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Descriptive Analyses of the National Breast Cancer Screening and Early Detection Program,
Kingdom of Saudi Arabia, 2011— 2016

by

Nada Munshi, MBBS
Degree to be awarded: MPH

Hubert Department of Global Health

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Nada Munshi, MBBS
Emory University
2017

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An abstract of
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Abstract

BACKGROUND: Breast cancer (BC) is the most common cancer worldwide; its incidence and mortality rates are high, but have recently dropped in the United States and parts of Western Europe, in part due to BC screening. Unfortunately, there are few BC studies among women in the Middle East and North Africa (MENA). The Kingdom of Saudi Arabia (KSA) – a country in WHO's Eastern Mediterranean Region Office (EMRO) – where BC has been recognized as a major problem among women for two decades, established a pilot BC screening and early detection (ED) program in 2011. So, for the first time, we reviewed the program, analyzed data from a portion of women screened from 2011 – 2016, and made recommendations to improve the program for the future.

METHODS: The program's history, goals, and performance were collected through a review of one internal report of the program called: "The suggested expansion plan of the national BC screening and ED program" and key informant interviews of two of the BC screening and ED program staff. Data from an arbitrary portion (N = 8,365) of women (N = 44,553) seen in five KSA Ministry of Health (MoH) BC and ED screening clinics in Riyadh from 2011 to June 30, 2016 were collected; cleaned; organized into three categories: demographic, epidemiologic, and medical; and analyzed using SPSS. Additionally, from 2015 – June 30, 2016 the number of servings of fruit and vegetables and physical activities were collected, cleaned and analyzed.

RESULTS: Over 5,000 women attended the program in 2013; while > 10,000 women attended in 2016, highlighting the program's acceptability and increasing popularity. Among the 8,365 women interviewed, 84% had been screened for the first time. Most women were Illiterate (30%) or had only primary schooling (18%). Most women (4,902; 59%) were obese. Among the 5,702 women screened from 2015 – June 30, 2016 (in all age categories), 2 – 4 servings of fruit and vegetables was most commonly reported. And 1,423 (26%) women of ≥ 40 years of age reported not engaging in any physical activity.

CONCLUSION: The pilot KSA MoH BC screening program began in 2011 with a successful start. For five years it grew and served the needs of > 40,000 KSA women by providing free BC screening services. Needing education and services about diet and exercise, most (59%) KSA women screened were obese and did not exercise. One limitation was that data were arbitrarily collected from a portion (19%) of the 44,553 women who visited the BC Screening and ED program; therefore, the objective findings described here are not generalizable and should be interpreted with caution. As the program enters stage three (2017 – 2020), we recommend updates in program design and implementation by evaluating the value of each variable collected (including their definitions), systematically recruiting participants, and digitizing data entry. In addition, the program should geographically expand to include women from all KSA cities and establish measures to monitor and evaluate the program.

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TABLE OF CONTENTS

Introduction

Breast cancer (BC) is the most common cancer worldwide and it is one of two major sites for women (breast and colorectal); its incidence and mortality have reached alarming levels (1). At the same time, the incidence and mortality of BC have dropped in the United States and West Europe (1,2). Many relate this decline to early detection (ED) through BC screening and the use of systemic adjuvant therapy (3). All countries should put more effort to provide BC screening and ED and educate women to decrease incidence and mortality (3).

Unfortunately, there are few BC studies among women in the Middle East and North Africa (MENA). Yet BC among women in the Eastern Mediterranean Region Office (EMRO) of the World Health Organization (WHO) is the number one cancer among 16 of 22 EMRO countries (4). Mammography screening is the most common control strategy – in technically advanced countries – for women ≥ 50 years of age (4). EMRO has focused on organizing screening programs using a step-wise approach where early diagnosis is promoted through public and professional education, followed by pilot programs and eventually the establishment of national programs (4). This approach is embedded in the EMRO Cancer Control Strategy.

The Kingdom of Saudi Arabia (KSA) – a country in EMRO – where BC has been recognized as a major problem among women for the past two decades, put forth efforts in 2011 to create a BC screening and ED program beginning in Riyadh (4). The purpose of this thesis is to provide a comprehensive review of the KSA BC screening and ED program to provide guidance for its future expansion into stage three. There are three aims that support this purpose:

1. Describe the pilot KSA BC screening and ED program, including goals and changes in implementation;
2. Describe the characteristics of a portion of the screened population;
3. Recommend improvements in the design and implementation

To reiterate, since the KSA Ministry of Health (MoH) has undertaken this pilot program recently, it was necessary to review the program's history and highlight the progress, changes, and challenges (aim one). This thesis also described a portion of women screened (aim two) and made recommendations for stage three (aim three).

Literature Review

Breast cancer (BC) is the most common cancer worldwide and it is one of two major sites for women (breast and colorectal); its incidence and mortality have reached alarming levels (1). At the same time, the incidence and mortality of BC have dropped in the United States and West Europe (1,2). Many relate this decline to early detection (ED) through BC screening and the use of systemic adjuvant therapy (3).

