% (29)	21.6% (19)	
Cola	0	66.4% (101)	69.3% (61)	.667	68.8% (143)	69.3% (61)	.445
	1	20.4% (31)	16.2% (16)		13.9% (29)[b]	18.2% (16)	
	2	3.3% (5)	5.7% (5)		4.8% (10)	5.7% (5)	
	≥3	9.9% (15)	6.8% (6)		12.5% (26)	6.8% (6)	
Fish	0	80.3% (122)	90.9% (80)	**.039**	87.0% (180)	90.9% (80)	.371
	1	17.1% (26)	5.7% (5)		10.6% (22)	5.7% (5)	
	≥2	2.6% (4)	3.4% (3)		2.4% (5)	3.4% (3)	
Fresh vegetables	0	3.9% (6)	6.8% (6)	.520	4.3% (9)	6.8% (6)	.540
	1	55.9% (85)	58.0% (51)		63.5% (132)	58.0% (51)	
	≥2	40.1% (61)	35.2% (31)		32.2% (67)	35.2% (31)	
Nuts	0	54.3% (82)	58.0% (51)	.886	68.8% (143)	58.0% (51)	.236
	1	18.5% (28)	15.9% (14)		14.4% (30)	15.9% (14)	
	2	6.6% (10)	8.0% (7)		6.3% (13)	8.0% (7)	
	≥3	20.5% (31)	18.2% (16)		10.6% (22)	18.2% (16)	
Tea	0	80.3% (122)	78.4% (69)	.731	86.6% (187)	78.4% (69)	.077
	1	19.7% (30)	21.6% (19)		13.4% (29)	21.6% (19)	

(*continues*)

Table 4. Dietary Habits by Study Group (*Continued*)

	Units/Wk	FCD	Non-FCD	*P*[a]	FA	Non-FA	*P*[a]
Red meat	0	3.9% (6)	5.7% (5)	.392	7.7% (16)	5.7% (5)	.161
	1	17.1% (26)	11.5% (10)		16.3% (34)	11.5% (10)	
	2	13.8% (21)	18.4% (16)		22.1% (46)	18.4% (16)	
	3	32.9% (50)	25.3% (22)		29.3% (61)	25.3% (22)	
	≥4	32.2% (49)	39.1% (34)		24.5% (51)	39.1% (34)	
Sausages	0	80.3% (122)	89.8% (79)	.054	87.0% (180)	89.8% (79)	.499
	1	19.7% (30)	10.2% (9)		13.0% (27)	10.2% (9)	
Soy	0	60.9% (92)	72.7% (64)	.181	69.7% (145)	72.7% (64)	.828
	1	29.1% (44)	20.5% (18)		21.6% (45)	20.5% (18)	
	≥2	9.9% (15)	6.8% (6)		8.7% (18)	6.8% (6)	
Spices	<7	98.7% (150)	54.5% (48)	**<.001**	57.7% (120)	54.5% (48)	.617
	≥7	1.3% (2)	45.5% (40)		42.3% (88)	45.5% (40)	

Abbreviations: FA, fibroadenoma; FCD, fibrocystic disease.
[a]Bold values indicate significant ($P < .05$).
[b]Includes ≥1.

subjects may be representative of those cases of BBD that cause a suspicious finding or an image that leads to biopsy or surgery. In the study by Chen et al,[27] women with diabetes, liver disease, and metabolic syndrome were also included, while women with these conditions were excluded in our study. Therefore, the results of our research might account for a better demonstration of the relationship between BBD and body fat.[10]

PA has been mentioned as a modifiable factor affecting endogenous estrogen levels because of its effect on sex hormone synthesis and bioavailability.[29] Nevertheless, few studies that have investigated the relationship between PA and BBD have yielded controversial results.[11,29] In the Growing Up Today Study,[11] no association was found between PA in adolescents and their future risk of BBD, except for a lowered risk in those who walked more. Accordingly, the Nurses' Health Study II cohort[29] showed a reverse association between amount of walking in young age and BBD in adulthood; however, heavy exercise was found to have a probable protective effect for some BBD. Conversely, Nelson et al[30] showed that strenuous exercise earlier in life increased the rate of FA, although moderate exercise lowered the risk. These studies were about PA in young age, although da Conceição[5] found no association between PA during adulthood and BBD. Our results were consistent with the latter in terms of life period of PA and lack of any association with BBD.

The relationship of different foods and BBD has been postulated in various studies. Hafiz et al[16] showed the association of mastalgia in BBD with consumption of methylxanthines including coffee, tea, and chocolate, and Sochacka-Tatara et al[31] demonstrated the relationship with fried dishes. Boeke et al[32] disclosed a positive association with alcohol and a negative association between nuts and BBD. Aghababayan et al[33] approached the issue of nutrients and BBD from another perspective. In one study,[33] they calculated the dietary inflammatory index in the diets of patients and showed a probable direct association with using higher amounts of foods with inflammatory potential. In a second study,[34] they considered the dietary phytochemical index of the diets and showed an inverse association with BBD. Tiznobeyk et al[35] classified patient diets as healthy (including fruits and vegetables, nuts, low-fat dairy, fish, and chicken among others) and unhealthy (including red meats and other foods) and showed that a healthy diet could lower BBD to some extent, although the unhealthy one was not a specific risk factor for BBD.

