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Abstract

Background: Most breast cancers in Oman are diagnosed at advanced stages and therefore early detection is important. The Oman Cancer Association (OCA) initiated a mobile mammography program in 2009 but no studies have evaluated the impact of the program. This study aimed to estimate the proportion of OCA-screened women who had repeated mammography (compliance) and the associated predictors. The sensitivity and specificity of the program were also evaluated.

Methods: Data for 13,079 women screened in the mammography clinic of OCA from 2009-2016 and medical records of all breast cancer patients seen at Royal and Sultan Qaboos University hospitals during the same period were retrieved and abstracted. Data included demographics and screening results from OCA and diagnosis and treatment from the two hospitals. Logistic regression analysis was conducted to identify predictors of compliance.

Results: A total of 8,278 screened women over age 42 years were in the study (median age 50 years, standard deviation (SD) 8 years). Only 18% of screened women were compliant with mammography screening. Predictors of compliance included age 50-69 years, family history of cancer, family history of breast cancer, and breast self-examination. The cancer detection rate was 4.1/1000 screened women. Positive predictive value of screening mammography was 4.7% with a sensitivity rate of 53% and specificity of 92%.

Conclusion: This study showed low mammography compliance rate among previously screened women. The study revealed low sensitivity, high specificity, and acceptable cancer detection rate. Future programs should focus on improving data collection for screened women, initiating linkage of databases between breast cancer screening and treatment clinics, and developing guidelines and policies for breast cancer screening in Oman.

Background:
Cancer is a global disease affecting women in developed as well as developing countries with expected rise of the disease burden from 14.1 million in 2012 to over 20 million patients per annum by 2025 (Ferlay et al., 2015). With increasing life expectancy in the developing countries, the burden of cancer is expected to increase. Approximately 8.8 million deaths worldwide were cancer-related in 2015 and 70% of cancer mortality occurred in low and middle-income countries (Fitzmaurice et al., 2017). Breast cancer is the most common cancer among women globally and its proportion to all cancers jumped from 11 % in 2008 to 12 % in 2012 (Tao et al., 2015). In 2015, breast cancer mortality represented 15% of all cancer-related deaths among women (World Health Organization, 2017). Although breast cancer is thought to be a disease of the developed world, over half (52%) of breast cancer cases occur in less developed countries (DeSantis et al., 2015). Furthermore, breast cancer survival tends to be poorer in developing than developed countries because of delayed diagnosis, limited availability of screening programs, and limited access to treatment (Siegel et al., 2012).

Patient timeliness is one of the most important factors for successful breast cancer management and survival (Tarver, 2012). Early detection and diagnosis with early intervention and follow-up play key factors in determining patient breast cancer survivorship. The survivorship rate of breast cancer increases to 98% if the disease is diagnosed at early stages and survivorship drops to 84 % if the disease is diagnosed at regional stages (Miller et al., 2016; Tarver, 2012). Delay in breast cancer diagnosis and treatment has its significant impact on lowering survival rates and diminishing quality of life (Caplan, 2014).

The Sultanate of Oman is located in the southeastern coast of the Arabian Peninsula and shares borders with Saudi Arabia, United Arab Emirates, and Yemen. The native population of Oman is 2.5 million individuals in addition to 2.3 million expatriates (NCSI, 2017). Breast cancer accounts for approximately 32% of the total cancers among females in Oman (Renganathan et al., 2014) and 25% of patients are under the age of 39 years (Mehdi, I. 2014). The World Health Organization cancer country profiles for 2014 showed breast cancer as the leading cause of cancer-associated mortality in women in Oman with 18.0% proportional mortality ratio of all cancer-related deaths (WHO, 2014). With an overall improvement in 5-year breast cancer survival rate (from 64% to 78%) in Oman from 1996 to 2008 (Kumar, Burney, Al-Ajmi, & Al-Moundhri, 2011), there has been no change in younger age and advanced stage at presentation [stages III (41.2%) and IV (18.2%)] in the same period (Al-Moundhri, 2013).

