

Breast Cancer Risk Factors: a Cross- Cultural Comparison between the West and the East

Lina Kurdahi Badr^{1*}, Laura Bourdeanu², Manal Alatrash³, Garine Bekarian⁴

Abstract

Background: The incidence of breast cancer in Lebanon is higher than any other Middle –Eastern country, is diagnosed at a younger age than women in Western countries, and is more aggressive and fatal. Therefore addressing risk factors in this population is of paramount importance. **Methods:** A descriptive cross-sectional, comparative design evaluated the risk factors for breast cancer in a convenient sample of 105 Lebanese-American women with 250 Lebanese. Odds Ratio, Chi square t-tests or ANOVA were used to compare the two groups' risk factors and knowledge of screening tools. Associations found to be statistically significant were included in three multiple logistic regression models to estimate the odds of each variable for performing a mammography, a clinical breast exam (CBE) and a breast self-exam (BSE). **Results:** There were more Muslims in the Lebanese-American sample who perceived having a better income, and had a better understanding of the effectiveness of the mammogram, the CBE and the BSE. The Lebanese group reached menopause at an older age, $t = 2.66$, $p = 0.05$, smoked more, $OR = 1.42$, $p = 0.001$ and were five times more likely to live close to a main road or highway, $OR = 5.75$, $p = 0.001$ than the Lebanese-American group. The Lebanese- Americana group breast fed longer $\chi^2 = 11.68$, $p = .008$, used contraceptives more, $OR = 1.74$, $p = 0.027$, exercised more, $OR = 1.61$, $p < 0.001$, and consumed more vegetables and fruits than their Lebanese counterparts, $OR = 1.22$, $p = 0.002$, and $OR = 1.27$ $p = 0.001$, respectively. For ever having a mammogram, the duration of breastfeeding (>6 months), effectiveness of the mammogram, and exercise were significant predictors. While for ever having a CBE, smoking, eating fruits, and exercise were significant. No variables were related to performing a BSE. **Conclusion:** The Lebanese women had higher risk factors for developing breast cancer, and had less knowledge of the benefits of breast cancer screening tools, calling for the importance of promoting healthy life styles and education.

Keywords: Breast cancer- risk factors- screening

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Introduction

Breast cancer is the most commonly diagnosed cancer in females living in developed and developing countries. It is the second leading cause of cancer death in women after lung cancer (WHO, 2014a). World wide, the estimated number of women who died in 2011 due to breast cancer exceeded 500,000 with nearly 1.7 million diagnoses yearly (WHO, 2014b). In Lebanon, the incidence of cancer is higher than any other Middle –Eastern country (Kulhánová et al., 2017) with breast cancer being the most prevalent malignancy (Adib et al., 2009). Breast cancer in Lebanon accounts for one third of all female cancers with and presents at an earlier age at diagnosis, 52 years compared to 63 years for counterparts in the West, including the United States (Makoukji et al., 2016). Younger age at diagnosis is of concern, as typically younger women present with more aggressive forms of breast cancer, more invasive pathology and higher rates of lymph node involvement leading to poor prognosis and

subsequently high mortality rates (Lakkis et al., 2010; Chouchane, 2013). Remarkably, it has been examined that the prevalence of deleterious BRCA mutations is lower than expected in Lebanese women, supporting the hypothesis that factors other than genes contribute to breast cancer in young women (El Saghier et al., 2015). Moreover, Makoukji et al., (2016) noted different gene expressions in Lebanese women compared to women in the West and concluded that Lebanese women may be exposed to unique environmental and genetic factors which lead to early breast cancer and which warrant further investigations. There are several documented risk factors for developing breast cancer and these can be divided into two groups: genetic factors and lifestyle or environmental factors. The genetic factors include age, race, family history or personal history of breast cancer, early menstruation (before age 12), late menopause (after age 51), reproductive history, and dense breast tissue. The lifestyle or environmental risk factors include: number of births, use of birth control or hormone therapy after

¹Azusa Pacific University, ²Excelsior College, ³Cal State University, Fullerton, United States, ⁴Saint-Joseph University, Lebanon.

