UNDERSTANDING BETTER THE KNOWLEDGE, BELIEFS, AND ATTITUDES TOWARD BREAST CANCER AND BREAST SCREENING PRACTICES AMONG WOMEN LIVING IN RAS AL KHAIMAH, UNITED ARAB EMIRATES (UAE)

Salman M. Albeshan*[1,2], Syeda Z. Hossain [3], Martin G. Mackey [4], Syed Suhail Naser Osmani [5] and Patrick C. Brennan[1]

[1]*Discipline Medical Radiation Sciences, Medical Image Optimization and Perception Group (MIOPeG), Faculty of Health Sciences, University of Sydney, Sydney, New South Wales, Australia*

[2]*Department of Radiological Sciences, College of Applied Medical Sciences, King Saud University (KSU), Saudi Arabia,*

[3]*Discipline of Behavioral and Social Sciences in Health, Faculty of Health Sciences, University of Sydney, Sydney, New South Wales, Australia*

[4]*Discipline of Physiotherapy, University of Sydney, Faculty of Health Sciences, Sydney, New South Wales, Australia.*

[5]*Center for Educational Development & Research, Ras Al-Khaimah Medical and Health Sciences University (RAKMHSU),United Arab Emirates (UAE)*

*Email: *salb5075@uni.sydney.edu.au, patrick.brennan@sydney.edu.au*

Abstract: Breast cancer is the most frequently diagnosed malignant disease among women in the United Arab Emirates (UAE), and the incidence rate is rising. Breast cancer early detection practices through regular screening have been found to reduce morbidity and mortality from this disease. This study aims to explore the knowledge, beliefs, attitudes, and practices towards breast cancer and its screening methods among women living in the emirate of Ras Al Khaimah (RAK). One hundred and two women who met the study's inclusion criteria were interviewed. Pearson's chi-squared test and multivariate logistic regression analysis were performed in the statistical analysis. Relatively low participation rates in breast cancer screening practices (BCSP) were found. Women who stated that their doctors talked to them about breast cancer were significantly more likely to undergo BCSP (p <0.05). Fear of being diagnosed with breast cancer, lack of a doctor's recommendation and perceived discomfort with breast screening were strongly associated with not planning to practice clinical breast examination (CBE) or mammography screening in the following 12 months. The study findings indicated that RAK women's knowledge and practice of breast cancer early detection screenings are currently inadequate. Establishing a culturally acceptable health education program with appropriate interventions is required.

Keywords: Breast cancer screening practices; Breast Self-Examination; Clinical Breast Examination; Mammography

Introduction

Breast cancer is the most frequently diagnosed malignancy among women worldwide with an estimated 1.67 million new cases in 2012 (accounting for 25% of all cancers) (Ferlay *et al.*, 2015). The incidence rates vary globally ranging from 91.6 per 100,000 women in North America to 43 per 100,000 in the Middle-East and Northern Africa (MENA) region (International Agency for Research on Cancer, 2012). Although breast cancer incidence rate is lower in the United Arab Emirates (UAE) compared with westernized countries, the incidence is increasing rapidly. The age-adjusted standardized incidence rates has increased from 19.4 per100,000 women in 2002 (Sreedharan *et al.*, 2010), to 30.8 per 100,000 women in 2004 (Gulf Center for

Cancer Control and Prevention, 2011), to 36.7 per 100,000 women in 2008 (El-Zaemey *et al.*, 2012) up to 39.2 per 100,000 women in 2012 which is one of the highest rates in the Gulf Cooperation Council (GCC) region (International Agency for Research on Cancer, 2012).

Corresponding author at: University of Sydney, Faculty of Health Sciences, School of Medical Radiation Sciences, Cumberland Campus, M Block, 75 East Street, Lidcombe, Sydney, New South Wales (NSW), 2141, Australia.

UAE women are not only being diagnosed with breast cancer in advanced stages (Health Authority Abu Dhabi, 2008), but also at younger ages, a decade earlier compared with westernized women (Median age 49 year) resulting in poorer disease prognosis and outcomes (Najjar and Easson, 2010, Al-Othman *et al.*, 2015). It was reported that nearly 24.2% of UAE women who were diagnosed with breast cancer died from the disease, compared with 15.7% among Australian women (International Agency for Research on Cancer, 2012). Currently, breast cancer screening practices (BCSP) including Breast Self-Examination (BSE), Clinical Breast Examination (CBE), and mammography remain the cornerstone of breast cancer control and prevention (Anderson *et al.*, 2008).

Unfortunately, recent research has indicated that participation rates of Arab women in breast screening is low (Donnelly *et al.*, 2013a, Elobaid *et al.*, 2014, Sabih *et al.*, 2012, Hasan *et al.*, 2017). Several studies have revealed important facilitators and determinants of BCSP (Abdallah *et al.*, 2015, Donnelly *et al.*, 2013b, Othman *et al.*, 2015, Liu *et al.*, 2014, Kwok *et al.*, 2015, Donnelly *et al.*, 2015b, Dahlui *et al.*, 2013). These factors include: demographic characteristics including age, health status, educational levels and employment status; physiological, social and cultural beliefs towards breast cancer and its screening practices; religious and fatalistic beliefs; fear of being diagnosed with breast cancer and discomfort or pain associated with CBE and mammography procedures; doctor's recommendations; perceived risk of breast cancer; and knowledge about breast cancer and its screening practices.