The Oman Cancer Association (OCA) is a non-governmental non-profit organization dedicated to increasing public awareness and educating cancer patients and their families. In 2009, OCA introduced a mobile mammography clinic as the first mobile screening program that travels all over the country offering free mammography and referral of suspected cases to the Royal Hospital (RH). The RH is one of the 2 tertiary referral hospitals that provide cancer treatment in the country (Ministry of Health, 2017). Since the inception of the OCA program, more than 15,000 women have been screened and around 1,470 suspected cases were referred for further diagnostic investigations such as ultrasound testing, fine needle aspiration, and tissue biopsies. Although this program has been ongoing for almost a decade, no studies have been conducted to evaluate the experience of the OCA screening and awareness programs. Therefore, this study aimed to estimate the proportion and predictors of the OCA-screened women who had repeated mammographic examination and to examine the sensitivity and specificity results among the cohort of the OCA-screened women.

Methods:

Study population:

Data for this study was obtained from 3 sources: a) the mobile screening clinic of the OCA, b) the medical records of breast cancer patients diagnosed and/or treated at the RH, and c) the medical records of breast cancer patients diagnosed and/or treated at Sultan Qaboos University Hospital (SQUH). The RH and SQUH are the only 2 tertiary hospitals that provide comprehensive cancer treatment in the country.

The OCA database:

Data of the 13,079 OCA-screened women from 2009 to 2016 was used for the current study. Inclusion in this study was limited to Omani women with no previous diagnosis of breast cancer, and those who had no pain, discharge, or palpable breast masses by history or on physical examination at the time of screening. Considering these inclusion criteria, a total of 8,278 screened women were included and 720 of them had suspected results and were referred to the RH for further evaluation. We restricted our study to women over the age of 42 years to ensure sufficient time for women to have a second mammogram (we are looking for the second mammogram after the first one that should have been done at age 40 at least) and to increase the chance of women to catch the unit as the OCA mobile unit visit each place once per year. We also restricted the study to women of Omani nationality because many non-Omanis do not have medical insurance and are more likely to receive cancer treatment outside Oman. To allow for adequate time for breast cancer to be reported to a tumor registry after a suspected mammography, we included only women who were screened from January 2009 to December 2016.

The OCA patient history database is composed of demographic and medical history as well as mammography results of all women screened through the OCA screening program. The patient history database is populated by data of self-administered questionnaires for women who can complete the questionnaires or interviewer-administered questionnaires, for illiterate screened women. The questionnaire included 40 questions about demographic, reproductive, family history of cancer, and breast cancer screening history questions which included frequency and date of screening. Results of initial screening examinations were classified as negative for cancer or suspected and referred. In the OCA mammography database that used the BI-RADS classification, findings were considered negative for cancer if classified as category 1 or category 2. Examinations reported with any of the following BI-RADS assessments were categorized as suspected and referred: category 0, category 3, category 4, and category 5.

The RH and SQUH databases:

The databases of the RH (1,153 cases) and the SQUH (810 cases) included data for 1,963 breast cancer patients diagnosed between January 2009 and December 2016. Electronic medical records were retrieved from both hospitals to obtain demographic characteristics (national ID, age, place of residence, and marital status) and date of breast cancer diagnosis. The data from 2 hospitals were compiled into one Excel file.

Using national ID, place of residence, and 100% name match, the databases of OCA and the two hospitals were merged to identify breast cancer patients who were referred from the OCA screening program and breast cancer patients referred from any other screening or diagnostic services.

The OCA patient history and examination forms included a consent that was signed by all women included in this study to use the data for research. The study was reviewed and approved by the institutional review boards at the University of Nebraska Medical Center, the Royal hospital, and the SQUH.

Data management and statistical analysis:
Repeated screening (compliance) was defined in this study as more than one screening. The definition was based on a previous study (Brown, 2006). However, since the OCA database included screened women only, we modified the definition to more than one screening, regardless of the period between the screenings.