While implementing BC screening, risk factors can be also collected during the visit at the screening center. The risk factors of BC can be categorized in four groups (5):

- ➢ This category accounting for 15% of cases and it is family history and genetic background

- ➢ The hazardous effects of hormonal exposures, and comes under that:
    - menarche at early age
    - menopause at late age
    - fewer children and nulliparity (late age at first birth)
    - limited to no breastfeeding
    - long-term hormone replacement therapy (HRT) use

- ➢ High-breast density; this risk factor considered a significant marker of BC risk

- ➢ History of benign, proliferative breast disease (5).

Evidence shows that obesity and overall caloric intake are also related to increased BC risk (5).

BC has been thoroughly studied in the west and near east. For example, in Korea, among 10,528 patients of the National Cancer Screening Program with various cancers including BC, authors find participants with lower socioeconomic status had significantly greater risk of being diagnosed with BC at a late stage. The odds ratio (OR) for these participants with BC is 1.35 (95%CI=1.02-1.81) (6). Another example of a national BC screening program is the

2007 National Breast Cancer Screening Program (NBCSP) in Poland had the critical goal of decreasing mortality from BC (7). The aim of their study was to evaluate the impact of participation in the screening program on BC prognosis. The study included two groups of patients: those who participated in the NBCSP and those who did not. The first displayed fewer advanced American Joint Committee on Cancer (AJCC) stages, lower tumor diameters, and lower incidence of metastases to axillary lymph nodes (7). This study confirmed the positive effect (enhanced prognostic factors and the satisfactory staging) of NBCSP on participating women (7).

Unfortunately, there are few BC studies among women in the Middle East and North Africa (MENA). In KSA and MENA, one 2010 pilot of a mammography screening program showed poor compliance with attendance (4). This study included 1,628 women, and the number of detected BC cases was small. Only four women were diagnosed with invasive BC, which is a potential limitation given that the number of detected cases was low. This study indicates that the low detection rate might be due to the fact that the majority of the women screened were young. Further, in MENA, when comparing the KSA study to a population-based breast screening trial in Cairo, Egypt (which has the highest BC incidence among EMRO countries), more efforts towards screening of BC were seen, resulting in a higher BC detection rate (screening involved clinical breast examinations at primary health centers [PHCs] and mammography) (4). One possible explanation for this is that the Cairo study was more successful in persuading women to attend screening due to social workers who visited homes of potential screenees (4). Therefore, it has been suggested that to recruit more screenees in KSA, further evaluation should be done, as in Sana'a, Yemen; Khartoum, Sudan; and Cairo, Egypt (4). Some countries in EMRO did not include mammography in BC screening. For example, in a pilot mammography screening study in Morocco, national BC screening was based on clinical breast examinations. Oman followed suit (4).

In Egypt, the Ministry of Health and Population started a mammography screening program to include digital mammography where images are read in a central location (4). This program is based on mobile units going to PHCs (this method is largely beneficial). Further, Egypt provided guidelines for successful BC screening that mandated a fully organized program to include several components (4).

- Identifiable target group or population, with accompanying population registers
- Implementation measures available to guarantee high coverage and participation
- Access to high-quality screening
- Effective referral system in place for diagnosis and treatment
- Measures in place to monitor and evaluate the program

In a Lebanese study of BC screening, the association between whether or not a woman ever used and/or repeated a mammography and the psychosocial and social-demographic factors were examined (8). Variables with significant bivariate associations with various types of behaviors were entered in multivariate analysis. A sample of 2,400 women aged ≥ 40 years of age in 2014 were selected and surveyed from several locations in Lebanon. Among these, 105 (4.4%) never heard of mammography as a BC early detection and screening tool. Among the remaining women (2,295), only 45% ever used mammography. Of these, 10% received a mammography for the first time in the previous 12 months. Repeaters were 67% of 926 women who had the opportunity to do so (median lifetime frequency). Factors such as older age, more advanced socio-economic status (SES) and residing within the Greater Beirut (GB) were significantly associated with ever-use. Psychosocial factors like perceived susceptibility and benefits were highly associated with ever-use within GB. In contrast, socio-economic advantage appeared to greatly affect ever-use outside GB. Husband support was critical for observance of mammography guidelines mainly outside GB; disagreement from husbands towards

mammography was recorded among 4% of women. In all regions of Lebanon, higher education was a significant socio-demographic determinant for ever-repeating mammography screening. The perceived comfort of using the mammography test on a previous occasion greatly affected the likelihood of repeating the test.

Recommendations in this study were to provide mammography tests free-of-charge to lessen the obstacles faced by women with socio-economic disadvantages and ensure repeat testing. Healthcare providers should stress that good test results provided during a year of examination does not make cancer less likely in following years. Repeat testing could also be ensured by improving comfort (8).

In Turkey, the screening program's impact (changed attitudes and behaviors) by education on BC early diagnosis was studied among 342 women (9). Data were collected using the "Champion's Health Belief Model Scale Breast Cancer (HBMSBC)" form and examined the women's health beliefs prior to and after six months of education about early diagnosis of BC. When comparing findings before and after the six months, avoidance of mammography decreased while breast self-examination (BSE) self-efficacy and attitudes of mammography benefits increased over time.