Whilst some data are emerging around women's engagement in breast cancer early detection practices in GCC region, few studies have been carried out which explore the relevance of previous findings to women in the UAE, particularly those living in regions distant from the large cities such as RAK. Therefore, the aim of this study was to investigate the knowledge, beliefs, attitudes, and practices towards breast cancer and its screening practices in RAK, the north-eastern most Emirate in the UAE. The findings of this study will provide evidence regarding perceptions of the women living in RAK with respect to breast cancer and BCSP and help inform the development of strategies to promote early detection program towards enhancing BCSP.

Methodology

This cross-sectional study used a structured questionnaire to collect data on the knowledge, beliefs, and attitudes about breast cancer and BCSP among women living in RAK. Ethical approval was obtained from the Human Research Ethics Committee of the University of Sydney (Project Number: 2014/884). Participants provided informed consent prior to enrolment in the study.

Convenient sampling method was used to recruit women living in RAK between January and July 2015. Initially 120 women who met the study's inclusion criteria (aged $\geq$ 30 years and living in RAK for at least 10 years), were invited to participate in a 35-45 minutes face-to-face interview.

The structured questionnaire used in this study was developed and validated in the United States (US) and Australia and has been recently used in a similar study in Qatari women [14]. However, we adapted the instrument by adding questions about participants' knowledge of breast cancer physical signs and treatment options, which were obtained from an existing survey validated in Muslim women living in Australia (Hossain *et al.*, 2016). The questionnaire consisted of 64 items categorized into six main sections; socio-demographic characteristics; overall health status of the participants; breast cancer knowledge; cancer beliefs and attitudes; awareness and practices of regular BCSP (BSE, CBE, mammography); participant

satisfaction with health care service provision in RAK. Forward and backward translations of the questionnaire and related documents (Behling and Law, 2000) between English into Arabic were carried out to ensure lexical equivalence and that the meaning of questions and concepts were not changed in translation. These translations were checked and approved by a Justice of Peace (JP), authorized by the Australian Government in New South Wales (NSW), Sydney, Australia.

The questionnaire was administered to participants by four female medical students from Ras Al Khaimah Medical and Health Sciences University (RAKMHSU) and a female staff from RAK Private Hospital who were each fluent in English and Arabic. Interviewers received training on the content of the questionnaire; the interview procedure, how to handle difficult situations including any interruption during interview and so on, and how to overcome barriers when conducting the interviews. The face to face data collection process was aimed to ensure a maximum response rates and the participants' full understanding of the study objectives.

Data analysis

Pearson's chi-squared test and Fisher's Exact Test (two-tailed) were used to examine the associations between BCSP and demographics information, breast cancer related knowledge, belief, and attitude variables. Participants' knowledge about breast cancer assessed both breast cancer symptoms and treatment options. A breast cancer symptoms knowledge scale was constructed based on 6 items (including breast lump, nipple discharge, crusting/ulcer/redness of nipples, dimpling of breast, swollen underarms and breast swelling). Response to each item was recorded as 0 (indicating no knowledge) or 1 (have knowledge) and then summated. A similar strategy was used to construct knowledge of breast cancer treatment options (based on 5 items). Internal validity for both scales was confirmed by a Cronbach's Alpha coefficient of 0.82 for physical signs scale and 0.76 for treatment options scale. Factors demonstrating statistical significance in bivariate analyseswere included in the multivariate regression to determine the predictors of participating in BCSP. A p value < 0.05 was considered as the cut-off for statistical significance. Data analyses were conducted using SPSS (version 22) [IBM, USA].

Results

Participants Background Information

At the data entry stage, 18 incomplete participant questionnaires were excluded, resulting in a response rate of 85%, with a final sample size of 102 participants. Study population characteristics are shown in Table 1. In brief, participants were aged between 30-65 years [mean= 41.6, Standard Deviation (SD)= 9.2]. Most participants were married, had 4 or more children, of Muslim faith, university-educated and employed. Nearly three quarters of women were Emirati nationals and the remainders were from North African, Middle Eastern or Asian countries. Nearly half of participants were teachers and a quarter of participants were in the middle income group (however, approximately 40 % of participants refused to disclose or did not know their monthly family income).

Table 1   Selected socio-demographic characteristics.