True negative was defined as breast cancer not diagnosed within 2 years of a normal mammography result. False negative was defined as breast cancer diagnosed within 2 years of a normal mammography result. Women who received normal mammography results and later no record was found regarding their breast conditions in these 2 hospitals were considered as true negatives as well. Patients screened at OCA and found to have abnormal mammography followed by histopathologic confirmation, within 2 years from the abnormal mammography, were considered true positives. If breast cancer was not diagnosed within 2 years of an abnormal mammography, the examination was considered false positive. The diagnosis date was the date at which the patient was assigned an ICD code for diagnosis of breast cancer in the RH or SQUH registration records.

The sensitivity of mammography was calculated as the number of true-positive examinations divided by the number of true-positive plus false-negative examinations. The specificity of mammography was calculated as the number of true-negative examinations divided by the number of false-positive examinations plus the number of true-negative examinations. The positive predictive value was calculated as the percentage of women with abnormal OCA mammography results who were diagnosed later as cases of breast cancer within 2 years of the screening examination. Cancer detection rate was calculated as the number of true positive examinations divided by the total number of screening mammograms per 1000 examinations.

Descriptive statistics were calculated using the PROC FREQ procedure and the variables were tested for significant association to screening compliance with the chi-square test. Logistic regression analysis was performed to identify predictors of screening compliance. We included in the model, the variables that show significant results in chi-square test (P values < 0.05). The dependent variable was screening compliance and the independent variables included age, family history of cancer, family history of breast cancer, and breast self-examination. Odds ratios and 95% confidence intervals were calculated from the logistic regression model and p values for significance were defined as less than 0.05 for all the analyses which were performed using SAS statistical package version 9.3 (SAS, Inc. Cary, NC).

Results:
Characteristics of the screened women in the OCA program are reported in Table 1. A total of 8,278 screening examinations were performed from 2009 to 2016. The median age of the screened women was 50 years (standard deviation (SD) 8 years). The largest proportion of women screened was in the age group 50–69 years (51%). Out of 8,278 screening mammography examinations, 8.6% were performed for women with a family history of breast cancer. Only 19.5% of screened women performed breast self-examination. Out of 8,278 screened women, 9.7% and 3.8% reported a history of contraceptive use and surgical removal of the ovaries, respectively. Table 1 summarizes the characteristics of referred versus non-referred women. Among women who were screened and referred, 12% had a family history of breast cancer. Most referred women were in the age group 42-49 (51%) followed by women in the age group 50-69 (47%). The smallest proportion of referred women (2%) was in 70+ -year age group. The proportion of women with abnormal mammographic examination results was higher among women with no history of breast self-examination than among those who performed breast self-examination (80% versus 20%, for the 2 groups respectively). Additionally, breast self-examination, contraceptive use, and history of oophorectomy were not significantly associated with referrals after suspected mammography ($p>0.05$).

Prevalence of previous mammography for the total population is presented in Table 2. Among the 6,547 (82%) screened women who had not received a mammogram, 34% of them had family history of cancer, with 19% of them had family history of breast cancer. Only 18% of screened women reported having mammography more than once. Previous mammography was higher among women with no family history of cancer (66%) than those with family history of cancer (34%) ($p<.0001$). Higher compliance rates were also more likely in age group 50-69 than among women in other age groups (58%) ($p<.0001$). Women who were married had significantly higher compliance rates (80%) than non-married women, although the difference was statistically not significant ($p>0.05$). The proportion of women who had history of breast self-examination was higher among the compliant group (38%) than non-compliance group (15%) ($p<.0001$).