Further, six months after education, the number of women who had undergone mammography was 28.4% and the number who had performed BSE was 69.9%. These authors find that six months of education positively influenced the health behaviors of women to mammography and BSE. Therefore, this study indicates that a professional education program providing education consistently is an essential part of increased participation in early screening (9). Turkey and Saudi Arabia, countries in the Middle East, share similarities with regard to women's behavior towards health education about BC screening. It is important to understand

women's behavior in all middle eastern countries because of shared cultural values. Therefore, health education should be a part of a BC screening and ED program.

In assessing the availability of KSA BC screening prior to the National BC screening and ED program, programs not affiliated with the KSA MoH were found in the eastern region (e.g., Al Hassa city); Al-Qassim city; the western region (e.g., Jeddah, Madina); and the northern region (e.g., Tabuk city) (10 - 14). Although many initiatives addressing BC awareness and screening were available, they were not permanent and were not provided to the public on a continuous basis.

In a previous study in KSA in Al-Hassa, a city in the eastern region, women (1,315) from 10 primary health care centers were interviewed (10). The questionnaire included BC knowledge, screening practices (i.e., clinical breast examination [CBE] and mammography), individual BC risk factors and perceived barriers towards CBE. The knowledge of BC and its risk factors were low. Further, many barriers affected early screening. The outcome of the questions regarding the mammography and clinical examination were 3% and < 5%, respectively. When examining the BC family and past medical history of participants, 18% had a positive family history (first and second degree relatives), and 2% had a benign breast lesion history. This study concluded that BC knowledge was low among participants, regardless of their educational background (10).

Other BC efforts exist in the KSA eastern area. One study examined a nongovernmental screening program of two mobile mammography machines first established in October 2009 (11). The two mobile mammography machines covered 14 healthcare clinics for women ≥ 40 years of age. From 2009 to 2014, they interviewed 8,061 women with 15% uptake and recall of 7.9%. Of those screened, 47 cases of BC were confirmed, with a detection rate of 5.83 per 1,000 women screened. However, 70.2% of the cases diagnosed had either no mass or the lesions were < 2 cm. The median age of the cases was 50.4 (SD=7.9) years old. Recommendations from this study

indicated a strong need for a national BC screening program in KSA (11), therefore, it is recommended to expedite program's expansion to all regions of Saudi Arabia.

In the western region of KSA – Madinah city – a cross-sectional study among five primary health care clinics attended by 465 women aimed to examine BC knowledge, practices, and screening barriers. Structured questionnaires were distributed asking about socio-demographics, knowledge about BC, and practices and barriers of mammography. The mean age of the participants was 34.9 ± 12.2 years. Those screened by mammography and performed breast self-examination (BSE) were 27.7% and 38.5%, respectively. All participants showed poor knowledge of BC and its risk factors regardless of whether they received a mammography. Major predictors of not receiving mammography screening were incorrect beliefs about mammography and its procedures. For example, the belief a mammography is painful resulted in a significant reduction in its use (56%) (OR= 0.44; 95%CI = 0.22–0.88). The need for greater efforts to increase BC awareness was recommended after observing poor knowledge (12).

Few studies on BC have been conducted in the Gulf Region (13). One study investigated BC awareness among 200 women > 20 years of age. They conducted face-to-face interviews to assess BC knowledge, warning signs, risk factors, screening programs, and BSE. BC Awareness Measures (CAM) version 2 was converted to Arabic. In a descriptive statistical analysis using Pearson's Product Moment correlation coefficients and ANOVA test, of 200 participants, 50.5% were aware of a breast lump being a warning sign; 57.5% indicated that family history was risk factor; 20.5% received breast screening; 79% had heard about BSE; and 47.5% knew how to perform BSE. Increased BC awareness in KSA was apparent (13).

In a retrospective review of BC in Tabouk city from 1990 to 2014 conducted by the University of Tabouk, including the KSA Cancer Registry from the King Faisal Specialist Hospital and Research Center, BC patterns indicated a steady increase of women with BC (14). In 2008, 1,152 BC cases rose to 1,308 in 2009 and 1,473 in 2010. Of the total number of cancer cases in

KSA in 2010 (5,378), BC leads, constituting 27.4% of female cancers. The average age of BC diagnosis was 48, but the weighted average was 49.8, and the range was 43-52 years of age. There has been a significant increase in BC over the years. Their recommendations were to establish early diagnosis programs, perform optimal treatments, continue screening by mammogram, and educate women and patients (14).

In KSA, BC is the most common cancer among females for 12 consecutive years (KSA Cancer Registry, 1994—2005) (15). Though BC is more common in women > 50 years of age worldwide, it is diagnosed among younger women. BC is the single leading cause of cancer death for women 20 – 59 years of age (15). It is a major public health concern. There were 1,873 cases in 2013, accounting for 29.1% of all newly diagnosed female cancers. Evaluating early BC detection and screening, plus understanding risk factors is a priority. Early BC detection provides enhanced survival and mammography decreases BC deaths, with 20—40% of deaths from BC among women if detected early (5). This is why the KSA national BC screening and ED program is important.