Characteristic	n (%)	Characteristic	n (%)
Age (Years)		**Employment status**	
≤ 40	45 (44.1)	Work full time	76 (75.5)
> 40	57 (55.9)	Unemployed[c]	26 (25.5)
Nationality		**Current occupation**[d]	
Emirati citizen	74 (72.5)	Teacher	46 (46.4)
Non-Emirati citizen[a]	28 (27.5)	Administration	19 (19.2)
Marital status		Other[e]	34 (34.3)
Single	9 (8.8)	**Education level**	
Married	93 (91.2)	University or higher level	79 (78.2)
Number of children[b]		School or diploma level	22 (21.8)

0-3	27 (29)	**Monthly family income**	
≥ 4	66 (71)	≤ 20,000 AED[f]	19 (18.6)
Overall health		21,000-40,000 AED	25 (24.5)
Good/Excellent	73 (72.3)	≥ 41,000 AED	19 (18.6)
Poor/Fair	28 (27.7)	I do not know or refused	39 (38.2)

[a]Non-Emirati citizens include (Egypt, n=9; Jordan, n=6; Syria, n=3; Palestine, n=2), and 1 participant from the following countries (Tunisia, Sudan, Somalia, Lebanon, Iran, Iraq, Yemen, and Philippines).
[b] 9 Single participants were removed from the analysis.
[c] 3 Part time workers and 1 full time student were categorized as unemployed.
[d]1 Full time student and 2 missing values were removed from the analysis.
[e] Other (22 homemakers and 12 professionals).
[f]1United Arab Emirates Dirham (AED) = 0.2723 United States Dollar (USD).

Association between background variables and breast cancer screening

Table 2 Associations between selected background (socio-demographic) variables and breast cancer screening practices.

	Breast Self-Examination (BSE)			Clinical Breast Examination (CBE)			Mammography		
	No	Yes		No	Yes		No	Yes	
Variables	n (%)	n (%)	P, Unadjusted OR [95% CI]	n (%)	n (%)	P, Unadjusted OR [95% CI]	n (%)	n (%)	P, Unadjusted OR [95% CI]
Age									
≤ 40*	23 (51.1)	22 (48.9)	0.84, 1.08 [0.50, 2.37]	21 (65.6)	11 (34.4)	0.002, 4.61 [1.71, 12.44]	36 (81.8)	8 (18.2)	<0.0001, 5 [1.99, 12.62]
> 40	28 (49.1)	29 (50.9)		12 (29.3)	29 (70.7)		27 (47.4)	30 (52.6)	
Nationality									
Emirati*	42 (56.8)	32 (43.2)	0.02, 2.78 [1.11, 6.93]	23 (47.9)	25 (52.1)	0.52, 1.38 [0.52, 3.68]	51 (69.9)	22 (30.1)	0.01, 3.09 [1.26, 7.60]
Non-Emirati	9 (32.1)	19 (67.9)		10 (40)	15 (60)		12 (42.9)	16 (57.1)	
Employment									
Work full time*	37 (48.7)	39 (51.3)	0.65, 0.81 [0.33, 1.99]	28 (52.8)	25 (47.2)	0.03, 3.36 [1.07,10.58]	55 (73.3)	20 (26.7)	<0.0001, 6.19 [2.33, 16.45]
Unemployed	14 (53.8)	12 (46.2)		5 (25)	15 (75)		8 (30.8)	18 (69.2)	
Education									
University/higher*	39 (49.4)	40 (50.6)	0.96, 0.98 [0.38, 2.51]	27 (47.4)	30 (52.6)	0.61, 1.35 [0.43, 4.29]	54 (69.2)	24 (30.8)	0.005, 3.94 [1.46, 10.63]
School/ diploma	11 (50)	11 (50)		6 (40)	9 (60)		8 (36.4)	14 (63.6)	
Overall health									
Excellent/Good*	40 (54.8)	33 (45.2)	0.08, 2.18 [0.89, 5.37]	27 (54)	23 (46)	0.01, 3.99 [1.27, 12.50]	56 (77.8)	16 (22.2)	<0.0001, 12.83 [4.45, 37.04]
Poor/Fair	10 (35.7)	18 (64.3)		5 (22.7)	17 (77.3)		6 (21.4)	22 (78.6)	

*Reference group for odds ratio.

The results of the bivariate analysis presented in Table 2 indicated that women who were > 40 years old, were unemployed, and reported their health status to be poor or fair were significantly more likely to practice CBE (p=0.002, 0.03, and 0.01 respectively) and mammography (p=<0.0001). In addition, participants were more likely to undergo mammography screening if they had a school or diploma level qualification (p=0.005) or were non-Emirati citizen (p=0.01). In terms of BSE practice, the only significant relationship shown was that non-Emirati women were more likely than Emirati women to engage with BSE (p=0.02).

Participants' beliefs, attitudes, and knowledge toward cancer and breast cancer and BSCP

Twenty-eight of 98 women reported having a family member diagnosed with breast cancer. A lump in the breast and swollen underarm were the two breast cancer symptoms that most study participants could identify (Table 3). Although the majority of participants 97% stated that they would seek medical help if they discovered any breast cancer indicative signs, only 15.2% were able to correctly identify all indicative signs of breast cancer. Two thirds of the study population was aware about the availability of drugs and surgery as possible treatments for breast cancer, however only 15 % were able to correctly identify all treatment options.

The public media was the main source of information for women about breast cancer (newspaper and magazine 60%, television or radio 56%, pamphlets 48%), followed by friends or family members 49%. In contrast, less than 35% of information about breast cancer was obtained from the health care providers (doctor 35%, health care educator 25% and nurse 18%). In contrast, less than 35% of information about breast cancer was obtained from the health care providers (doctor 35%, health care educator 25% and nurse 18%).