Results of the multiple logistic regression analysis are reported in Table 3. Factors that predicted compliance included age, family history of cancer, family history of breast cancer, and breast self-examination. When adjusting for all other factors, those in the 42–49 age group had 36.5 % lower odds of compliance as compared to women in the 50-69 age group (OR 0.64, 95% confidence interval (CI) 0.56-0.72, $p>0.0001$). Women in the 70+ age group also showed 43.5% lower odds of compliance than those in the age group of 50-69 (OR 0.57, 95% CI 0.37-0.87, $p=0.01$). After adjusting for all other factors, family history of cancer was significantly associated with compliance (OR 1.5; 95% CI 1.32-1.82, $p>0.0001$). Women with a history of breast self-examination had 3 times higher odds of compliance compared to those with no history of breast self-examination (OR 3.2, 95% CI 2.77-3.61, $p>0.0001$). Women with family history of breast cancer had 2 times higher odds of compliance compared to women without family history of breast cancer (OR 2.10, 95% CI 1.70-2.59, $p>0.0001$).

Table 4 shows recall rate, sensitivity, specificity, and positive predictive value of the OCA screening program during the period 2009-2016. A total of 720 women were recalled and referred for further evaluation that translated to 8.7% recall rate. The largest proportion of women recalled in this study was in the age group 42–49 years (51%). A total of 34 breast cancer cases were diagnosed by screening 8,278 women from 2009 to 2016. Thus, the cancer detection rate in this study was 4.1 per 1000 examinations. The positive predictive value of screening mammography was 4.7% with a sensitivity rate of 53% and specificity of 92%.

Discussion:

This study revealed the following interesting observations. First, the study showed a low overall rate of repeated mammography (compliance) in this population of screened women in Oman. Second, family history of cancer, family history of breast cancer, and history of self-breast examination were significant predictors of compliance. Third, the sensitivity of this screening program in Oman is lower than the sensitivity of other international programs but the specificity of the program was comparable to other international programs.

Regarding the low rate of compliance shown in this study, it is important to report that no previous studies have been conducted on screening or compliance in Oman. Studies from Saudi Arabia showed variable rates of screening and compliance. For example, a longitudinal prospective study of 3778 Saudi women over the age of 40 years conducted in Riyadh reported the outcome of 7 years of follow-up (2007-2013) of the oldest breast cancer screening program in the country. The study showed 30% of mammography compliance (Abulkair et al., 2015). Another study conducted in Dammam included 8061 women over the age of 35 years screened between 2009 and 2014 by 2 mobile screening units of the Saudi Cancer Foundation showed only 3.0% of women reported having a second mammogram (Al Mulhim, Syed, Bagatadah, & Al Muhanna, 2015). However, studies from other Gulf countries showed results of ever-using mammography but no studies on repeated screening or compliance. For example, a cross-sectional study of 519 women over the age of 20 years conducted in Kuwait showed 16.2 % rate of ever having a mammogram (Saeed, Bakir, & Ali, 2014). Another cross-sectional study of 1063 Qatari and non-Qatari women over the age of 35 years showed 22.5% of the study participants ever having mammography (Donnelly et al., 2013).

Studies from other Arab countries showed higher rates of compliance. A study conducted in Lebanon used data for the period 2005-2013 of 2400 women over the age of 40 years showed a compliance rate of 20.7% within the12 months following the initial screening (Haddad, Kourie, & Adib, 2015). A study from Jordan Jordan of 1549 women over the age of 18 years showed a compliance rate of 43.1% (Othman, Ahram, Al-Tarawneh, & Shahrouri, 2015). In general, the overall compliance rates in Arab countries is lower than the rates in developed countries such as U.S. in which the compliance rate ranged between 50-70% (Puckett, Abedi, Alavi-Dunn, Hayes, & Garcia, 2016). It also is important to note that mammographic screening programs in Arab countries, including Oman, are relatively recent (less than 15 years old). Also, screening programs in Oman adopt opportunistic screening approaches. While population-based screening in Arab countries is not recommended because of low to moderate incidence of breast cancer (Harford, 2011), the situation in Oman is different. Factors that make Oman different from low- and moderate-incidence developing countries include the relatively not uncommon young-onset breast cancer (25% of patients present under the age of 39), the advanced stage presentation (59% of cases are stages III and IV), the possible hereditary breast cancer genetics that need further investigation in this population, and the fact that Oman has financial resources, and that the population size of Oman is relatively small (2.5 million individuals).