The program was developed in three stages. Initiated in 2011, the program first began as a pilot where a few primary health care (PHC) centers, public places (e.g., malls, government agencies) and mobile clinics were selected to provide clinical breast screening examination and mammography (16). The program officially launched March 31, 2012 by Princess Hessa Al-Shaalan (personal communication; BC screening and ED program). It provided screening services with two mobile clinics located between health centers and malls and expanded in 2014, to include three mobile clinics and two permanent ones (personal communication; BC screening and ED program). One of the permanent clinics, located in Hayat Mall, was launched by H.E. Dr. Mansour Al-Hawasi, the Vice Minister of Health (personal communication; BC screening and ED program). The second was launched in Panorama Mall by HRH Princess, Haifa Bint Faisal (personal communication; BC screening and ED program). The program collaborated with

foundations such as Susan Komen International BC Foundation and the Jordanian Program for BC to establish national training programs for BC health education (16).

The second stage included three phases: (1) coverage of the Riyadh region with several cities, (2) connecting the permanent clinic at the Panorama Mall to the Administration of Health Affairs in Riyadh, and (3) beginning of expansion to the other regions in KSA. Since the program began, a questionnaire was developed and administered arbitrarily to some women who visited the clinics. They complete it in paper form while measurements (e.g., BMI, weight) were made by healthcare professionals. In 2015, the program modified the questionnaire to include fruit consumption and physical activity questions (N = 81 questions). The third phase will be implemented beginning 2017 and involves expansion to cover all regions within KSA, by maximizing available resources and by incorporating recommendations (16)

This program goal was to provide women access to dedicated, essential health services. These clinics offered general health examinations including height, weight, and blood pressure assessments, plus clinical breast examinations, mammography, and ultrasound breast screenings. The program provided general health education, with an emphasis on promoting healthier lifestyle habits to prevent non-communicable diseases (personal communication; BC screening and ED program).

While the program began in 2011, no formal evaluation has yet been conducted. It is important to track program goals, implementation and performance (aim one). Periodic reviews ensure program efficiency and effectiveness. Further, data were collected but no yet analyzed (aim two). Therefore, after analyzing the data we have a better understanding of the population that was screened and although an expansion plan (phases two and three) was developed, it has not yet been implemented. Aim three makes recommendations for program improvement as it moves into phase three.

Methods

Study design

Aim one is a review of the KSA MoH BC and ED screening program goals and implementation. To collect information about aim one, in Riyadh 2016, I reviewed a document of the program called "The suggested expansion plan of the national BC screening and ED program" (16) plus I conducted key informant interviews with two of the BC screening and ED program staff (personal communication; BC screening and ED program). The questions asked in these interview were about background, development, and stages of program. I also performed a descriptive analyses of data collected from a portion of women arbitrarily interviewed (aim two) from 2011 to June 30, 2016. Between 2011 and 2016, a total of 44,553 women were screened; among those, 8,365 were arbitrarily recruited and interviewed. This analyses included data from these 8,365 women.

Data collection

A paper questionnaire was provided to the arbitrarily selected 8,365 women to complete while physical measurements (e.g., BMI, weight) were made by healthcare professionals.

Data source

These data were from an arbitrarily selected portion (N = 8,365) of women (N = 44,553) visiting five KSA MoH BC and ED screening clinics from 2011 to June 30, 2016. In Figure 1, only years 2013 – 2016 were presented. The number of women completing the questionnaire and analyzed, by year, was 1,337 (23%) of 5,915 screened in 2013; 1,320 (11%) of 12,413 screened in 2014; 4,326 (37%) of 11,856 screened in 2015; and 1,376 (13%) of 10,664 screened in 2016.

Study variables

There were 81 variables in the questionnaire distributed to the women, but only a portion of those were analyzed in this thesis. Data were sorted and categorized into (1) demographic (screening, age, education, marital status, pregnancy, number of children, age at menarche, and menopause); (2) epidemiologic (history of contraceptive pill use, history of breast feeding, history of hormone replacement therapy, and mammography); and (3) medical (BMI, history of BC, history of ovarian cancer, history of breast biopsy, positive clinical examination, suspicious mammogram screening, cancer diagnosis, and number of full-term pregnancies). Among other variables collected, the KSA MoH ED and BC Screening Program determined in 2015 that fruit and vegetable consumption was important since diet and obesity are linked to poor health outcomes (5). They also wanted to capture physical activity. Therefore, from 2015 – June 30, 2016 the number of servings of fruit and vegetables and physical activities were collected, cleaned and analyzed (personal communication; BC screening and ED program).

Statistical analyses

Data were entered into SPSS, cleaned, and analyzed by frequency, mean, and standard deviation. Categorical variables were expressed as frequency and percent of total (Table 1). Continuous variables were expressed as mean and standard deviation.

Ethics

This study used secondary data without personal identifiers. It was reviewed by the Emory University Institutional Review Board; it did not meet the criteria for human subject research and was found exempt from review.

