




Awareness of Breast Cancer Screening and Risk Factors among the General Female Population in the Western Province of Saudi Arabia: A Cross-Sectional Study

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ABSTRACT

Background: Worldwide, breast cancer is the most common cancer affecting women, and a common cause of death-related cancer. Fortunately, evidence suggests that we might be able to help improve the outcome with screening, early diagnosis, and intervention.

Objective: The present study investigates the awareness of breast cancer screening and breast cancer risk factors among women in the western province of Saudi Arabia.

Method: The present study employed a cross-sectional survey design, with 365 participating females (aged ≥ 18 years) in the western region of Saudi Arabia. Data were collected from December 2019 to January 2020 using a self-administered questionnaire. The questionnaire covered sociodemographic characteristics, breast cancer knowledge, risk factors, family history, and screening, as well as personal medical history. Data were analyzed using descriptive statistics, chi-square tests, the t-test, and one-way ANOVA tests.

Result: In general, the majority of the women (98.1%) were aware of breast cancer screening. The most commonly identified risk factor in our study was a family history of breast cancer (75.1%), and women with previous exposure to breast cancer measured significantly higher on the socioeconomic index score ($M=0.147$, $SD=0.95$) than did those who had never been screened ($M=-0.134$, $SD=1$, $p=0.007$). The findings denote that the women who had a higher knowledge are of a higher socioeconomic class and educational level than were those who were measured and found to have a lower knowledge.

Conclusion: The findings indicate that the level of awareness of breast cancer screening and breast cancer risk factors, including knowledge about mammogram usage, among women of Saudi Arabia is acceptable, being more than a half. However, the results are still sub-optimal and more educational campaigns are needed to improve the knowledge and screening compliance.

Keywords:

Breast cancer, Female population, Risk factor, Hormone Replacement Therapy (HRT), Clinical Breast Examination (CBE), Breast Self-Examination (BSE)

Introduction

Worldwide, breast cancer is the most common incident cancer and it is the primary cause of cancer-related deaths among women [1]. Approximately 1.7 million women are affected by breast cancer each year, accounting for 23% of all newly diagnosed cancer cases [2]. In 2018, the World Health

Organization (WHO) reported that 627,000 women died from breast cancer, representing approximately 15% of all cancer-related deaths [3]. In 2012, the global cancer project (GLOBOCAN 2012) identified about 1,671,149 new breast cancer cases, and 521,907 deaths due to breast cancer occurred worldwide [4]. Fortunately, one-third of the cases can be successfully treated and lives saved if detected and treated at an early stage [3].

Breast cancer is a disease that develops from breast tissue with different histological subtypes, depending on the cell line origin [2]. Invasive ductal carcinoma, where the cancer cells grow outside the ducts into other parts of the breast tissue,

and invasive lobular carcinoma, where the cancer cells spread from the lobules to the breast tissues, are considered the most common types of breast cancer. These invasive cancer cells can also metastasize and spread to other parts of the body [5].

Patients may present with different symptoms at different stages. Patients with early stages might be completely asymptomatic. Breast cancer warning signs and symptoms include a new lump in the breast or underarm (Axilla), irritation or dimpling of breast skin, thickening or swelling of part of the breast, redness or flaky skin in the nipple area or the breast, and pain in any area of the breast. These symptoms can also happen with other conditions that are not cancer [6].

Multiple risk factors are associated with the risk of developing breast cancer, and they can be classified into four groups: first, family history and genetic background (accounting for approximately 15% of all breast cancer cases); second, hazardous effects of hormonal exposure, late menopausal age, late age at first birth, a fewer number of children and nulliparity, little or no breastfeeding, and long-term use of Hormone Replacement Therapy (HRT); third, the most significant marker, high breast density; fourth, benign proliferative breast disease history [7]. Additionally, it is commonly believed that stress, poor health behaviors, and toxic environmental exposure could be risk factors for women's breast cancer [8]. There is marked geographical variation in incidence rates, being highest in the developed world and lowest in the developing countries in Asia, the Middle East, and Africa [9].

Many studies support the idea that regular breast cancer screening can reduce cancer mortality and morbidity by 20–35%, by facilitating the early diagnosis of cancer [2,10]. The goal of the screening test is to find the disease before any symptoms arise. The breast cancer size and how far it has spread are some of the most important factors in predicting a woman's prognosis (outlook) with this disease [11]. Although breast cancer screening cannot prevent breast cancer, it can help find breast cancer early, when it is easier to treat [12].

Early detection of breast cancer can be achieved through screening mammography, Clinical Breast Examination (CBE), and Breast Self-Examination (BSE) [13]. Poor breast cancer awareness and barriers to accessing healthcare services cause a delay of breast cancer diagnosis in the developing countries [14].