Table 5. Association Between Food Intake and the Risk of Each BBD: Logistic Regression Analysis

		FA Group				FCD Group			
		Crude Model		Adjusted Model		Crude Model		Adjusted Model	
Variables		**OR (95% CI)**	***P*[a]**	**OR (95% CI)**	***P*[a]**	**OR (95% CI)**	***P*[a]**	**OR (95% CI)**	***P*[a]**
Banana	0	1.82 (0.91-3.64)	.089	1.34 (0.55-3.25)	.521	**2.45 (1.14-5.30)**	**.022**	**2.41 (1.10-5.27)**	**.028**
	1	1.30 (0.63-2.68)	.482	1.20 (0.47-3.07)	.708	**2.47 (1.12-5.44)**	**.024**	**2.50 (1.11-5.63)**	**.027**
	2	1.96 (0.85-4.50)	.113	1.84 (0.59-5.70)	.293	1.79 (0.70-4.60)	.223	1.63 (0.62-4.27)	.324
	≥3	References	. . .	References	. . .	Reference	. . .	References	. . .
Cabbages	0	**2.46 (1.22-4.95)**	**.012**	**2.46 (1.03-5.91)**	**.043**	1.15 (0.56-2.36)	.692	1.20 (0.57-2.51)	.630
	1	1.18 (0.51-2.74)	.693	2.23 (0.70-7.07)	.172	1.55 (0.69-3.51)	.289	1.85 (0.79-4.30)	.153
	2	1.22 (0.42-3.56)	.718	0.79 (0.24-2.65)	.709	1.53 (0.54-4.31)	.421	1.53 (0.53-4.46)	.432
	≥3	References	. . .	References	. . .	Reference	. . .	References	
Celery	0	**10.44 (2.11-51.58)**	**.004**	**10.00 (1.65-60.55)**	**.012**	1.65 (0.55-4.93)	.369	1.99 (0.62-6.33)	.245
	1	3.31 (0.60-18.19)	.169	3.70 (0.52-26.21)	.190	2.28 (0.70-7.45)	.173	2.66 (0.76-9.27)	.125
	≥2	Reference	. . .	References	. . .	Reference	. . .	References	. . .
Cheese	0	**6.66 (1.52-29.13)**	**.012**	4.68 (0.59-36.81)	.143	**4.86 (1.07-22.05)**	**.041**	3.86 (0.83-17.98)	.085
	≤7	1.40 (0.82-2.38)	.222	0.82 (0.43-1.60)	.569	1.09 (0.62-1.93)	.755	1.00 (0.55-1.80)	.997
	7	Reference	. . .	References	. . .	Reference	. . .	References	. . .
Chocolate	0	**2.19 (1.10-4.38)**	**.026**	**2.49 (1.03-6.05)**	**.043**	1.02 (0.51-2.02)	.955	0.93 (0.45-1.90)	.841
	1	1.33 (0.54-3.26)	.528	1.38 (0.44-4.27)	.579	0.97 (0.40-2.37)	.960	0.78 (0.31-1.96)	.599
	2	0.79 (0.32-1.93)	.608	0.63 (0.21-1.84)	.398	0.46 (0.18-1.16)	.100	0.40 (0.15-1.03)	.059
	≥3	Reference	. . .	References	. . .	Reference	. . .	References	. . .

Abbreviations: CI, confidence interval; FA, fibroadenoma; FCD, fibrocystic disease; OR, odds ratio.

[a]Bold values indicate significant ($P < .05$).

In our study, in the crude model for FA, not consuming cabbage (OR = 2.46; 95% CI, 1.22-4.95), celery (OR = 10.44; 95% CI, 2.11-51.58), cheese (OR = 6.66; 95% CI, 1.52-29.13), and chocolate (OR = 2.19; 95% CI, 1.10-4.38) but consuming chicken (OR = 2.85; 95% CI, 1.45-5.61) increased the risk of FA. In the adjusted model, the association of cabbage, celery, and chocolate intake remained statistically significant. In addition, there was a significant association between not consuming coffee and tea (OR = 2.19; 95% CI, 1.01-4.76) and a higher risk of FA in the adjusted model. In the crude model for FCD, not consuming banana, cheese, and spices (OR = 2.45; 95% CI, 1.14-5.30; OR = 4.9; 95% CI, 1.07-22.05; OR = 62.5; 95% CI, 14.56-268.28, respectively) significantly increased the risk of FCD. Conversely, chicken intake significantly increased the risk (OR = 2.58; 95% CI, 1.27-5.24). All associations remained significant in the adjusted model except for cheese intake. In summary, diet was shown to impact the risk of BBD, and in contrary to previous assumption, cabbage, celery, and chocolate, tea, and coffee had an inverse association with FA; banana and spices had an inverse relationship with FCD. While use of red meat was not associated with BBD, a higher use of chicken was associated with an increased risk of both FA and FCD.

Our study had limitations. We did not assess the relationship between symptoms such as breast pain and breast edema with food intake. In addition, we did not investigate whether modifying the dietary habits could affect the clinical picture of BBDs.

CONCLUSION AND CLINICAL IMPLICATIONS

Our study showed that BBD had no association with BMI and WHR, and PA also had no impact on FA and FCD. Dietary habits may affect BBD risk. Contrary to the general assumption, chocolate, tea, and coffee consumption were not associated with BBD, while higher use of chicken elevated the risk. This study has several implications in clinical practice. Dietary recommendations are often provided to women as the first step of BBD management, and patients may be asked to avoid methylxanthines or caffeine including tea, coffee, and chocolate. However, since our results did not identify these components as risk factors for BBDs, these recommendations should be carefully considered. We have also shown that the association of different types of meat and BBDs warrant further investigation. Finally, PA may not be the most appropriate management strategy for BBDs. Further study on the relationship among diet, PA, and BBD is needed.

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