*For Correspondence: lbadr@apu.edu

menopause, breastfeeding, alcohol use, being overweight or obese, and lack of exercise and diet (Horn &, Vatten, 2017; Jerônimo et al., 2017; Lakkis et al., 2010; Li et al., 2017).

Due to early age of breast cancer occurrence among Lebanese women, the Lebanese guidelines for breast cancer screening include annual mammogram screening starting at the age 40, monthly breast self-exam, and yearly clinical breast exam (Lakkis et al., 2010). Despite these recommendations, there seems to be disparities in breast cancer screening practices between Lebanese women compared to their Lebanese-American counterparts. For example comparing screening rates within similar years of data collection, 36.4% of women of Lebanese descent in the US underwent a mammography every one to two years (Schwartz et al., 2008), which is twice that reported in the Lebanon of 18% (Adib et al., 2009). In addition, several studies of Arab women reveal that breast cancer screening participation rates are in general low (Abu-Helalah et al., 2015; Aminisan et al., 2016; Azaisa et al, 2010; Elias et al., 2016).

Early detection of breast cancer can be achieved by mammography, breast self examination (BSE), and clinical breast examination (CBE), all of which can lead to lower breast cancer mortality rates (Smith et al., 2014). Although mammography screening is currently the only standard for screening for breast cancer in the US, CBE and BSE should continue to be alternatives to the early detection of breast cancer in developing countries where mammography is not readily available or affordable (Kohler et al., 2017). In resource-constrained countries, BSE is recommended because it is free, private, painless, easy, safe, and requires no specific equipment (Sama et al., 2017; Suh et al., 2012).

To date, there are no studies identifying breast screening practices and life-style or environmental risk factors for developing breast cancer in Lebanese women living in the US compared to those living in Lebanon. A thorough understanding of the prevalent risk factors of breast cancer and the use of breast cancer screening tools will lead to prevention interventions for breast cancer and early detection of the disease. Therefore, the purpose of this study was to compare the breast cancer screening practices and risk factors for breast cancer in Lebanese and Lebanese–American women, to assess the knowledge of mammography, CBE and BSE and to investigate any relationships between risk factors, knowledge and ever performing a mammography, a CBE or a SBE. Although recent statistics in Lebanon and California are not available, what is documented is that thirty-nine percent of Arab Americans in the US are of Lebanese origin, with California being the second state after Michigan where Lebanese Americans reside. Lebanese Americans have diverse religious backgrounds including mostly Christian Maronite Catholicism, and Greek Orthodox, followed by Muslim Sunnis and Shia Islam. In Lebanon, Muslims are the most numerous group overall followed by Maronite Catholics and Greek Orthodox (Maksoud et al, 2019, Stephan, 2009). The research questions posed for this study include:

1) Is there a difference in the risk factors for breast

cancer between Lebanese- Americans and Lebanese participants?

2) Is there a difference in the performance of breast cancer screening tests between Lebanese- Americans and Lebanese participants?

3) What are the best predictors of performing a Mammogram, a CBE and a SBE in both groups combined?

Materials and Methods

Design

A descriptive cross-sectional, comparative design was used in this study.

Sample

The sample size was based on a previous study (Adib et al., 2009) where the percent of women in Lebanon obtaining a mammogram is 18% and the following formula (Cohen, 1987).

$$n = \left(\frac{r + 1}{r} \right) \frac{(\bar{p})(1 - \bar{p})(Z_{\beta} + Z_{\alpha/2})^2}{(p_1 - p_2)^2}$$

yields a sample size of 350 to achieve a power of 80% at a 5% significance level. A convenience sample of 250 women was recruited from Beirut, Lebanon and 105 women from greater Los Angeles area, United States of America. Criteria for inclusions were (a) first generation Lebanese born for the American sample and Lebanon-born residing in Lebanon for Lebanese women, (b) age 40 or older, (c) no history of breast cancer, and (d) understands and reads English or Arabic.