Despite the relatively low incidence of breast cancer in Saudi Arabia compared to other countries, it has been the most common cancer among Saudi females for the past 12 consecutive years (Saudi Cancer Registry, 1994–2005) [15]. In fact, breast cancer is the single leading cause of cancer death for women 20 to 59 years of age, thus posing a major public health concern [16].

In the Middle East and Gulf region, breast cancer incidence is rising and affecting women below the age of 40, compared with Western countries, reaching as high as 20% [15,17]. More than 50% of the cases usually present at an advanced stages (II and III) [7]. Saudi Arabia is one of the Gulf region countries with a Breast Cancer Early Detection Program, which should be applied to all asymptomatic women aged 40-69 year. However, regrettably, there's poor compliance among women to this program. Considering the growth and aging of Saudi Arabia's

population, cancer rates are expected to increase considerably [18]. This will add an enormous burden to the healthcare-utilization costs [19]. In this study, we aimed to investigate the awareness of breast cancer screening in women who live in the western province of Saudi Arabia, which may reflect the reason behind the poor compliance.

Materials and Methods

An obtained consent form was taken by all the participating women before filling out the questionnaire.

A cross-sectional study was performed among the female population in the western province of Saudi Arabia to explore their level of awareness about the risk factors of breast cancer and about mammogram screening. Data were collected from the 1st of December 2019 to the 31st of January 2020. The target population was the female population aged ≥ 18 years, in the western province of Saudi Arabia.

We excluded male gender, female population younger than 18 years, and females who do not live in the western region of Saudi Arabia. The sample size was calculated by an online application (sample size calculator). Data collection was done by a survey based on questionnaires. The Data collection form included 36 questions divided into four sections: socio-demographics, mammogram knowledge, breast cancer knowledge, personal and family history. Sociodemographic information collected included age, nationality, marital status, educational level, monthly income, occupation, and smoking. Twenty-one questions were used to investigate each participant's knowledge about breast cancer risk factors and screening.

Means and standard deviations were used to describe the continuous variables, and categorically measured variables were described with frequency and percentages. The association between categorical variables was measured with the chi-square test and the t-test of independent groups; the one-way ANOVA tests were used to assess the women's mean knowledge score for statistically significant differences across the levels of binary and multi-level categorical variables, respectively. The Categorical Principal Components Analysis (CATPCA) was used to summarize the measured socioeconomic and educational factors (income, education, employment, and nationality) into one socioeconomic score, to help characterize the combined effect of those educational, economic, and nationality-related factors into the analysis, as a proxy for each woman's socioeconomic class. The histograms and the Kolmogorov-Smirnov tests were used to assess the Normality of continuous variables, and Levene's test of equal variance was used for the constant variance assumptions.

Multivariate Binary Logistic Regression was used to assess the combined and individual associations between the women's sociodemographic, educational, and past medical conditions. Alongside gynecological factors, the women's odds of having a high knowledge or previous experience of breast cancer screening were represented in two different models. The associations between those factors, with the women's odds of high knowledge and having breast cancer screening, were expressed as an Odds Ratio as effect size, and the SPSS IBM V.21 was used for the statistical data analysis. The Alpha significance level was considered significant at 0.050 for all the statistical tests we have conducted.

Results

Participants' characteristics

365 women electively enrolled themselves into the study. The descriptive analysis results for their demographic variables are shown in (Table 1), with most of the women (n=182 (49.9%)) aged between 18-30 years. 192 (53.2%) women were married, and the majority (n=286 (78.4%)) were Saudi women, and 79 (21.6%) were expatriates residing in the Kingdom. The women's educational attainment level was an associate diploma or higher for 244 women (66.8%); of those, 165 (45.2%) women had a monthly income between 3,000-10,000 Saudi riyals. Regarding employment, 172 of the women (47.1%) were employed, but 184 (50.4%) were also housewives. Only 33.7% were smokers.

Table 1: Descriptive statistics of women's sociodemographic characteristics (n=365).

	Frequency n(%)
Age group	
18-30 Years	182 (49.9)
31-40 Years	80 (21.9)
41-50 Years	62 (17)
51-60 Years	27 (7.4)
>60 Years	14 (3.8)
Marital state	
Married	192 (53.2)
Single	171 (46.8)
Nationality	
Saudi	286 (78.4)
Non-Saudi	79 (21.6)
Educational level	
High school or less	121(33.2)
Diploma or Higher education	244 (66.8)
Households monthly income (SR)	
<3,000 SR	132 (36.2)
3,000 – 10,000 SR	165 (45.2)
>10,000 SR	68 (18.6)
Employment	
Employed	172 (47.1)
Housewife	184 (50.4)
Retired	9 (2.5)
Actively smoking	
No	242 (66.3)
Yes	123 (33.7)
Age started smoking	
<20 Years	47 (12.9)
21-30 Years	62 (17)
>31 years	14 (3.8)
Not smoker	242 (66.3)

Most of the women in the sample (n=307 (84.1%)) were in their pre-menopause age. Only 12 (3.3%) of them had been diagnosed with breast cancer previously. Nonetheless, 112 (30.7%) of the women had a positive family history of breast cancer, and 31 (8.5%) had recently been diagnosed with benign breast disease.