The study group demonstrated a variety of beliefs and attitudes regarding cancer (Figure 1). A majority of the participants believed that cancer is due to fate, would threaten relationship with loved one, and would threaten their career. Women whose doctors talked to them about breast cancer (48/94 women) were significantly more likely to engage in BCSP compared with women who did not experience these conversations. The significant associations between beliefs and attitudes towards cancer and BCSP are shown in Table 4.
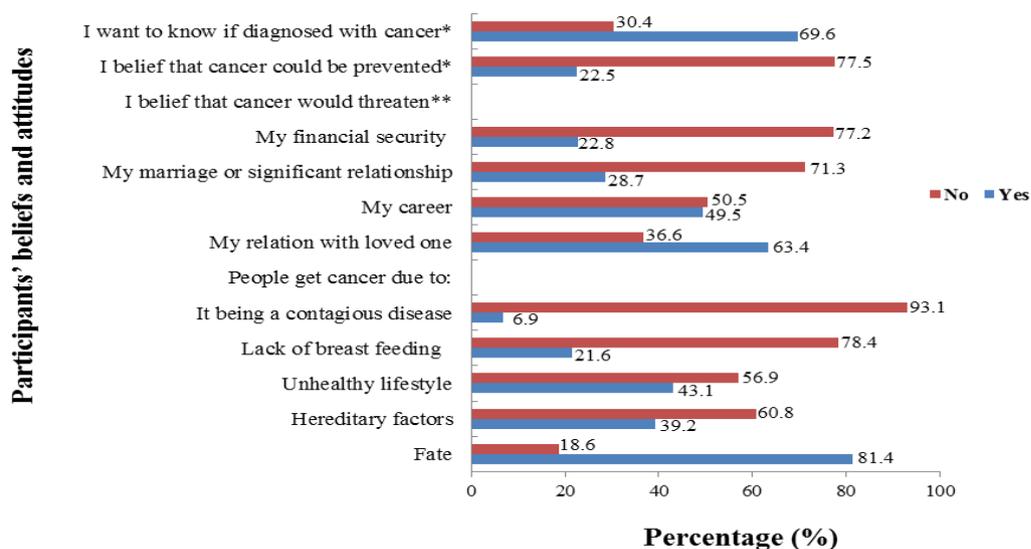

*Figure 1 Participants' beliefs and attitudes towards cancer (n=102). Note: * No and not sure answers were added together. ** 1missing value (n=101). Data represnts multiple respones options (Yes, No).*

Table 3   Participants' knowledge about breast cancer including physical signs and treatment options.

Variable	Correct response, n (%)
Physical signs (n=99)	
Lump in the breast	65 (65.7)
Nipple discharge	35 (35.4)
Crusting, ulcer or redness of the nipple	26 (26.3)
Redness or dimpling of the breast	33 (33.3)
Swollen underarm	53 (53.5)
Breast swelling	28 (28.3)
Treatment options (n=100)	
Prescription drugs	34 (34.0)
Chemotherapy	61 (61.0)
Radiation therapy	38 (38.0)
Hormonal therapy	25 (25.0)
Surgery	63 (62.0)

Note: No and I do not know answers were recorded as incorrect response.

*One participant with history of breast cancer was removed from this analysis.

Associations between participants' beliefs and attitudes with BSCP (bivariate analysis)

Breast Self-Examination (BSE)

Of the 102 women studied, the majority had a good level of BSE awareness (n=76) and knowledge (n=60) on how to perform a BSE, although only half of participants had practiced it previously (Figure 2). Of those who had practiced BSE before, 43.1% had done so in the last month, whilst an additional 15.7% last performed it within the last year and 29.4% over a longer period of time. In addition, 11.8% of participants did not remember the last time they performed the test. The significant findings are shown in Table 4.

Clinical Breast Examination (CBE)

Although 73 participants were aware of CBE screening, only 40 had engaged with CBE previously (Figure 2). Of those who had practiced CBE, 57.5% were performed by a doctor, 20% by a nurse, whilst 22.5 % were examined by both types of health professional. Analysis revealed that 63.4% and 43.1% of participants (n=101) would prefer a doctor and an Arab health care practitioner to perform the CBE, respectively. Eighty-nine precent of participants' preferred a female health professional to perform CBE. Further, 54 of 101 participants were planning to perform a CBE in the following 12 months. The main reasons found to encourage or discourage women for undertaking a CBE screening are presented in Figures 3 and 4. The significant associations between are shown in Table 4.
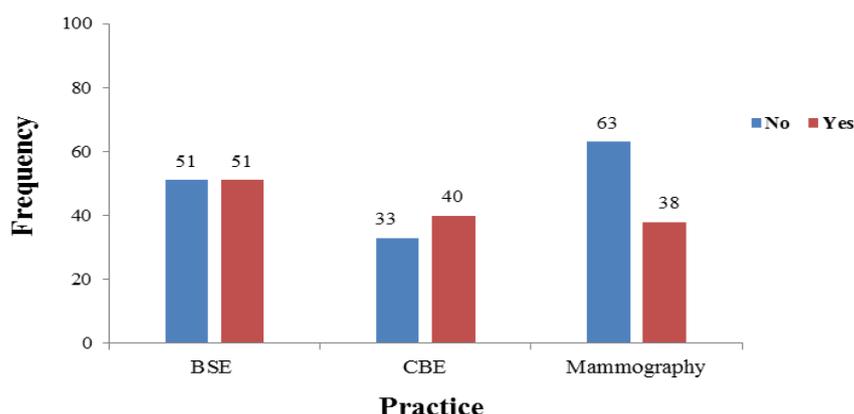
Figure 2 Breast cancer screening practices participation rates. Note: BSE (n=102) and mammography (n=101). For CBE (n=73), when individuals answered no or I did not know to the previous question (Have you ever heard about CBE?), we could not glean further CBE information about those individuals.