Instruments

A survey containing two parts based on earlier studies on risk factors for breast cancer and knowledge of breast cancer screening tools was used (Azaisa et al., 2010; Jerônimo et al., 2017 ; Lakkis et al., 2010).

1) Socio-Cultural information included: age, height and weight (BMI), marital status, education, employment, perceived economic status, and religion. In addition participants were asked to rate their familiarity with mammography, CBE and BSE (yes/no) and effectiveness of mammography, CBE and BSE (rated from 1 very low to 5 very high) and whether their doctor recommend a mammogram. The dependent variable was ever having a mammogram, a CBE or a BSE.

2) Risk factors for breast cancer included: age at menarche, age at first pregnancy, number of pregnancies, age at menopause, breast feeding history, being physically active, use of hormones after menopause, use of contraceptives, history of breast biopsy, family history of breast cancer, smoking (cigarettes and Hooka or water pipe), alcohol use, and living close to a main road or highway. We did not obtain information on the BRCA gene as a previous study in Lebanon did not attribute the BRCA gene to breast cancer incidence in Lebanon (El Saghier et al., 2015).

Procedure

A poster was posted on the announcement bulletin board of the churches and mosques frequently attended

by Lebanese women in Beirut, Lebanon and Greater Los Angeles, USA requesting their participation in the study. The poster was placed on the Announcement Bulletin Board and the study materials were made available in a box near the Announcement Bulletin Board. The churches and mosques provided the venue for the study only, and did not sponsor, support, or participate in the promotion of the study. The members of these institutions were not involved in asking eligible women to participate. Interested participants completed a questionnaire packet that was returned to the researcher in the enclosed postage paid envelope. By filling out the questionnaire the participants consented to participating in the study.

Data analysis

Descriptive statistics were first conducted on all the socio-cultural variables and were then compared using Odds Ratio (OR), Chi square (χ^2), t-tests or Analysis of variance (ANOVA), depending on whether the variable was continuous or categorical. Second, the risk factors in both groups were compared using OR, Chi square, t tests or ANOVA based on whether the variable was continuous or categorical. Third we calculated the average scores on the effectiveness of the mammogram the CBE and the SBE and compared the 2 groups using ANOVA. We also compared the 2 groups on their familiarity with or having had a mammogram a CBE or a BSE, using OR, and if the doctor recommended a mammogram using OR. Fourth, any associations found to be statistically significant (p -value ≤ 0.05) between the two groups were included in three multiple logistic regression models to estimate the odds of each variable for ever performing a mammography (yes/no), a CBE (yes/no) and a BSE (yes/ no) adjusting for income and religion. Likert responses were categorized into high (average > 3) or low average (≤ 3). Breastfeeding duration was categorized into > 6.1 months and ≤ 6 months, and age at menopause was categorized into > 51.1 years and below ≤ 51 years. All tests were two sided, and p value < 0.05 was considered significant.

Results

Sample characteristics

The majority of the participants were between the ages of 40-49 years with significant differences in religion and income. There were more Muslim women (55.7%) in the Lebanese-American group compared to the Lebanese group (38.2%), [OR = 1.6 (CI= 1.35-1.86), $p = 0.004$] and the Lebanese-American group had a perceived better income [$\chi^2 = 10.28$, $p = 0.006$]. More physicians recommended a mammogram in the Lebanese-American sample, [74.3% vs 63.2%. OR = 1.68 (CI= 1.01- 2.79), $p = 0.045$] and the Lebanese-American participants had a significantly better understanding of the effectiveness of the mammogram, the BSE and the CBE [F (1/349) = 4.12, $p = 0.043$, F(1/349) = 6.29, $p = 0.013$, and F(1/349) = 5.47, $p = 0.020$], respectively.

Is there a difference in the risk factors for breast cancer between Lebanese- Americans and Lebanese participants?