Regarding the second observation of the predictors of compliance, it is noteworthy that the factors included in different studies to predict compliance varied between these studies. Some common variables in most of these studies included age, socioeconomic, and health insurance status of screened women, and whether or not primary care providers recommended screening. Age as a predictor of compliance in our study showed women in the age group 50-69 as the most compliant (58%) compared to other age groups [(40%) among the 42-49 age group and (2%) among the 70+ age group]. This finding was similar to other studies conducted in non-Arab countries. For example, a prospective cohort study conducted among 8450 women who received a mammographic screening through mobile vans in Saint Louis, Missouri, showed that women in the age group 50-65 had higher odds of repeated visits to the mobile mammography van compared to women in the age group of 40-50 (Drake et al., 2015). This is an interesting observation since the median age of breast cancer in developed countries is higher than Oman but the compliant age groups are very similar between Oman and the U.S. The higher rate of compliance among the age group of 50-69 might be due increased focus of women in this age group on chronic diseases than reproductive health. Management of chronic diseases increases the possibility of multiple clinical visits and contact with clinical staffs, a variable found significantly associated with mammographic compliance in several studies (Peterson et al., 2016; Scheel et al., 2017). Unfortunately, information regarding provider-patient communication/recommendation was not included in the OCA breast examination form and accordingly we were not able to assess it. For the age group under age 50, the low compliance might be due lack of feeling of breast cancer risk among this relatively young age group. A study of 1570 Hispanic women over the age of 40 years in the U.S. showed women under age 50 as non-adherent to mammography screening guidelines (Jones et al., 2017). Lower utilization in the 70+ age group is probably due to women's belief of their low risk for breast cancer in older age. Lower utilization in the 70+ age group in this study was similar to a study conducted in Chile on 98 women over the age of 50. The study showed that women 65 years and older were less likely to comply with mammography screening recommendations than younger women (Wood, Vial, Martinez-Gutierrez, Mason, & Puschel, 2013). Lower utilization in the 70+ age group also reported in the study described above from Lebanon (Haddad, Kourie, & Adib, 2015).

Family history of breast cancer was a predictor of compliance in this study. Studies in the U.S. conducted in the 1990s on women 50 years and older showed family history of breast cancer as a significant predictor of screening mammography compliance (Lerman, Rimer, Trock, Balshem, & Engstrom, 1990). Another factor that predicted compliance in our study was breast self-examination. However, most studies from developed countries did not show breast self-examination as predictor of compliance but as a predictor of mammographic screening. It is important to differentiate between our definition of compliance (ever repeated screening) and the definition of compliance/adherence in other studies (any mammography in last 2 years or following the guidelines of local mammographic screening). Our results regarding the low compliance among screened women should be taken with caution because our definition of compliance is different from that in other studies. Also, we studied compliance among screened women while the vast majority of studies investigated compliance among general populations of non-screened women.

It is important to clarify that the term for suspected and referred cases in our study is equivalent to the term of recall rate used in other studies. Recall rate in other studies has been defined as the percent of screening mammograms that showed abnormalities and required further diagnostic procedures for confirmation (M. M. Bonafede, Miller, Huang, Troeger, & Fajardo, 2015; M. Bonafede, Miller, Lenhart, Nelson, & Fajardo, 2014). The recall rate in Gulf countries such as Saudi Arabia was reported from Riyadh as (6.8-10.9%) (Abulkair et al., 2015), Dammam as 7.9% (Al Mulhim et al., 2015), and Jeddah as 13% (Baslaim, Baroum, Dashash, Al-Awwad, & Siddiqui, 2013). The American College of Radiology and the Agency for Health Care Research and Quality in the U.S. recommended recall rates of less than 10% (Rothschild, Lourenco, & Mainiero, 2013). The European guidelines for quality assurance in breast cancer screening and diagnosis also reported recall rates not higher than 7% as an acceptable rate for initial screening examinations (Perry et al., 2008). However, U.S. and European screening programs show recall rates with a range of 1.3% to 18.4% which makes the 9% recall rate of the OCA comparable to international standards. Although the Omani rate in this study is comparable to other studies, we anticipated a higher recall rate in Oman than the observed rate in this study. We also anticipated a higher Omani rate than the rates in developed countries. The reason for the anticipated higher rate is that the screening experience in this population is very recent and new screening programs are usually encountering symptomatic cases and act like diagnostic rather than screening programs. The lower than anticipated recall rate in this study might be due to our exclusion of symptomatic cases, the low incidence of breast cancer in Oman, and the low level of awareness about breast cancer and screening in this population (Al-Azri, Al-Hamedi, Al-Awisi, Al-Hinai, & Davidson, 2015; Albeshan, Mackey, Hossain, Alfuraih, & Brennan, 2017). We also anticipated a higher recall rate than the observed rate but the 9% recall rate in this study is considered within the recommended acceptable range of 5%–12% (Lehman et al., 2016). We used the Lehman et al., 2016 study for comparing our results as it is a benchmark for modern digital screening mammography in U.S. community practice.

The cancer detection rate in this study was 4.1 per 1000 examinations, which is similar to a study conducted in Egypt on 20098 women over age 45 and showed a cancer detection rate of 4.3 per 1000 screened (Salem et al., 2008). The cancer detection rate in this study is significantly higher than 3.5 cancers per 1000 examinations (a benchmark published by the U.S. National Mammography Database) but lower than the recent finding of 5.1 cancers per 1000 examinations in the Lehman et al., 2016 study. Although, the cancer detection rate in our study is lower than the recent finding of the Lehman et al., 2016 study, the OCA cancer detection rate is within the acceptable range of higher than 2.5 cancers per 1000 examinations. The sensitivity level of 53% in this study was lower than the recent reported level of the Breast Cancer Surveillance Consortium (78.7%) and also lower than the acceptable sensitivity range of greater than 75% in U.S. (Lehman et al., 2016). The low level of sensitivity and expected recall rate in this study might be related to the inclusion of average risk group in OCA program. The specificity rate of 92% in this study is comparable to the acceptable specificity range of 88%–95% in U.S. (Lehman et al., 2016).

This study has several strengths. First, the study was the first investigation of any screening program in Oman. Second, the relatively long period (2009 to 2016) and large sample size of over 13079 add to power of the study. Third, the inclusion of women from capital city of Oman and different geographic and remote area of country provided population representation of the country. Fourth, the inclusion of the two-tertiary hospitals for cancer management in the Oman maximized the opportunity for capturing all suspected breast cancer patients seen at OCA during the study period. However, the study had a few limitations. The study was limited by the use of self-reported history which could have introduced recall bias. Furthermore, we were unable to include data from other limited number of screening programs in Oman that could have given a broader picture of screening in the country. The hospital database variables required manual capturing which limited our ability to better investigate the comparison in stage and survival between screened and non-screened patients.

In summary, this study showed low compliance rate among previously screened women of OCA. The study also showed that family history of cancer, family history of breast cancer, and breast self-examination are predictors of compliance. The study revealed low sensitivity, high specificity, and acceptable cancer detection rate. Future programs should be directed into three channels. First, the OCA data collection process should be enhanced by tightening the number and quality of demographic and clinical questions on the breast history and examination forms. OCA should also put more emphasis on transforming the data entry and uploading the data into direct electronic databases. Second, RH and SQUH should enhance their medical record systems and make them more research oriented and accessible for linkage with the OCA. Third, the ministry of health should lead different groups dealing with breast cancer screening and management in Oman to develop national guidelines for breast cancer screening. These guidelines can address issues such as age limits of screening, frequency of screening, and integrating screening facilities and databases. This study demonstrates that OCA mobile screening program is an asset to remote geographic regions and communities with limited access to health care. More resources to expand this program will definitely has impact on increasing awareness and early diagnosis. This is demonstration of breast cancer screening programs in country with increasing incidence rate of breast cancer and emerging screening programs. The experiences of the OCA program and the lesion learned from evaluating it can be translated to other countries with similar condition of increasing cancer rate and consideration of screening program.

Table 1. Characteristics of total papulation of 8,278 OCA-screened women, 7,558 screened not referred women and 720 screened and referred women included in the OCA screening program for period 2009-2016

	Total screened women (8,278)		Non-referred women (7,558)		Suspected and referred (720)		
	Median	SD	Median	SD	Median	SD	
Age (years)	50	8	50	8	49	7	
	Number	%	Number	%	Number	%	[a]χ^2
Age groups							0.004
42 to 49	3793	46	3425	45	368	51	
50 to 69	4257	51	3917	52	340	47	
70+	228	3	216	3	12	2	
Marital status							0.020
Married	6501	79	5960	79	541	75	
Other[b]	1777	21	1598	21	179	25	
Family history of cancer [c]							0.025
Yes	1736	21	1561	21	175	25	
No	6420	79	5883	79	537	75	
Missing	122						
Family history of breast cancer [c]							0.001
Yes	682	9	598	8	84	12	
No	7212	91	6592	92	620	88	
Missing	384						
Performed any breast self-examination							0.623
Yes	1554	19	1412	19	142	20	
No	6427	81	5865	81	562	80	
Missing	297						
Ever used a contraceptives method [d]							
Yes	803	10	734	10	69	10	0.912
No	7475	90	6824	90	651	90	
History of surgical removal of ovaries (oophorectomy)							0.990
Yes	309	4					
No	7858	96	282	4	27	4	
Missing	111		7173	96	685	96	
Any previous mammography							0.0001
Yes	1463	18	1294	18	169	24	
No	6547	82	6010	82	537	76	
Missing	268						

[a] The X^2 and p value results reflect the comparison between screened not referred and screened and referred groups.
[b] Unmarried, divorced, and widowed
[c] First- or second-degree relative
[d] Pills, injections, and patches

Table 2. Characteristics of 8010 women seen at OCA with and without previous mammographic screening history in database of 2009-2016

	Previous mammography (1463)		No previous mammography (6547)		
	Number	%	Number	%	χ^2
Age groups					<0.0001
42 to 49	586	40	3069	47	
50 to 69	847	58	3278	50	
70+	30	2	200	3	
Marital status					0.256
Married	1163	79	5116	78	
Other	300	21	1431	22	
Family history of cancer					<.0001
Yes	487	34	1189	18	
No	955	66	5268	82	
Missing	111				
Family history of breast cancer					<.0001
Yes	268	19	402	6	
No	1159	81	6024	94	
Missing	157				
Preformed any breast self-examination					<.0001
Yes	544	38	992	15	
No	899	62	5510	85	
Missing	65				
Ever used a contraceptives method					0.831
Yes	139	10	634	10	
No	1324	90	5913	90	
History of surgical removal of ovaries (oophorectomy)					<.0001
Yes	88	6	222	3	
No	1345	94	6251	97	
Missing	104				

Table 3. Odd ratio and 95% confidence interval from logistic regression of screening compliance among 8010 screened women at OCA during the period 2009-2016

	OR	95% CI	P value
Age (years)			
42 to 49	0.64	0.56-0.72	<.0001
50 to 69	1.00		
70+	0.57	0.37-0.87	0.0102
Family history of cancer			
Yes	1.55	1.32-1.82	<.0001
No	1.00		
Breast self-examination			
Yes	3.16	2.77-3.61	<.0001
No	1.00		
Family history of breast cancer			
Yes	2.10	1.70-2.59	<.0001
No	1.00		

Table 4. Recall rate, sensitivity, specificity, and positive predictive of the OCA screening programs during the period 2009-2016

Rate/ indicator	Number/percentage
Number women recalled	720
Number of cancer detected	34
Recall rate	9%
Cancer detection rate (per 1000 screened women)	4.1
Positive predictive value	4.7%
Negative predictive value	99.6%
Sensitivity	53%
Specificity	92%

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