Mammography

Mammography was the least frequently accessed breast cancer screening practice with only 38 of 101 participants (Figure 2). Of those who had undergone mammography, 73.7% had done so in the last year, whilst an additional 18.4% performed it over a longer period of time or did not remember the last time they performed the test (7.9%). Only 15.7% of the participants (n=102) knew that mammography should be completed every two years, and an additional 20.6% did not know the answer or provided incorrect answer. Further, 40.2% and 23.5% responded that the test should be conducted once a year or only when a doctor prescribed it, respectively. Only 4% of participants (n=100) knew that mammography should be ideally performed in women aged 40 years and older, whilst 57 % failed to provide the appropriate age for screening and an additional 39% did not know the answer. The significant findings are shown in Table 4. Overall less than half of participants (n=48) were planning to undergo a mammography screening in the following 12 months. The main facilitators and barriers for women undertaking a mammography screening in the next 12 months are shown in Figures 3 and 4 respectively.

Table 4 Associations between participants' practice, awareness, beliefs, and attitudes with breast cancer screening practices.

Variables	No, n (%)	Yes, n (%)	P, Unadjusted OR, [95% CI]
Breast Self-Examination (BSE)			
Cancer could be prevented			
No/Not Sure*	45 (57)	34 (43)	
Yes	6 (26.1)	17 (73.9)	0.009, 3.75, [1.34, 10.52]
People get cancer because they have unhealthy lifestyle			
No*	34 (58.6)	24 (41.4)	
Yes	17 (38.6)	27 (61.4)	0.04, 2.25, [1.01, 5.01]
Doctor talked to participant about breast cancer			
No*	29 (63)	17 (37)	
Yes	15 (31.3)	33 (68.8)	0.002, 3.75, [1.60, 8.82]
BSE awareness			
No*	23 (88.5)	3 (11.5)	
Yes	28 (36.8)	48 (63.2)	<0.0001, 13.14, [3.62, 47.76]
Clinical Breast Examination (CBE)			
Cancer would threaten my relation with loved one			
No*	18 (66.7)	9 (33.3)	
Yes	15 (33.3)	30 (66.7)	0.006, 4.00, [1.45, 11.00]

Doctor talked to participant about breast cancer			
No*	20 (69)	9 (31)	
Yes	11 (28.9)	27 (71.1)	0.001, 5.46, [1.90, 15.65]
Planning for a CBE in the next 12 months			
No*	22 (84.6)	4 (15.4)	
Yes	11 (23.9)	35 (76.1)	<0.0001, 17.50, [4.95, 61.85]
Gender preference to perform a CBE			
No preferences *	8 (88.9)	1 (11.1)	
Female	25 (39.7)	38 (60.3)	0.009[a], 12.16, [1.43, 103.28]
Mammography			
People get cancer because it is fate			
No*	7 (36.8)	12 (63.2)	
Yes	56 (68.3)	26 (31.7)	0.011, 0.27, [0.096, 0.77]
People get cancer because it is hereditary			
No*	33 (54.1)	28 (45.9)	
Yes	30 (75)	10 (25)	0.034, 0.39, [0.16, 0.94]
Doctor talked to participant about breast cancer			
No*	34 (75.6)	11 (24.4)	
Yes	25 (52.1)	23 (47.9)	0.019, 2.84, [1.17, 6.98]
Participants who have a family doctor to visit			
No*	28 (82.4)	6 (17.6)	
Yes	35 (52.2)	32 (47.8)	0.003, 4.27, [1.56, 11.64]
Planning for a mammography in the next 12 months			
No*	47 (88.7)	6 (11.3)	
Yes	15 (31.9)	32 (68.1)	<0.0001, 16.71, [5.86, 47.66]
Agreeing to do a mammography after a medical consultation			
No*	27 (96.4)	1 (3.6)	
Yes	36 (49.3)	37 (50.7)	<0.0001, 27.76, [3.58, 215,13]

[a]P-value obtained from Fisher's Exact Test because 2 cells (50.0%) have expected count less than 5.
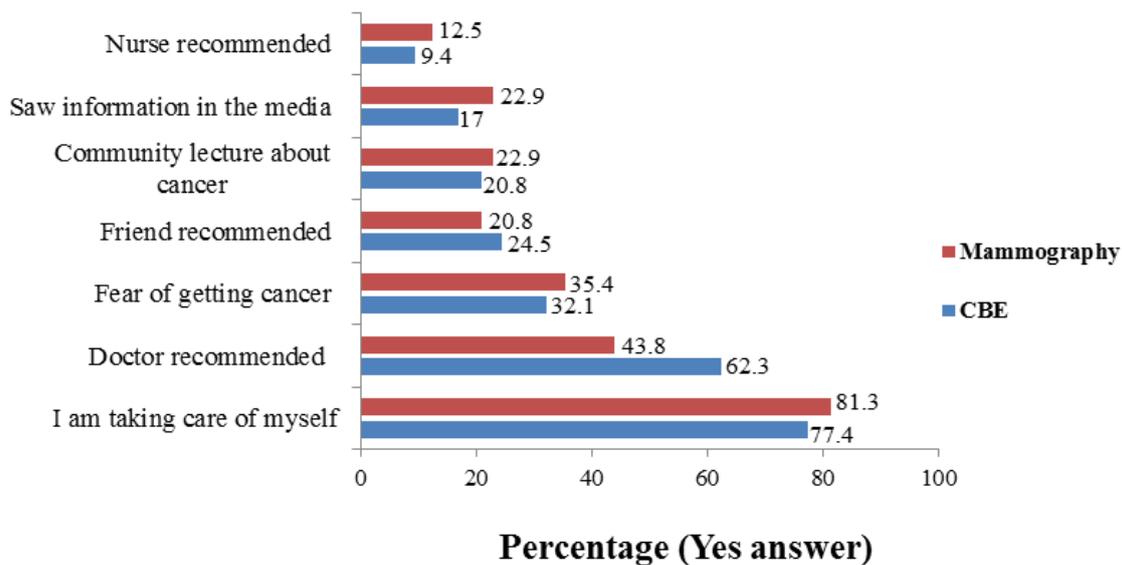
*Reference group for odds ratio.

Figure 3 Facilitators of CBE and a mammography in the following 12 months. Note: CBE, n=53, 1 participant answered, "I do not know" was removed from the analysis; Mammography, n=48.
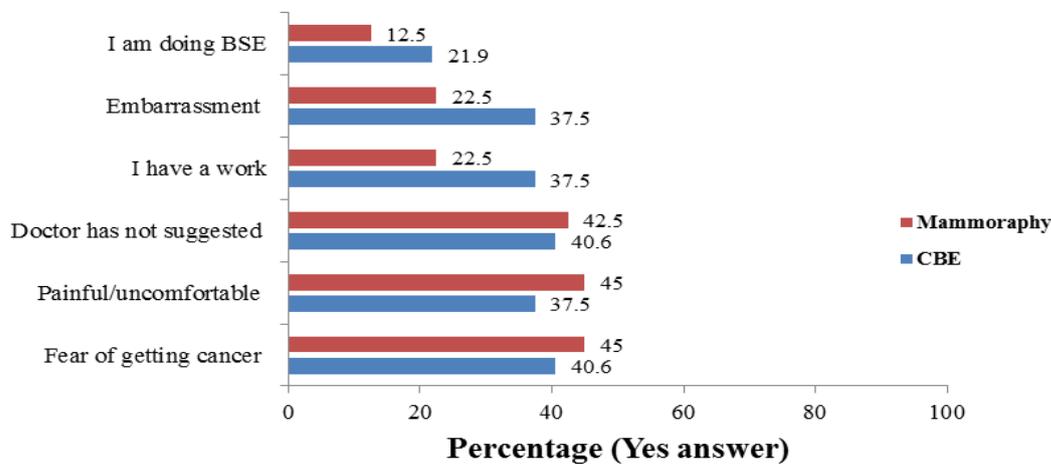

Figure 4 Barriers to CBE and a mammography in the following 12 months. Note: CBE, n=32, 4 participants answered "I do not know", 2 refused to answer, and 1 missing value were removed from the analysis; Mammography, n=40, 4 participants answered "I do not know" and 1 missing value were removed from the analysis).

Multivariate logistic regression was conducted to predict the impact of several independent variables on the probability that a participant would undergo BCSP (Table 5). Women with previous BSE awareness, women whose doctors talked to them about breast cancer, and those who thought that cancer could be prevented were 12, 3 and 5 times more likely to practice BSE, respectively. For CBE practice, women who were > 40 years old and women whose doctors talked to them about breast cancer were 3.4 and 4.6 times more likely to undergo CBE screening respectively. With regard to the mammography practice, women who were > 40 years old or described their health status as poor or fair were 9.2 and 4.8 times more likely to undergo mammography screening, respectively.

Table 5 Multivariate logistic regression of predictors associated with breast cancer screening practices.