Interestingly, almost half of the respondent women (n=174 (47.7%)) advised that they had previously been screened for breast cancer, as shown in (Table 2).

Table 2: Descriptive statistics for women's medical and gynecological history and breast cancer screening practices (n=365).

	Frequency n(%)
Do you still get your regular menstrual period	
No	58 (15.9)
Yes	307 (84.1)
When do you expect your menstrual cycle to cease	
Already in menopause	58 (15.9)
40-50 years	120 (32.9)
>50 years	187 (51.2)
Have you been diagnosed with breast cancer?	
No	353 (96.7)
Yes	12 (3.3)
Has your family member been diagnosed with breast cancer?	
No	253 (69.3)
Yes	112 (30.7)
Have you been diagnosed with or currently have a benign breast tumor?	
No	334 (91.5)
Yes	31 (8.5)
Have you or your family member been diagnosed with a benign breast tumor?	
No	258 (70.7)
Yes	107 (29.3)
Have you ever had a breast cancer screening?	
No	191 (52.3)
Yes	174 (47.7)
If screened, how did you screen?	
Never been screened	191 (52.3)
Breast self-examination	120 (32.9)
Manual examination by the doctor	17 (4.7)
Ultrasound (US)	8 (2.2)
Mammogram	26 (7.1)
MRI	3 (0.8)
Why do you think women avoid mammograms	
Unsure	55 (15.1)
Cannot afford cost	46 (12.6)

Age <40 years	150 (41.1)
Painful	48 (13.2)
Never heard of mammogram	66 (18.1)
In your opinion, what is the best method to raise awareness of breast cancer?	
Clinics	68 (18.6)
Internet	20 (5.5)
Previous patient cancer	11 (3)
Books	3 (0.8)
Campaigns	144 (39.5)
Media	119 (32.6)

The majority of women (n=358 (98.1%)) were aware of breast cancer screening as a general idea, and 273 (74.8%) women advised that they had previously heard about the mammogram as a screening method; however, 304 women (83.3%) believed that breast cancer is common in the society.

Only 37 (10.1%) of the women knew that routine mammogram screening should start after the age of fifty years, but, also surprisingly, another 94 (25.8%) women advised that they did not know what it is. Upon asking about the right frequency of breast cancer screening with a mammogram, only 59 (16.2%) women had correctly selected screening every two years, but, unfortunately, 127 (34.8%) women answered with "Do Not Know," as shown in (Table 3A).

Table 3A: Descriptive statistics for women's awareness of breast cancer and screening (n=265).

	Frequency n(%)
Have you Ever heard of Breast Cancer screening	
No	7 (1.9)
Yes	358 (98.1)
Have you Ever heard of mammogram	
No	92 (25.2)
Yes	273 (74.8)
Where did you hear the mammogram?	
Never heard of it	92 (25.2)

Table 3B: Descriptive Analysis of the women's knowledge on breast cancer risk factors (n=365).

	Incorrect n(%)	Correct n(%)	p-value
Multiparity	211 (57.8%)	154 (42.2)	<0.001
History of previous breast cancer	94 (25.8)	271 (74.2)	<0.001
Exposure to radiation	98 (26.8)	365 (73.2)	<0.001
Late menstrual period	230 (63)	135 (37)	<0.001
Early menstrual period	292 (80)	73 (20)	<0.001
Alcohol consumption	136 (37.3)	229 (62.7)	<0.001
Use of contraceptives	173 (47.4)	192 (52.6)	0.32
Obesity	156 (42.7)	209 (57.3)	0.006
Early marriage	327 (89.6)	38 (10.4)	<0.001
Breast feeding	89 (24.4)	276 (75.6)	<0.001

Doctor	74 (20.3)
Family or Friends	63 (17.3)
Social Media	101 (27.7)
TV Or Radio	14 (3.8)
Books	21 (5.8)
Do you think breast cancer is widely spread?	
No	61 (16.7)
Yes	304 (83.3)
In your opinion, at what age should a mammogram be started?	
<40 years	126 (34.5)
41 -50 years	108 (29.6)
>50 Years	37 (10.1)
Do not know	94 (25.8)
In your opinion, how often a mammogram must be done?	
Every 6 months	72 (19.7)
Every year	107 (29.3)
Every 2 years	59 (16.2)
Do not know	127 (34.8)
Do you think, regular screening should be done by?	
Family doctor	56 (15.3)
Gynecologist	188 (51.5)
Surgeon	58 (15.9)
Do not know	63 (17.3)