Figure 1. Number of Women Included in the Study as Portion of Total Number Screened in the Breast Cancer Screening and Early Detection Program, Kingdom of Saudi Arabia, 2013 – 2016
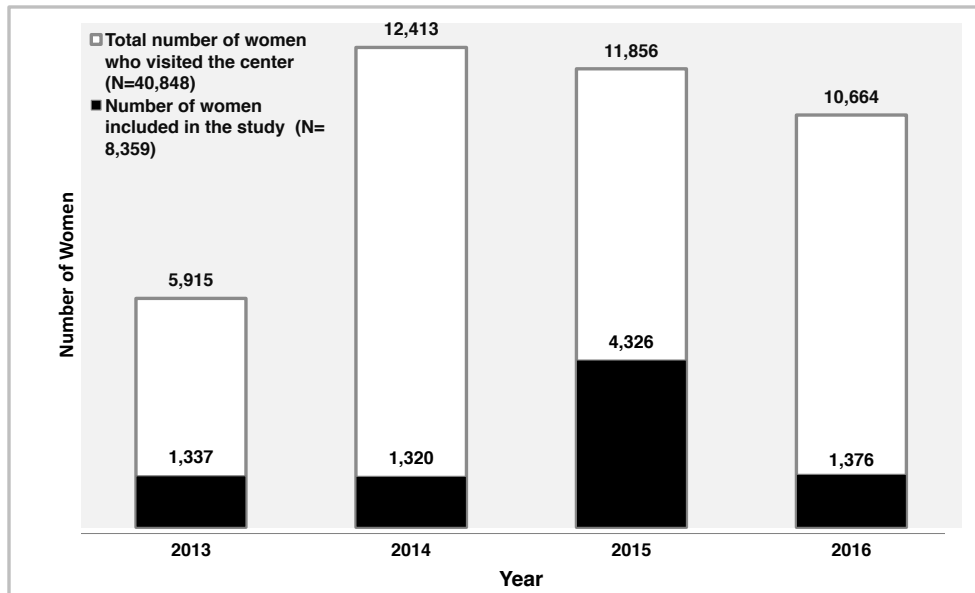
Results

There were > 5,000 women who attended the program in 2013; in 2016 > 10,000 women attended. This increase is a measure of the program's success (Figure 1). Demographic characteristics of women screened are important to define the population. Among the 8,365 women analyzed in this study, 84% were screened for the first time (Table 1). Middle-aged women (41 - 60 years of age) attended the screening center most frequently (80%). Forty-eight percent were illiterate or only had primary education. Thirty-nine percent had at least a high school education (Table 1).

The epidemiologic characteristics of women are important to be studied in relation to the BC risk factors. The mean number of pregnancies was 7.7 among those included in this study. Sixty-four percent of women in this study reported a history of oral contraceptive pill use (Table 2). And 7,144 women (86%) reported breast-feeding. Only 3,314 women (40%) had undergone a mammogram, and 66% of them were first timers.

The majority of women 4,902 (59%) were obese (Table 3). However, the number women with either breast (n=17, 0.2%) or ovarian (n=5, 0.1%) cancer was small. There were 221 (3%) and 619 (7%) women with a positive clinical examination or suspicious mammogram results, respectively. However only 32 (0.4%) case-patients were diagnosed using the center's resources and referred for additional evaluation and treatment.

Among 5,702 women were screened from 2015 – Jun 30, 2016, variables related to their fruit and vegetable consumption were collected. In all age categories, 2 – 4 servings of fruit and vegetables was most commonly reported, if known (Figure 2). And 1,423 (26%) women ≥ 40 years of age reported not engaging in physical activity (Figure 3).

Table 1. Demographic Characteristics[η] of Women* in the Breast Cancer and Early Detection Screening Program, Kingdom of Saudi Arabia, 2011 – 2016

Demographic Characteristics	N (%)
Screened	
Newly Screened	7,032 (84)
Re-screened	1,333 (16)
Age**	
<= 40	673 (8)
41 – 50	3,356 (40)
51 – 60	3,336 (40)
61 – 69	829 (10)
70 – 79	145 (2)
80+	13 (0.2)
Education[¥]	
Illiterate	975 (30)
Primary	613 (18)
Secondary	456 (14)
High school	453 (14)
College	788 (24)
Post-graduate	25 (1)
Been married	8,154 (98)
Age of first marriage[†]	18.5, 4.8
Been pregnant	7,925 (95)
Age at first live birth[Ω]	20.5, 4.7
Number of total pregnancies[£]	7.7, 3.4
Age at menarche[ә]	13.1, 1.7
Menopause	3,452 (41)
Age at menopause	50.3, 5.5

*N = 8,365
**N = 8,352
[¥]N = 3,310
[†]N = 4,531
[Ω]N = 7,505
[£]N = 7,936
[ә]N = 7,285
[η]Categorical variables were expressed as frequency and percent of applicable total in parenthesis. Continuous variables were expressed as mean and standard deviation.

Table 2. Epidemiologic Characteristics[η] of Women[*] in the Breast Cancer and Early Detection Screening Program, Kingdom of Saudi Arabia, 2011 – 2016

Epidemiologic Characteristics	N (%)
History of contraceptive pill use	5,357 (64)
Length of use (in years)	36.9, 24
Time since stopping (in years)	13.2, 8.5
History of breast feeding	7,144 (86)
History of hormone replacement therapy use	62 (0.7)
Length of use[**] (in years)	14.2, 15.7
Time since stopping[¥] (in years)	3.4, 2.3
Had mammogram	3,314
First mammogram	2,183 (66)
Number[Ω]	1.4, 1.4

[*]N = 8,365

[**]N = 61

[¥]N = 12

[Ω]N = 1,116

[η]Categorical variables were expressed as frequency and percent of applicable total in parenthesis. Continuous variables were expressed as mean and standard deviation.