As noted in Table 2, the Lebanese women reached

menopause at an older age [48.89 \pm 4.85 vs 46.13 \pm 10.04, $t = 2.66$, $p = 0.05$], smoked twice as much as the Lebanese-Americans, [45.2% vs 21.9%, OR = 1.42 (CI= 1.22-1.67), $p = 0.001$] and were five times more likely to live close to a main road or highway, [84.0% vs 69.5%, OR = 5.75 (CI= 2.98-11.09), $p = 0.001$]. Breast feeding duration was longer for the Lebanese-American group [$\chi^2 = 11.68$, $p = .008$], contraceptive use was higher [41.9% and vs 34.4%, OR = 1.74 (CI= 1.06-2.87), $p = 0.027$] and

Table 1. Characteristics of the Sample Size N= 355

Variable	Lebanese American (n=105)	Lebanese (n=250)	P-value
	N (%) or Mean \pm SD	N (%) or Mean \pm SD	
Age			0.07
40-49	47 (44.8)	131 (52.4)	
50-59	38 (36.2)	76 (30.4)	
60-69	12 (11.4)	33 (13.3)	
69-75	3 (2.8)	10 (4.1)	
BMI	26.61 \pm 4.61	25.89 \pm 5.72	NS
Marital status,			
Single/widowed/divorced	22 (20.9)	37 (14.8)	
Married	83 (79.1)	213 (85.2)	
Religion			0.004
Muslim	54 (55.7)	78 (38.2)	
Christian	43 (44.3)	126 (61.8)	
Employment			NS
Yes	56 (53.3)	143 (57.2)	
No	49 (46.7)	107 (42.8)	
Years of education	15.79 \pm 4.67	14.48 \pm 5.78	NS
Income			0.006
Comfortable	44 (41.9)	61 (24.4)	
Enough to make ends meet	52 (49.5)	147 (58.8)	
Not enough	9 (8.6)	42 (16.8)	
Familiar with a mammogram			NS
Yes	99 (94.3)	228 (91.2)	
No	6 (5.7)	22 (8.8)	
Familiar with a CBE			NS
Yes	53 (49.5)	113 (45.2)	
No	52 (49.5)	137 (54.8)	
Familiar with a SBE			NS
Yes	62 (59.1)	151 (60.4)	
No	43 (40.9)	99 (39.6)	
Effectiveness of mammogram (from 1-5)	4.32 (1.12)	4.01 (1.24)	0.043
Effectiveness of BSE (from 1-5)	3.75 (1.25)	3.24 (1.47)	0.013
Effectiveness of CBE (from 1-5)	3.97 (1.12)	3.24 (1.35)	0.02
Has Doctor recommend a mammogram			0.045
Yes	78 (74.3)	158 (63.2)	NS
No	27 (25.7)	92 (36.8)	

*NS, non-significant

Table 2. Risk Factors for Breast Cancer in Both Groups

Variable	Lebanese–American N= 105	Lebanese N =250	P value
Breastfeeding			NS*
Yes	72 (68.6)	169 (67.6)	
No	33 (31.4)	81 (32.4)	
Breastfeeding duration			0.008
Less than 2 months	18 (17.1)	64 (25.6)	
Up to 6 months	29 (27.6)	96 (38.4)	
6 months to 1 year	32 (30.5)	54 (21.6)	
More than 1 year	26 (24.8)	36 (14.4)	
Number of pregnancies			
Age at first pregnancy age in years.	24.67±4.45	24.33 ± 5.24	NS
Age at menarche	13.06 ± 4.70	12.99 ± 1.42	NS
Age at menopause	46.13 ± 10.04	48.89 ± 4.85	0.05
Use of contraceptives			0.027
Yes	44 (41.9)	86 (34.4)	
No	61 (58.1)	164 (65.6)	
Smoking (cigarettes and Hookah)	23(21.9)		0.001
Yes	23 (21.9)	122 (45.2)	
No	82 (78.1)	137 (54.8)	
Exercise			0.001
Yes	64 (60.9)	91 (36.4)	
No	41 (39.1)	159 (63.6)	
Intake of red meat			NS
Daily	20 (19.1)	39 (15.6)	
3 times or less per week	85 (80.9)	211 (84.4)	
Intake of vegetables			0.004
Daily	88 (83.8)	171 (68.3)	
3 times or less per week	17 (16.2)	79 (31.6)	
Intake of fruits, number (%)			0.001
Daily	93 (88.6)	177 (70.8)	
3 times or less	8 (11.4)	73 (29.2)	
Consumption of alcohol			NS
Daily	26 (24.8)	81 (32.4)	
3 times or less per week	79 (75.2)	169 (67.6)	
Distance form main road/highway			0.001
< 3 kilometers	73 (69.5)	210 (84.0)	
> 3 kilometers	32 (30.4)	40 (16)	
Relative with breast cancer			NS
Yes	27 (25.7)	87 (34.8)	
No	78 (74.3)	163 (65.2)	
Had a biopsy			NS
Yes	15 (14.3)	36 (14.4)	
No	90 (85.7)	214 (85.6)	

they exercised more [60.9% vs 36.4 %,OR = 1.61 (CI = 1.28-2.01), $p < 0.001$]. The Lebanese-American group ate more vegetables and more fruits than their Lebanese counterparts [83.8% vs 68.3%, OR= 1.22 (CI = 1.083-1.36), $p = 0.002$ and 88.6% vs 70.8%, OR = 1.27 (CI = 1.15-1.41), $p = 0.001$], respectively. There were no other differences between groups (Table 2).

Is there a difference in the performance of breast

Table 3. Performance of Screening Tests

Variable	Lebanese/ American N =105	Lebanese N= 250	P value
	Number (%)or Mean ± SD	Number (%)or Mean ± SD	
Had a Mammogram			NS
Yes	78 (74.3)	182 (72.8)	
No	27 (25.7)	68 (27.2)	
When			0.006
Last year	71 (67.6)	129 (51.6)	
2 - 3 years	23 (21.9)	74 (29.6)	
>3 years	11 (10.5)	47 (18.8)	
Had a CBE			0.001
Yes	89 (84.8)	146 (58.4)	
No	16 (15.2)	104 (41.6)	
Done a BSE			NS
Yes	51 (48.6)	115 (46.0)	
No	54 (51.4)	135 (54.0)	

cancer screening tests between Lebanese- Americans and Lebanese participants?

Both groups had similar rates for having had a mammogram, with 74.3% of Lebanese-American women vs 72.8% of Lebanese women, however, the Lebanese-American women had a higher rate of having had a mammogram within a year of completing the survey than the Lebanese women [67.6% vs 51.6%, $\chi^2 12.39$, $p = 0.006$] (Table 3). Also, the Lebanese-American group were more likely to have had a CBE, [84.8% vs 58.4%, OR = 3.74, (CI = 2.00- 6.89), $p = 0.001$]. Performing a BSE was not significantly different between groups [48.6% vs 46.0%]

What are the best predictors of performing a Mammogram, a CBE and a BSE in both groups combined?

Multiple logistic regression analyses were conducted to assess any relationship between the variables that were significantly different between groups and the likelihood of participants ever having a mammogram, a CBE or a BSE in both groups combined (Table 4). The results indicate that for ever having a mammogram, duration of breastfeeding (>6 months), [OR= 1.98 (CI=1.08-1.21), $p = 0.05$], knowledge of effectiveness of the mammogram, [OR= 1.23 (CI= 1.02-2.6), $p < 0.05$] and exercise, [OR = 2.93 (CI= 1.41-6.09), $p = 0.03$] were related to ever having a mammogram. For ever having a CBE, eating fruits, [OR = 1.34 (CI= 1.06-2.67), $p = 0.04$] smoking, (OR = 2.56 (CI= 1.02-6.94), $p = 0.04$) and exercise, [OR = 3.64 (CI =1.21-6.18), $p < 0.02$] were significant predictors. No variables were significantly associated with a BSE.

Discussion

This study is the first to identify risk factors of breast cancer and its screenings in Lebanese women compared to those in Lebanese-American women. A total of 355 healthy women between the 40 to 75 years participated in this study. The majority of Lebanese-American

Table 4. Multiple Logistic Regression with OR and its 95% CI for Variables that are Associated with Performing a Mammogram, a CBE and a SBE in Both Groups Combined

Variable	Mammogram		CBE		SBE	
	OR	CI	OR	CI	OR	CI
Vegetables	1.51	0.54-4.21	0.94	0.27-3.03	1.91	0.48-1.34
Fruits	0.72	0.26-1.98	1.34*	1.06-2.67	0.26	0.05-1.96
Smoking	1.19	0.56-2.39	2.56*	1.02-6.94	1.58	0.49-5.08
Duration of Breast feeding	1.98*	1.08-1.21	0.93	0.58-1.38	0.97	0.71-1.31
Effectiveness of Mammogram	1.23*	1.02-2.61	1.34	0.81-2.21	1.72	0.98-3.03
Effectiveness of BSE	1.07	0.82-1.41	1.12	0.68-1.82	0.95	0.59-1.53
Effectiveness of CBE	0.82	0.63-1.08	0.84	0.52-1.39	0.73	0.43-1.23
Age at menopause	1.01	0.93-1.08	0.98	0.91-1.06	0.98	0.91-1.06
Contraceptive use	0.41	0.12-1.44	0.82	0.27-2.45	2.25	0.72-5.06
Exercise	2.93*	1.41-6.09	3.64*	1.21-6.18	1.05	0.36-3.22
Physician recommended	0.89	0.78-2.11	1.12	0.67-4.44	1.34	0.56-2.87

* p < 0.05

women were Muslim and had higher incomes. The higher percentage of Muslim women in the Lebanese American group was probably due to the recruitment from the southern area of greater Los Angeles where a high influx of Muslims has occurred in the last two decades due to the conflicts in the Middle –East (Hendricks, 2005). A perceived higher income in the Lebanese–American sample is expected as 28.5% of the Lebanese population is estimated to be poor, living on less than \$4 per day (UNFPA, 2016). It was evident from our study, that Lebanese women had significantly more risk factors which may explain the higher prevalence rates of breast cancer in younger women in Lebanon. The Lebanese women smoked significantly more than their Lebanese-American counterparts, that smoking is which is one of the highest attributable factor for cancer in both males and females in Lebanon (Akl et al., 2010; Charafeddine et al., 2017). In addition, 22% of the adult population in Lebanon smoke Hookah regularly which similar to cigarettes, has toxins linked to several types of cancers (Lopez et al., 2017; Sibai and Hwalla, 2010).

Both groups breast fed their infants; however, the Lebanese-Americans breast fed for significantly longer periods. Breastfeeding is known to be protective against breast cancer, with longer periods of breastfeeding associated with lower rates of breast cancer (Gajalakshmi et al, 2009; Hadjisavvas et al, 2011; Liu et al 2011). Breastfeeding is assumed to protect a woman from breast cancer by increasing breast differentiation, postponing the return of the ovulatory menstrual cycle post-pregnancy, and decreasing breast fluid estrogen levels, all of which decrease exposure to total estrogens that has been related to proliferative and carcinogenic effects (Gajalakshmi et al., 2009; Ritte et al., 2017; Russo and Russo, 2011).

Reproductive factors which were different between groups were age at menopause (higher for the Lebanese group) and use of contraceptives (higher for the Lebanese- American group). The relationship between menstruation and breast cancer has been controversial in the literature. Several studies have noted a higher risk of breast cancer in women who have a longer period of

menstruation. This is thought to be attributed to the longer exposure to estrogens during a women’s reproductive life (Ritte et al., 2013). In contrast, other studies found no such relationship (Gajalakshmi et al., 2009; Jafari-Mehdiabad et al., 2016; Lodha et al., 2011). It was postulated that the differences in the findings could be attributed to genetic factors, as the latter studies were done in India and Iran.

Oral contraceptive (OC) use was significantly higher in the Lebanese-American group. The use of OC has been extensively studied and reported in numerous epidemiological studies (Grevers et al., 2016; Heikkinen et al., 2016; Hunter et al., 2010; Soini et al., 2015). While some studies have found a moderate increased risk of developing breast cancer with recent use of OC, especially with long-term use (Bhupathiraju et al., 2016; Gierisch et al, 2013; Grevers et al., 2016, Soini et al., 2015), recent reviews and case–control studies have suggested a protective effect of OC use in some populations and especially when using progesterone alone (Iversen et al., 2017; Samson et al, 2016). Thus, the association between OC and breast cancer remains unclear and necessitates further larger cohort studies with women from different cultural backgrounds.

The Lebanese-American group exercised nearly twice as much compared to the Lebanese group. The role of exercise in protecting against breast cancer has been well documented in several studies (Eliassen et al., 2010; Niehoff et al., 2017; Peters et al., 2009). Thus, it is imperative that women of all ages be cognizant of the benefits of physical exercise, especially in postmenopausal women, in order to reduce their risk of developing breast cancer.

In terms of nutrition, the Lebanese-Americans ate significantly more vegetables and exponentially more fruits than their Lebanese counterparts. This is a very surprising finding considering that the Mediterranean diet is commonly used in Lebanon and it is known for its richness in fruits and vegetables (Naja et al., 2015). It appears from the results of this study that the Lebanese –American group was more faithful in adhering to the traditional Mediterranean diet compared to the

Lebanese women. Evidence from several studies supports the theory that a diet high in fruits and vegetables can reduce the chances of developing breast cancer (Ahmadnia et al., 2016; Catsburget al., 2015; Tiznobeyk et al., 2016; van den Brandt and Schulpfen, 2017). In contrast, other studies and reviews indicate that there is insufficient data to reach a conclusion about the relationship between a Mediterranean diet and breast cancer (Cadeet al., 2011; Couto Sandin Löf Ursin Adami and Weiderpass, 2013; Kojima et al., 2017). A large cohort study with 62,573 women aged 55-69 in the Netherlands found an inverse association between a Mediterranean diet adherence and breast cancer (van den Brandt and Schulpfen, 2017). Given the results of this latter study and our findings, it will be of benefit to advocate for the benefits of the traditional Mediterranean diet for breast cancer prevention.

The Lebanese group was five times more likely to live close to a main road or highway. Few studies have suggested that long-term exposure to road traffic noise or pollution may increase the risk of breast cancer (Crouse et al., 2010; Sørensen et al., 2014). A Probable explanations for this association is that traffic noise may disturb sleep, thereby reducing melatonin levels which has an antioxidant effect, thereby inhibiting breast carcinogenesis. Another conjecture is that exposure to traffic noise results in stress increasing glucocorticoid cortisol levels which may result in tumor progression (Pan et al., 2011). Air pollution has also been linked to breast cancer in some studies (Crouse et al., 2010) but not in others (Reding et al., 2015), calling for future cohort studies before firm associations can be made.

In relation to knowledge about breast screenings tests, the majority of the Lebanese-American and Lebanese women were familiar with the use of mammogram for detecting cancer (94.3% vs 91.2%, respectively), which is in accordance with an earlier study in Lebanon that found that only 4.4% of women had never heard of mammography (Elias et al., 2016). Familiarity with the CBE and the BSE were similar in both groups at around 50 and 60%. Although no study was found in Lebanon about familiarity with the CBE and BSE, few studies in the Middle East have reported that very few Arab women are familiar or perform a BSE (Abolfotouh et al., 2015; Norooziet al., 2011; Reisi et al., 2013). Likewise, few women in Middle Eastern countries undergo a CBE (Abu-Helalah et al., 2015; El Bcheraoui et al., 2015). This indicates extensive educational efforts should be undertaken in applying health promotion programs and systematic screening for breast cancer especially in rural areas where access to a mammogram is not possible or affordable.