Variables	P value	Adjusted OR [95% CI]
Breast Self-Examination (BSE)		
People get cancer because they have unhealthy lifestyle (*No, Yes)	0.47	1.48 [0.51, 4.29]
Nationality (*Emirati, Non-Emirati)	0.78	0.85 [0.26, 2.77]
Cancer could be prevented (*No, Yes)	0.03	5.88 [1.19, 29.18]
Doctor talked to participant about breast cancer (*No, Yes)	0.02	3.15 [1.13, 8.79]
BSE awareness (*No, Yes)	0.001	11.99 [2.90, 49.56]

Model Summary -2 Log likelihood (94.361); Cox & Snell R Square (0.315); Nagelkerke R Square (0.421)

Clinical Breast Examination (CBE)		
Age group (*≤ 40, > 40)	0.04	3.42 [1.03, 11.38]
Overall health (*Good/Excellent, Poor/fair)	0.36	1.97 [0.46, 8.48]
Doctor talked to participant about breast cancer (*No, Yes)	0.01	4.67 [1.38, 15.79]
Employment status (*Work full time, Unemployed)	0.48	1.71 [0.39, 7.45]
Cancer would threaten my relation with loved one (*No, Yes)	0.09	3.02 [0.84, 10.91]

Model Summary -2 Log likelihood (66.508); Cox & Snell R Square (0.300); Nagelkerke R Square (0.401)

Mammography		
Age group (*≤ 40, > 40)	0.003	9.25 [2.08, 41.05]
Cancer would threaten my relation with loved one (*No, Yes)	0.50	1.66 [0.38, 7.32]
Overall health (*Good or Excellent, Poor or fair)	0.04	4.88 [1.07, 22.28]
Employment status (*Work full time, Unemployed)	0.11	4.01 [0.72, 22.29]
Participants who have a family doctor to visit (*No, Yes)	0.10	3.77 [0.77, 18.59]
Nationality (*Emirati, Non-Emirati)	0.06	4.33 [0.91, 20.63]
Education level (*University or higher level, School or diploma level)	0.55	1.69 [0.29, 9.67]
Doctor talked to participant about breast cancer (*No, Yes)	0.17	2.53 [0.67, 9.57]
People get cancer because it is fate (*No, Yes)	0.41	0.49 [0.09, 2.79]
People get cancer because it is hereditary (*No, Yes)	0.46	0.59 [0.15, 2.38]

Model Summary -2 Log likelihood (63.882); Cox & Snell R Square (0.454); Nagelkerke R Square (0.620)

*Reference group for odds ratio.

Discussion

It is well established that regular breast cancer screening practices including BSE, CBE, and mammography have been found to reduce morbidity and mortality if coupled with high-quality screening and treatment (Donnelly *et al.*, 2015a). However, UAE women may be at greater risk of mortality from breast cancer (Donnelly et al., 2012) due to diagnosis of breast cancer at a younger age and a more aggressive nature (Health Authority Abu Dhabi, 2008). Therefore, BCSP remains the cornerstone of breast cancer control and

prevention (Anderson *et al.*, 2008). In the present study, 50%, 54.8%, and 37.6% of the participants reported they practiced BSE, CBE, and mammography, respectively. These rates of participation in breast screening are similar to those reported recently by (Elobaid *et al.*, 2014) who found BSE was practiced by 48.6%, CBE by 49.4%, and mammography by 44.9% of the UAE study population. Further, the rates demonstrate a significant improvement in screening uptake when compared with earlier study conducted in the UAE where only 12.7%, 13.8%, and 10.3% practiced BSE, CBE and mammography, respectively (Bener *et al.*, 2001). Moreover, BCSP rates in our study group were higher than those reported among some other GCC courtiers (Donnelly *et al.*, 2013a, Donnelly *et al.*, 2013b, Abdallah *et al.*, 2015). These encouraging higher screening rates may reflect the recent awareness activities performed by the UAE health authorities in the last few years (Elobaid *et al.*, 2014).

Our finding that BCSP being more pronounced among women with lower education levels was surprising. It was suggested that higher education was linked to being knowledgeable about breast cancer (presumed to be linked to higher levels of education) and that actually knowledge rather than higher education was the main determinant in practicing early detection methods (Lagerlund *et al.*, 2000). Nonetheless, other studies conducted among Arab women have found that low participation even in those with sufficient knowledge (Donnelly and Hwang, 2013), suggesting that good levels of breast cancer knowledge alone will not address unwillingness to engage in BCSP. Consistent with our findings, a recent cross-sectional study conducted in the UAE showed higher BCSP among lower educated women (Elobaid *et al.*, 2014). This previous work argued that more educated women may have been more exposed to discussions about the breast cancer risk caused by radiation associated with mammography, as well as the continuing debate around over-diagnosis. A link between engagement of BCSP and lower education has also been shown outside the GCC region where in the United Kingdom it was found that women with no qualification were more likely to check their breasts compared highly educated women (Linsell *et al.*, 2008). This counter-intuitive finding between education and BCSP regardless of the cause highlights the need for comprehensive and effective public awareness campaigns across all sectors of the community, regardless of educational status.

In the current study, BCSP were more pronounced among women who stated that their health status was fair or poor compared with women with good or excellent health status. It was reported that Arab women define good health as the absence of visible symptoms of illness, so when visible diseases are apparent, preventive health measures for diseases such as breast cancer are more likely to be sought (Othman *et al.*, 2015, Kwok *et al.*, 2015). This could in part explain the higher screening uptake among women with fair or poor health status.