Table 3. Medical Characteristics[η] of Women[*] in the Breast Cancer and Early Detection Screening Program, Kingdom of Saudi Arabia, 2011 – 2016

Medical Characteristics	N (%)
Body Mass Index[**]	
Underweight (<18.5)	1,431 (17)
Normal (18.5 – 24.99)	419 (5)
Overweight ($\geq$25)	1,582 (19)
Obese ($\geq$30)	4,902 (59)
History of breast cancer	17 (0.2)
History of ovarian cancer	5 (0.1)
History of breast biopsy	14 (0.2)
Positive clinical exam	221 (3)
Suspicious mammogram screening	619 (7)
Breast cancer	32 (0.4)
Number of full-term pregnancies	6.4, 2.8

[*]N = 8,365

[**]N = 8,334

[η]Categorical variables were expressed as frequency and percent of applicable total in parenthesis. Continuous variables were expressed as mean and standard deviation.

Figure 2. Servings of Fruit and Vegetables Consumed by Women★
in the Breast Cancer Screening and Early Detection Program, by
Week, Kingdom of Saudi Arabia, 2015 – 2016

■ None ■ One ■ 2 - 4 ■ 5 or more ■ Unknown

★ N = 5,702

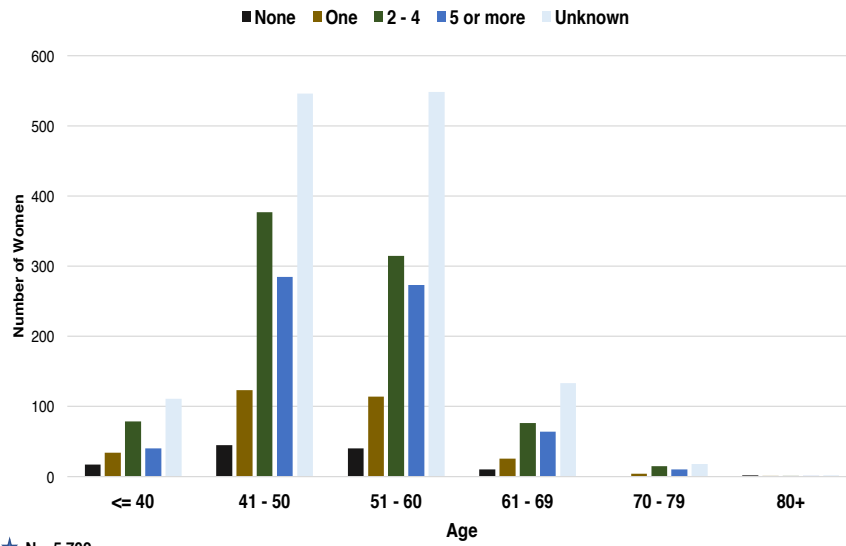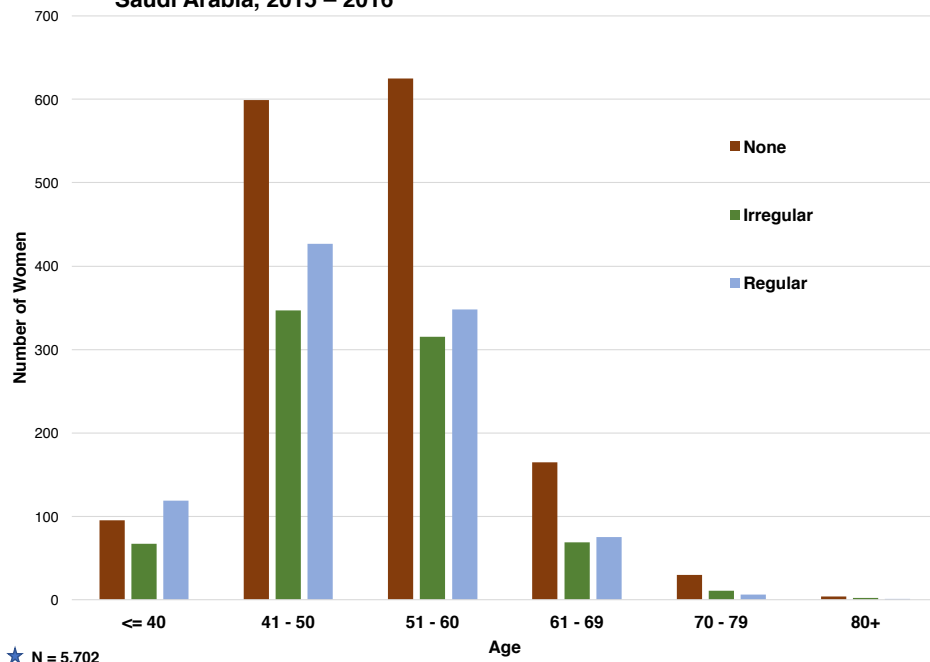Figure 3. Physical Activity among Women in the Breast Cancer Screening and Early Detection Program, by Week, Kingdom of Saudi Arabia, 2015 – 2016