In our study, 74.3% and 72.8% of the Lebanese-American and the Lebanese women respectively, reported ever having a mammogram which is higher than the 45% that was reported in an earlier studies in Lebanon (Elias et al., 2016). This may be in part due to the differences in education levels among the participants in the two studies, with the Lebanese-American and Lebanese women who participated in our study having more education than the participants in the latter

mentioned study. The increase in mammography screening among Lebanese women could also be attributed to the increased media attention in recent years to breast cancer screening by the ministry of health which in 2009, adopted national guidelines for screening (Adib et al., 2009). For the Lebanese –American group the 74.3 % rate is close to what Schwarts et al., (2008) reported for Lebanese-Americans living in Detroit. In terms of a CBE, the Lebanese- American group had a higher rates of ever having a CBE (84.8% vs 58.4%) which is likely due to the fact that most women in the US receive a CBE based on the recommendations for the American Cancer Society and the American College of Obstetricians and Gynecologists who recommend periodic CBE screening every 1–3 years for women ages 20–40 years, and annually in addition to mammography for women over the age of 40 (Smith et al., 2017; American College of Obstetricians-Gynecologists, 2011). The low rates of CBE in Lebanon are supported by several studies in the Middle-East where CBE remain very low (El Bcheraoui et al., 2015; Abu-Helalah et al., 2015). Self-breast examination did not differ between groups at slightly above 50% for both groups. The low rates of CBE and BSE should alert practitioners of the importance of training women to perform-self-breast examination to reduce delays in breast cancer diagnosis especially in rural areas where access to a mammogram is often not feasible. Studies in developing countries with poor resources have estimated that annual CBE using trained health workers achieve the same results as biennial mammography with half the cost (Okonkwo et al., 2008)

The variables that were predictive of ever conducting a mammogram were exercise, perceived knowledge of the effectiveness of a mammogram and duration of breastfeeding (>6 months). While for the CBE, the predictive variables were smoking variables were smoking, exercise and eating fruits. These findings may indicate that a healthy lifestyle is associated with performing screening tests. It is possible that women who live a healthy lifestyle are more likely to undergo a mammogram or a CBE. These finding are supported by several studies that find that certain lifestyle factors such as diet, alcohol intake, and exercise may reduce the risk of developing breast cancer (Olver, 2016; Rice et al., 2016)

Limitations

To our knowledge, this is the first study that compared a Lebanese sample to a Lebanese-American sample in terms of risk factors and knowledge of breast cancer screening. However, there are several limitations worth mentioning. An important limitation is selection bias since participants in this study may have had different view and rates of breast cancer screening than those of non-participants. In addition, our sample was more educated than previously reported samples which may have affected the results and limit generalization.

In conclusion, the results of this study shed light on the higher rates of risk factors in Lebanese women which may account for the higher prevalence of breast cancer in younger women when compared with their Lebanese-American counterparts. The findings of this study indicate

that Lebanese-American women tend to lead a healthier life style than their r Lebanese counterparts. They breast feed longer, are younger at menopause, smoke less, exercise more and eat more fruits and vegetables. The Lebanese participants tended to live closer to a highway or main road and had less knowledge of the benefits of breast cancer screening tools. It is possible that Lebanese women may have adopted Western habits of living while the Lebanese-Americans adhered to a more traditional life style in terms of nutrition, breast feeding and smoking. Thus, to fight breast cancer in Lebanese women, the emphasis should be on promoting healthy life styles, as well as on educating them about the benefits of mammography, CBEs and BSE especially those living in areas where a mammography is not feasible or economical.

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