The most commonly identified risk factors were a family history of breast cancer (75.1%), followed by personal history (74.2%). A history of chest radiation and smoking were also identified as risk factors by more than half the participants (73.2% for both). Early menstrual periods and early marriage were the two least-identified risk factors (20.0% and 10.4%, respectively). Most women had inferred that healthy food and breastfeeding are preventive measures against breast cancer (81.1% and 75.6%, respectively), as shown in (Table 3B).

Hormones treatment	163 (44.7)	202 (55.3)	0.041
Family history of breast cancer	91 (24.9)	274 (75.1)	<0.001
History of previous ovarian cancer	151 (41.4)	214 (58.6)	0.001
Family history of ovarian cancer	145 (39.7)	220 (60.3)	<0.001
Healthy food	69 (18.9)	296 (81.1)	<0.001
Smoking	98 (26.8)	267 (73.2)	<0.001
Older age	190 (52.1)	175 (47.9)	0.432

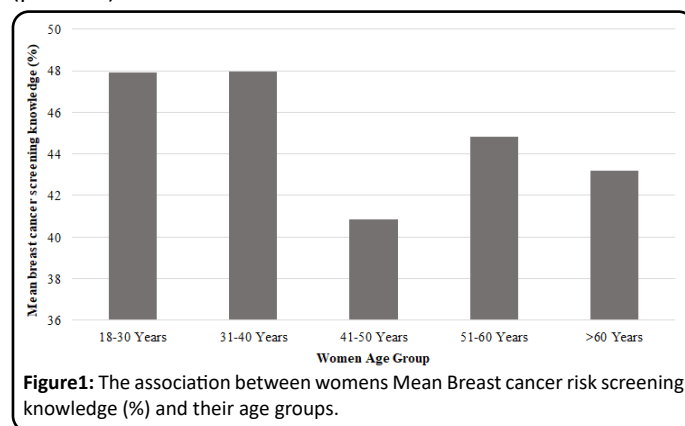
Overall knowledge on breast cancer risk and screening was computed via rewarding each correctly answered question (of the 21 knowledge questions) with two points, and zero was awarded for incorrectly answered questions. The resulting descriptive analysis in (Table 4) shows that the women had an overall mean knowledge score of 46.31 out of 100, SD=24.3.

Table 4: Descriptive statistics for the women overall knowledge on breast Screening in (%).

Mean (SD)	46.31 (24.3)	
Minimum	0	
Maximum	80.95	
Percentiles	25 th	33.33
	50 th	52.38
	75 th	61.9

According to an independent groups t-test, the women who were older than 40 years tended to have lower knowledge on breast cancer screening and risk, on average (p=0.026), as shown in (Figure 1). However, educated women with a diploma

or higher measured slightly higher on the knowledge score (p=0.059).



On the other hand, those women with a monthly household income above 10,000 SAR measured significantly higher in knowledge about screening (p>0.001), as did employed women, than did those who are housewives (p=0.005), as shown in (Table 5A and 5B).

Table 5A: Bivariate analysis of the women's mean breast cancer risk screening knowledge across their sociodemographic characteristics (n=365).

	Breast Screening Knowledge Mean (SD)	Test statistic	p-value
Age group			
18-30 Years	47.91 (19.8)	f(4,360)=1.52	0.197
31-40 Years	47.97 (22.1)		
41-50 Years	40.86 (21.7)		
51-60 Years	44.80 (22.9)		
>60 Years	43.20 (27.7)		
Age groups collapsed			
≤ 40 Years	47.93 (20.50)	t(170.76)=2.33	0.026
≥ 41 Years	42.21 (22.72)		
Marital state			
Married	46.02 (21.7)	t(363)=0.30	0.781
Single	46.64 (20.8)		
Nationality			
Saudi	47.25 (20.9)	t(363)=1.61	0.109
Non-Saudi	42.92 (22.2)		
Educational level			
High school or less	43.33 (21.8)	t(363)=1.90	0.059
Diploma or Higher education	47.80 (20.9)		

Households monthly income (SR)			
<3,000 SR	41.27 (21.7)	f(2,362)=9.21	<0.001
3,000-10,000 SR	46.98 (20.6)		
>10,000 SR	54.48 (19.3)		
Employment			
Employed	49.89 (19.6)	f(2,362)=5.10	0.007
Housewife	42.83 (22.3)		
Retired	49.21 (20.6)		
Actively smoking			
No	44.41 (22.1)	t(279.9)=2.53	0.012
Yes	50.06 (19.0)		
Age started smoking			
None-smoker	44.41 (22.1)	f(3,52.20)=1.83 Welch	0.048
<20 Years	49.54 (18.9)		
21-30 Years	49.00 (19.4)		
31-40 Years	53.97 (18.0)		
>41 Years	57.14 (18.8)		

Table 5B: Bivariate analysis of the of women's mean breast cancer risk screening knowledge across their gynecological and past medical history characteristics (n=365).

	Breast Screening Knowledge Mean (SD)	Test statistic	p-value
Do you still get your regular menstrual period			
No	42.53 (23.1)	t(363)=1.50	0.139
Yes	47.03 (20.9)		
When do you expect your menstrual cycle to cease			
<40	49.40 (20.78)	f(2,304)=3.29	0.07
40-50 Years	43.89 (21.9)		
>50 Years	49.05 (19.9)		
Have you been diagnosed with breast cancer?			
No	46.66 (21.2)	t(363)=1.70	0.091
Yes	36.11 (21.2)		
Has your family member been diagnosed with breast cancer?			
No	45.21 (22.4)	t(256.6)=1.62	0.108
Yes	48.81 (18.3)		
Have you been diagnosed with or currently have a benign breast tumor?			
No	46.56 (21.1)	t(363)=0.74	0.462
Yes	43.63 (23.5)		
Have you or your family member been diagnosed with a benign breast tumor?			
No	44.56 (22.2)	t(240.3)=2.50	0.008
Yes	50.56 (18.2)		
Have you ever had a breast cancer screening?			
No	43.26 (22.5)	t(362)=2.93	0.004
Yes	49.67 (19.4)		
If screened, how did you screen?			
Never been screened	43.26 (22.5)	f(5,7.83)=2.641 Brown-Forsythe x	0.109

Breast self-examination	51.75 (19.2)		
Manual examination by the doctor	38.66 (18.7)		
Ultrasound (US)	49.40 (10.8)		
Mammogram	48.72 (19.2)		
MRI	38.10 (35.9)		
Why do you think women avoid mammograms			
Cannot afford cost	46.79 (19.5)	f(3,113.9)=7.9	<0.001
Age <40 years	50.38 (19.1)		
Painful	50.50 (21.5)		
Never heard of mammogram	34.34 (24.1)		
In your opinion, what is the best method to raise awareness of breast cancer?			
Clinics	42.23 (20.5)	f(5,359)=1.60	0.159
Internet	43.33 (22.6)		
Previous patient cancer	46.75 (22.0)		
Books	46.03 (16.7)		
Campaigns	45.17 (21.7)		
Media	50.50 (20.7)		
Have you ever heard of breast cancer screening			
No	34.69 (26.6)	t(363)=1.50	0.145
Yes	46.54 (21.1)		
Have you ever heard of mammogram?			
No	36.90 (22.9)	t(139.4)=4.71	<0.001
Yes	49.49 (19.7)		
Where did you hear the mammogram?			
Doctor	50.84 (17.2)	f(4,58.96)=2.70	0.039
Family Or Friends	50.79 (16.4)		
Social media	45.73 (21.4)		
TV Or Radio	46.26 (25.8)		
Books	61.22 (20.1)		

Women who learned from social media measured significantly lower in knowledge as compared to those learning from books, on average ($p=0.029$).

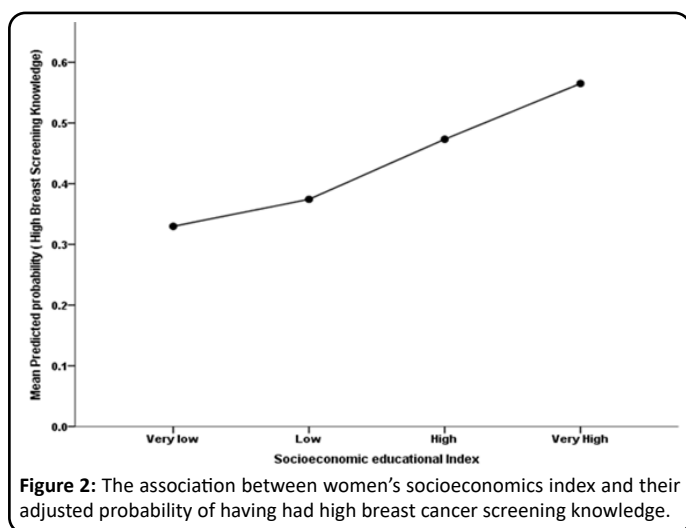
Interestingly, the analysis model showed that women's Socioeconomic Class Score (SES) converged positively and

significantly on greater odds of having a high breast cancer risk factors knowledge (O.R=1.24 times more), on average, above and over the effect of their educational level and nationality ($p=0.002$), as shown in (Table 5C) and in (Figure 2).

Table 5C: Multivariate Binary Logistic Regression Analysis of the odds of women having had higher than average knowledge breast screening (n=365).

	B	S.E.	Wald	Adjusted Odds Ratio	95% C.I. for O.R		p-value
					Lower	Upper	
Age group \geq 41 years	-0.138	0.228	0.37	0.871	0.557	1.36	0.543
Nationality=Saudi	-0.388	0.342	1.284	0.678	0.347	1.327	0.257
Marital state= Married	0.075	0.234	0.102	1.078	0.681	1.705	0.749
Educational level >High school	-0.619	0.37	2.799	0.538	0.261	1.112	0.094
Socioeconomic class score/Index	0.598	0.197	9.2	1.818	1.236	2.676	0.002
Smoker=Yes	0.27	0.234	1.331	1.311	0.828	2.075	0.249
Diagnosed with breast cancer=Yes	-2.12	1.066	3.959	0.12	0.015	0.969	0.047
Previously educated/heard of Mammo-gram=Yes	0.814	0.276	8.683	2.257	1.313	3.879	0.003

Constant	-0.029	0.556	0.003	0.971		0.958
Dependent Variable= High/Low Breast cancer screening knowledge; Model Hosmer-Lemeshow Goodness of Fit statistic; $\chi^2 (8)=9.8$; $p=0.282$; Model AUC ROC=0.70						



Moreover, the chi-square test of association suggests that married women and women with incomes above 3,000 SAR are significantly more likely to be screened than others ($p=0.028$, $p=0.006$, respectively). Likewise, housewives were found to be significantly less likely to be screened, as compared to employed and retired women ($p=0.048$). The statistical analysis findings show that neither a woman's nationality nor her educational level was correlated significantly with previous screening ($p>0.050$).

Interestingly, women with previous exposure to breast cancer measured significantly higher on the socioeconomic index score ($M=0.147$, $SD=0.95$) than did those who had never been screened ($M=-0.134$, $SD=1$, $p=0.007$), as shown in (Table 6A).

Women with a positive family history of breast cancer were significantly screened more than were those with a negative family history of breast cancer ($p=0.001$).

Table 6A: Bivariate analysis of the women's previous breast screening exposure across the levels of their sociodemographic characteristics (n=365).

	Previously Breast Screened n(%)		Test statistic	p-value
	No	Yes		
Age group				
18-30 Years	100 (52.4)	82 (47.1)	$\chi^2 (4)=1.60$	0.812
31-40 Years	40 (20.9)	40 (23)		
41-50 Years	29 (15.2)	33 (19)		
51-60 Years	15 (7.9)	12 (6.9)		
>60 Years	7 (3.7)	7 (4)		
Marital state				
Single	101 (52.9)	72 (41.4)	$\chi^2 (1)=4.83$	0.028
Married	90 (47.1)	102 (58.6)		
Nationality				
Saudi	144 (75.4)	142 (81.6)	$\chi^2 (1)=2.10$	0.15
Non-Saudi	47 (24.6)	32 (18.4)		
Educational level				
High school or less	67 (35.1)	54 (31)	$\chi^2 (1)=0.67$	0.412
Diploma or Higher education	124 (64.9)	120 (69)		
Households monthly income (SR)				
<3,000 SR	83 (43.5)	49 (28.2)	$\chi^2 (2)=10.30$	0.006
3,000-10,000 SR	80 (41.9)	85 (48.9)		
>10,000 SR	28 (14.7)	40 (23)		
Employment				
Employed	79 (41.4)	93 (53.4)	$\chi^2 (2)=6.05$	0.048
Housewife	108 (56.5)	76 (43.7)		
Retired	4 (2.1)	5 (2.9)		
Socioeconomic score, mean (SD)	-0.134 (1)	0.147 (0.95)	$t(363)=2.7$	0.007
Actively smoking				
No	142 (74.3)	100 (57.5)	$\chi^2 (1)=11.6$	0.001

Yes	49 (25.7)	74 (42.5)		
Age started smoking, n=123				
<20 Years	23 (46.9)	24 (32.4)	$\chi^2 (2)=2.90$	0.24
21-30 Years	22 (44.9)	40 (54.1)		
>31 Years	4 (8.2)	10 (13.5)		

Interestingly, women who advised they have never heard about the mammogram were significantly less previously screened ($p=0.044$), according to the chi-square test. In contrast, women who had previously been educated on mammograms were significantly more exposed to previous screening ($p<0.001$).

Although women's previously accessed sources of information on mammograms did not correlate significantly with their past screening ($p=0.071$), those who were educated by their doctors were slightly more likely to have had a previous mammogram screening, as shown in (Table 6B).

Table 6B: Bivariate analysis of the women's previous breast screening exposure across the levels of their past medical and gynecological history characteristics (n=365).

	Previously Breast Screened n(%)		Test statistic	p-value
	No=191	Yes=174		
Do you still get your regular menstrual period				
No	27 (14.1)	31 (17.8)	$\chi^2 (1)=0.92$	0.337
Yes	164 (85.9)	143 (82.2)		
When do you expect your menstrual cycle to cease				
<40 Years	7 (4.3)	4 (2.8)	$\chi^2 (2)=6.30$	0.067
40-50 Years	74 (40.9)	46 (29.4)		
>50 Years	90 (54.9)	97 (67.8)		
Have you been diagnosed with breast cancer?				
No	188 (98.4)	165 (94.8)	$\chi^2 (1)=3.72$	0.054
Yes	3 (1.6)	9 (5.2)		
Has your family member been diagnosed with breast cancer?				
No	147 (77)	106 (60.9)	$\chi^2 (1)=11.02$	0.001
Yes	44 (23)	68 (39.1)		
Have you been diagnosed with or currently have a benign breast tumor?				
No	148 (96.3)	150 (86.2)	$\chi^2 (1)=12.02$	0.001
Yes	7 (3.7)	24 (13.8)		
Have you or your family member been diagnosed with a benign breast tumor?				
No	157 (82.2)	101 (58)	$\chi^2 (1)=25.6$	<0.001
Yes	34 (17.8)	73 (42)		
Why do you think women avoid mammograms				
Cannot afford cost	23 (12.6)	23 (18.1)	$\chi^2 (3)=8.1$	0.044
Age <40 years	82 (44.8)	68 (53.5)		
Painful	30 (16.4)	18 (14.2)		
Never heard of mammogram	48 (26.2)	18 (14.2)		
In your opinion, what is the best method to raise awareness of breast cancer?				
Clinics	25 (13.1)	43 (24.7)	$\chi^2 (5)=12.3$	0.031
Internet	10 (5.2)	10 (5.7)		
Previous patient with cancer	7 (3.7)	4 (2.3)		
Books	2 (1)	1 (0.6)		
Campaigns	88 (46.1)	58 (32.2)		

Media	59 (30.9)	60 (34.5)		
Have you ever heard of breast cancer screening?				
No	7 (3.7)	0	$\chi^2 (1)=4.70$	0.03
Yes	184 (96.3)	174 (100)		
Have you ever heard of mammogram?				
No	69 (36.1)	23 (13.2)	$\chi^2 (1)=25.3$	<0.001
Yes	122 (63.9)	151 (86.8)		
Where did you hear the mammogram? n=273				
Doctor	23 (8.7)	51 (34)	$\chi^2 (4)=8.63$	0.071
Family or Friends	31 (25.2)	32 (21.3)		
Social Media	52 (42.3)	49 (32.7)		
TV Or Radio	6 (4.9)	8 (5.3)		
Books	11 (8.9)	10 (6.7)		

Finally, the analysis model, (Table 6C), indicates that women's knowledge of breast cancer screening did not correlate significantly with their odds of having had a previous screening (p=0.122), when accounting for the other factors in the analysis model.

Table 6C: Multivariate binary logistic regression analysis of the women odds of having had previous breast screening (n=365).

	B	S.E.	Wald	Adjusted Odds Ratio	95% C.I. for O.R		p-value
					Lower	Upper	
Age >40 years	-0.241	0.317	0.577	0.786	0.422	1.463	0.448
Nationality=Saudi National	-0.277	0.385	0.517	0.758	0.357	1.612	0.472
Marital state=Married	0.549	0.269	4.183	1.732	1.023	2.933	0.041
Educational level ≥ Diploma level	-0.825	0.437	3.566	0.438	0.186	1.032	0.059
Socioeconomic class index	0.495	0.227	4.742	1.64	1.051	2.559	0.029
Currently smoker=Yes	0.795	0.272	8.519	2.215	1.298	3.777	0.004
Positive family history of Benign tumor=Yes	1.338	0.293	20.897	3.81	2.147	6.761	<0.001
Perceived reason for avoiding Mammograms	-0.658	0.135	23.837	0.518	0.398	0.674	<0.001
Previously informed on mammogram=Yes	0.599	0.391	2.348	1.821	0.846	3.919	0.125
Knowledge score (%) on breast cancer risk screening	0.01	0.007	2.397	1.01	0.997	1.023	0.122
Constant	0.105	0.719	0.021	1.11			0.884

Dependent Variable=Past experience of breast cancer screening Yes/No; Model Hosmer-Lemeshow Goodness of Fit statistic; $\chi^2 (8)=9.72$; p=0.285; Model AUC ROC=0.80

Discussion

Breast cancer is the most common cancer among females worldwide [3]; fortunately, early detection by mammogram screening may contribute to decreasing the disease mortality and morbidity [20]. Saudi Arabia is one of the countries with a Breast Cancer Early Detection Screening Program, which is applied in most hospitals in all regions of Saudi Arabia among females aged 40 to 69 who show no symptoms of breast cancer [18].

In the present study, we investigated the awareness of breast cancer screening, risk factors, and factors that affect this knowledge among the general female population in the western province of Saudi Arabia.

We found that most participants (98.1%) had heard about breast cancer screening from social media, which became the

most common source of information. This finding was consistent with a study conducted by Rahman et al. [21], among female students at the University of Sharjah in the United Arab Emirates (UAE). It showed that social media was the main source of information on breast cancer screening (98.8%) [21]. Similarly, a study in Egypt by Boulos et al. [22] among female students showed that the main source of information was the mass media (TV and radio) in 89.1% of the participants [22]. Another study in Yemen also reported mass media as the main source of information for 81.6% of participants [23]. The studies in the UAE, Egypt, and Yemen among university students may reflect the impact of technology penetration. In general, our sample was a group of women from the general population who lived in the western province of Saudi Arabia in 2020, reflecting the impact of technology—not the education level—in the general population. On the other hand, however, the level of awareness

affected by the educational level was for diploma only, whereas higher education had a higher level of awareness by 47.8% of the participants, which is consistent with previous studies [24-26].

Mahfouz et al. reported in a study conducted in Abha city, southwestern Saudi Arabia (2013), that only 22% of participants had heard about a mammogram [27]. In the present study, we found that 74.8% of participants knew that the mammogram is the screening modality for breast cancer, but only 10.1% were aware that it starts at the age of 50, and 16.2% knew it should be repeated every two years in an average-risk female. In a recent study in Syria by Omar et al. among females at Syrian Private University [2], they reported 71% of participants were aware of mammograms as a modality of breast cancer screening [2]. The difference in the reported awareness between our study and the study conducted in Abha is probably related to the time difference, as that was back in 2013 (almost six years before our study) and the increased awareness may reflect the impact of the social media and educational campaign in improving awareness over time among women.

Although women aged older than forty years have lower breast cancer screening and knowledge about the risk factors, only 41.8% of the study population had heard about the mammogram. On the other hand, the most common cause of not having a mammogram done in the past is that they didn't hear about it, followed by thinking it might be painful. This concern was consistent with the reported findings of a study conducted by Boulos et al. in Egypt [22]. More than half of the participants knew that older age, family, or a personal history of breast cancer, late menopause, and early menarche are known risk factors for breast cancer. They were also aware that multiparities, breastfeeding, early marriage, and a healthy lifestyle are protective factors. Knowing it was more than 50% is probably acceptable, but we could not find other studies assessing awareness of breast cancer risk factors. Our study shows that 57.3% of participants were aware that obesity is considered a risk factor for breast cancer, which is similar to the results of another study conducted in Syria by Omar et al., of which 51% of participants did know that [2]. In a study conducted among female university students in Angola, Sambanje et al. [28] also reported a similar finding, that 57% were aware that obesity is a risk factor.

We found that, among the participants, only 12 patients had a personal history of breast cancer (6.8%), while the others never had a history of breast cancer (93.2%). Among the affected cases, only nine patients had had a screening mammogram done prior to the diagnosis (2.5%). As expected, a family history of breast cancer was associated with a significantly higher screening rate in our study population, 23% vs 39.1% ($p < 0.001$). A similar higher screening rate was reported in patients with a personal history of benign breast disease, 3.7% vs 13.8% ($p < 0.001$). We did not find in the literature a comparison study to assess the impact of breast cancer on screening compliance; however, Sambanje et al. [28] reported that, in those with a family history of benign diseases, no previous screening was found in 96.3%. This low screening rate corresponded to our findings in this study, in which (82.8%) of the patients with a family history of benign breast disease never had a screening mammogram.

Conclusion

In general, the level of women's awareness of breast cancer screening and of the mammogram, as well as of breast cancer risk factors, is still suboptimal and reaches around half the female population in the area. Low awareness may also reflect low compliance. There is a need for greater support of healthcare providers and for educational/social media campaigns to improve public awareness, acceptability, and compliance, all of which may impact the early detection and hence the treatment of breast cancer and its prognosis. Further studies are needed to investigate the accessibility and obstacles in the system to improve awareness and compliance, which will enhance the screening program in Saudi Arabia.

Conflict of Interest

The authors report no conflict of interest.

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