★ N = 5,702

Discussion

The KSA MoH BC screening program began in 2011 with a successful start. For five years it grew and served the needs of > 40,000 Saudi women with free BC screening services (Figure 1). In 2015 the program made adjustments (16); and there are plans (stage three) to make further updates and both expand geographically and adapt to global best practices to meet the needs of KSA women (16). . Therefore, this thesis reviewed the program's past history (aim one), analyzed a portion of the women screened (aim two), and made recommendations (aim three) to support stage three implementation. The KSA program now provides free KSA MoH BC screening services to predominantly middle-aged women from Riyadh, but in the future will expand geographically (16). Most women screened during stage one and two were > 40 years of age with poor educational backgrounds. And 86% of women analyzed answered "Yes" to the breast-feeding question; this is a positive finding. As mentioned, not breastfeeding is a risk factor for BC, so breastfeeding is a preventive BC measure. One explanation of this big of women breast feeding their infants, maybe because Muslim women breast feed their infants for two years because the Qur'an (Islamic holy book) advises this as good behavior. (5).

Most who underwent mammography were first timers; this is a good outcome. It reflects an increased awareness and availability of services that is similar to the positive impact of national BC screening programs initiated in other MENA countries (4). The introduction in 2015 of questions about diet and physical activity are good adjustments, as a significant number of women reported being obese (59%). Educating women about habits that cause obesity was a good adjustment (16).

One limitation of this study was that an arbitrary portion (19%) of the 44,553 women who visited the BC Screening and ED program between 2011 – 2016 were surveyed. These findings must be interpreted with caution because they are not representative of the women screened or

the overall population. There were also limitations in the conduct of the screening. Some variables were not clearly defined in the survey instrument (e.g., "regular" exercise).

There were other limitations. Forty-eight percent of women were either illiterate or had only a primary education; this is not representative of women in KSA, especially outside of Riyadh (personal communication; BC screening and ED program). Another indication of bias is the fact that one would expect oral contraceptive pill use to be > 64% if the study included younger women. The same trend would be true with physical exercise (personal communication; BC screening and ED program). These data were also administered in paper form; there was extra labor involved in data entry and the possibility of data-entry errors.

This study is important to public health in KSA because it brings the rigor of science and global best practices of implementation to this prevention program. We recommend that data be collected and entered electronically using a tablet and in a useful software tool (e.g., EpiInfo). This recommendation should be beneficial because in the past years only 19% of the women who visited the program were surveyed. Perhaps a larger percentage of women would be surveyed if data were collected electronically. Further, we recommend a review of variables collected to ensure the information collected is used; 81 variables were collected, but only a portion of those were used in this analyses. For that unneeded collection of data, the program should develop an analyses framework for all variables collected. In addition to conducting an analyses framework and after reviewing the program questionnaires, information collected should be defined with specificity so women would know the meaning and answer questions properly. For example, regular and irregular patterns of physical activity should be defined clearly (Appendix B).

The MoH will be expanding the screening program to other regions of KSA to implement phase three (2017 – 2020) (16), and we recommend to focus on universal recommendations for BC screening since the ED of BC was confirmed to decline BC incidence and mortality rate (3). Some studies previously referenced (e.g., Cairo study) have proven to increase BC screening

by including social workers for in-home visits (4). Future studies should explore steps that KSA

MoH should adopt to include in-home visits by the BC screening and ED program. Because of

the existence of mobile units, social workers can provide in home healthcare BC services. This

is a model that the BC screening and ED program in KSA can adopt to increase accessibility of

BC screening (4). Another recommendation we support (adopted from the Cairo study) is to put

into place monitoring and evaluation measures (4). Indicators of this monitoring and evaluation

should be studied in future stages of the program. Those indicators could measure BC

screening and ED program services or the expansion plan to include other cities.

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16. The suggested expansion plan of the national BC screening and ED program, The BC screening and ED program, 2016

Appendix

A) Questionnaire (2011 – 2014):

NBCSP- women data

ID number:

Date:

Age:

Weight :   **Height :**

New exam: **Re-screen** :   date of last exam

Pregnant :   Yes   No

Lactating :   Yes   No

Date of last Menstrual Period*:*   /   /

Reproductive History:

- Age at first Menarche: or   Unspecified
- Age at first marriage :   or   Unspecified
- Age of first Live-birth   :   or   Unspecified
- Total Number of pregnancies: or   Inapplicable
- Number of children
- Age at Menopause :   or   Inapplicable

Oral Contraceptive Use: Yes (length in years)   No

History of breast feeding :   Yes (length in years)   No

Hormone Replacement Therapy: Yes (length in years)   No

History of previous Breast Cancer: Yes (age:)   No

History of Breast Biopsy or Surgery: Yes (benign, Malignant)   No

History of previous ovarian Cancer: Yes (age:)   No

History of previous exposure to mantle radiation for NH lymphoma,
Between 10-30 years of age: Yes   No