It has been reported that religious belief might have an influence upon women's participation in BCSP (Donnelly and Hwang, 2013). In particular, it was found that higher religiosity hindered Asian (Rajaram and Rashidi, 1999) and African American (Mitchell *et al.*, 2002) women from adopting a positive screening behavior (Donnelly *et al.*, 2013a). In the present study and consistent with previous results reported from Qatari women (Donnelly *et al.*, 2013b), more than 80% of women have linked developing breast cancer with 'fate' implying that Muslim women (who comprised 99% of our respondents) might defer responsibility for their health to fate leading to limited attention to self-care. In addition, believing that cancer is inevitable and determined by fate or God has been shown in Muslim countries to act as a barriers to BCSP (Donnelly *et al.*, 2013a). However, the extent to which fatalism is a barrier to BCSP among RAK women requires further investigations (Donnelly *et al.*, 2013b), since we have only preliminary results suggesting this relationship. It is worth considering that the Islamic guidelines promote overall physical well-being, hold the individual responsible for one's health, and permit women to have their bodies examined by male health care professionals for medical reasons (Donnelly *et al.*, 2013a). Since Islam plays a major role in Muslim society, alignment of early detection methods with religious values could be emphasized by encouraging religious leaders to highlight these Islamic guidelines within any awareness program.

Much of the literature has reported that a doctor's recommendation is the most single powerful motivator to BCSP (Donnelly *et al.*, 2013b, Donnelly *et al.*, 2013a, Elobaid *et al.*, 2014). For instance, in a recent cross-sectional study carried out in the UAE, it was reported that approximately 80% of the participants who

engaged in BCSP were encouraged by their doctors (Elobaid *et al.*, 2014). It is clear therefore that health care providers must adopt a proactive role promoting engagement in regular BCSP (Donnelly *et al.*, 2013a, Farid *et al.*, 2014). Nonetheless, the fact that only half of the participants were exposed to information about breast cancer from their doctors in our study is worrying. The importance for current, enthusiastic, and knowledgeable engagement between doctors and health providers with women across the UAE cannot be understated.

Although the value of BSE and CBE in terms of breast cancer mortality reduction is less established (Panieri, 2012, Kösters and Gøtzsche, 2003), compared with mammography screening which contributes to around 25% - 30% of mortality reduction (Panieri, 2012), both BSE and CBE have been shown to be cost-effective in facilitating early detection and down-staging in breast cancer diagnosis (Hassan *et al.*, 2015, Miller and Baines, 2011, Brennan, 2016). It is also important to note that regular BSE practice would probably make women more "breast aware" which could potentially facilitate earlier-stage detection by prompt reporting of any breast changes (Okobia *et al.*, 2006, Al-Foheidi *et al.*, 2013). This is supported by the fact that nearly 80% of breast cancer in women under 40 years old were self-reported (Stojadinovic, 2011). However, inadequate level of knowledge in regard to breast cancer indicative signs reported from the present study might greatly influence women's timely responsiveness to these changes. Therefore, increased women's knowledge in regard to breast cancer symptoms and aetiology are urgently needed. While there is no organized nationwide mammography screening in the UAE and women often diagnosed with breast cancer a decade earlier than westernized women (Najjar and Easson, 2010), current efforts to improve breast cancer screening practices in the UAE should be based on a combination of both BSE and CBE (Okobia *et al.*, 2006, Provencher *et al.*, 2016) which can be presented as being sensitive to cultural beliefs and attitudes.

The rate of mammography screening of women in our study (37.6%) was low compared to the rate of mammography in westernized countries (Health and Social Care Informarion Centre, 2014) and an international standard of 75% (Perry *et al.*, 2006). It is important to note that in developing countries initiating a national breast cancer screening program as a solution in the absence of an adequate diagnostic infrastructure is a questionable approach (Panieri, 2012, Al-Foheidi *et al.*, 2013). For instance, Bahrain was the first country in the GCC region to initiate a national breast screening programme in 2005 (Donnelly *et al.*, 2013a), however participation rate was out of expectation with only 21.1% women underwent a mammography screening in 2009 (Bahrain Cancer Society, 2014). Comparable findings were also reported from the UAE (Health Authority Abu Dhabi, 2008) and Saudi Arabia (El Bcheraoui *et al.*, 2015).

It should be acknowledged that this study had a small sample size; however, we recruited the maximum number of possible participants given time and financial constraints. Moreover, the proportion of women recruited relative to RAK population was consistent with other similar studies in GCC region (Donnelly et al., 2013a). Lastly, BCSP were self-reported, which may introduce the possibility of response bias. Other possible limitations of our study include the potential for that interviewers' bias during data collection, and an absence of in-depth information, warranting a need for future a qualitative research.

Conclusion

Breast cancer has become a major public health concern in the UAE, and early detection may play a significant role in reducing morbidity and mortality of the disease. This work compared with previous data has shown improvements in women's willingness to engage with screening programs. However, this study indicated that the RAK women's knowledge and practice of breast cancer early detection activities are inadequate. Therefore, a thorough, sensitive, and comprehensive public awareness campaign is needed that involves all relevant members of the community. This campaign should highlight that screening activities are influenced by personal and social factors not at all at odds with religious and cultural beliefs. Emphasis has to be laid on health care professionals, in terms of education and awareness as they are largely involved in patient care in the UAE. The study findings should not only provide a valuable insight to policy makers and health planners in RAK who are considering the establishment of a population-based breast cancer

screening program, but also encourage early detection strategies that are tailored to the specific needs of RAK women so that breast cancer management and prevention strategies are optimized.

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