Family History of Breast or ovarian Cancer :

 if yeas please document the age

- Mother: (Yes ,No, NA)   Daughter: (Yes ,No, NA)
- Sister: : (Yes ,No, NA)   Aunt (mother's side): :(Yes ,No, NA)
- Aunt (Father's side): (Yes ,No, NA)
- Grandmother (mother's side): (Yes ,No, NA)
- Grandmother (father's side:(Yes ,No, NA)

Clinical exam Findings:

- Breast change (lump , size , shape , pain)
- Nipple(Discharge   ,inversion , pain)
- Skin (dimpled, puckered or scaly, color)
- Lymph node Enlargement: Yes   No

Additional Clinical Comments :

The reason of mammogram referral:

⊗ Age   ⊗ Risk Factors   ⊗ Symptomatic

B) Questionnaire (2015 – 2016):

NATIONAL BREAST CANCER EARLY DETECTION PROGRAM
Breast Cancer Risk Assessment Tool

01) ID Number: ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

02) Date of Examination :(/ /).

03) Age: **or** **04) Date of Birth:** (/ /).

05) Weight (Kg): **06) Height (meters):**

07) What is the Highest Level of Education you have completed?
    a. iiilliteracy   b. Primary school completed   c. Secondary school completed

    d. High school completed   e. College/ university complete   f. Post-graduate degree

08) Is this your first mammogram ever?   a. Yes   b. No
If No,
    08-1 How many mammograms have you had before?
    08-2 What was the date of your last mammogram? (/ /).

09)Who referred you/ advised you to come for a mammogram?
 a. Doctor   b. Self-referred   c. Family member: Specify: d. Friend   e. health educator   f. Other
10) Menstrual history:
 10-1 age at menarche:
 10-2 When did you have your last menstrual period: (/ /)
 10-3 Have you gone through menopause?   Yes   No
(if yes):
 10-4 Age at Menopause:

11)Are you currently: Married   Single   Divorced   Separated
Widowed

12) If married or previously married, please answer the questions that follow, otherwise proceed to question #14

      12-1 Have you been pregnant: Yes   No (if No, please proceed to Question #14)

      12-2 How many times have you been pregnant?

      12-3 Age at first full-term pregnancy (FTP) / live-birth:

        12-4 Total number of FTPs:

      12-5 Total number of live births:

13) Have you breastfed your children: Yes   No

If Yes:

      what was the total time you have breastfed them all?

14) Have you ever used any oral contraceptives: Yes

No   If Yes?

      14-1 How long have you been using / used the pills (lifetime-use):

      14-2 If stopped using the pills, how many years since stopping:

15) Have you ever used hormone Replacement Therapy (HRT): Yes   No

If Yes:

      16-1 How long have you been using the HRT pills (lifetime use):

      16-2 If stopped, how many years since stopping:

16) Have you ever had a breast biopsy: Yes   No

how many:

      17-1 Is any of these breast biopsies had abnormal findings? Yes   No

17) Were you ever diagnosed with breast cancer? Yes   No

which age:

18) Were you ever diagnosed with ovarian cancer: Yes   No

which age:

19)-Were you ever exposed to mantle radiotherapy between 10-30 years of age: Yes No

20) Has any of your family members been diagnosed with breast cancer or ovarian cancer: Yes   No

a. Which first degree relative had?		What was their age at time of diagnosis?	
breast cancer	Ovarian cancer	breast cancer	Ovarian cancer
Mother	Mother		
Sister	Sister		
Daughter	Daughter		
Father, brother			

b. Which second degree relative had?	What was their age at time of diagnosis?

Breast cancer	Ovarian cancer	Breast cancer	Ovarian cancer
Grandmother/Grandfather	Grandmother		
Aunt 1	Aunt 1		
Aunt 2	Aunt 2		
Niece (brother's daughter)	Niece (brother's daughter)		
Niece(sister 's daughter)	Niece(sister 's daughter)		

21)Diet:
   a. How many servings of fruits & vegetables **per day/per week**: None   One serving
2-4 servings   5 or more

   B. how many serving of red meat and meat products consumed **per day/ per wee**k:
         None   1-2   serving   2
   serving or more

   c. What type of oil/fat is most often used for meal preparation in your household?
         Vegetable oil   olive oil   Animal fat   Butter   Margarine
         None

22)Physical Activity:
   a. On a typical day, how much time do you usually spend sitting or reclining?

   b. In a typical week, do you perform any type of physical activity (example: walking or other
       types of exercise)?
                  regularly   irregularly   No

   c.   If Yes, How much time per week do you spend doing this activity/ activities?

   d.   Physical activities are mostly: Occupational   Housework
leisure

23)Findings of Clinical Examination: negative   Positive
If Positive**:**
            a. Breast change: Breast mass/ Breast lumps/ Axilla mass / pain/ size / shape
            b. Nipple: bloody/ serious discharge/   inversion / pain
            c. Skin: rash / scaly / change in color
            d. Lymph node enlargement**:**   Yes   No
24)What is the reason for your referral to mammogram:
      24-1Being over 40 years old   24-2 Having risk factor for breast cancer:

      24-3Having breast changes/ symptoms

Physician name & signature: