

# Do Men and Women in Saudi Arabia Have the Same Level of Awareness and Knowledge of Breast Cancer? A Cross-Sectional Study

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**Context:** Awareness is important in combating breast cancer, as early detection (through mammograms) and prompt treatment offer the greatest chance of long-term survival.

**Aims:** The aim of this study was to assess public knowledge of breast cancer (signs, symptoms, and risk factors) and awareness of screening programs; and compare it among men and women.

**Materials and Methods:** A cross-sectional study was conducted among male and female residents of five of the geographic regions of Saudi Arabia from February 2015 to May 2015. Information was collected using a questionnaire, and included sociodemographic data, general knowledge about breast cancer, and awareness of screening programs. Chi-square d test was used to compare the binary knowledge variables (correct/incorrect) between men and women. Logistic regression was utilized to assess predictors of breast cancer knowledge.

**Results:** A total of 9691 men and 31,022 women were surveyed. Women had better knowledge regarding breast cancer symptoms than men, except for breast cancer being related to death. Men and women had similar knowledge of breast cancer risk factors; however, more women correctly identified family history (68%), large breast size (46%) as increasing risk, and breastfeeding (60%) as reducing the risk of breast cancer compared to men (56%, 32%, and 47%, respectively). Older age and higher education were related with high breast cancer knowledge, and it was more pronounced among men. Employment was a predictor for better knowledge among women. Participants with no history of breast cancer were less likely to have good breast cancer knowledge compared with those with a family history, (OR: 0.5, 95% CI: 0.5–0.6) and (OR: 0.6, 95% CI: 0.5–0.6) among men and women, respectively. More women (24%) than men (19%) knew of breast cancer screening programs, although the awareness was low in both genders.

**Conclusion:** Awareness campaigns in Saudi Arabia, especially those aimed at men, remain critical to increase knowledge and change behavior toward early detection of breast cancer.

**Keywords:** breast cancer, knowledge, screening, awareness

## Introduction

Breast cancer is one of the leading causes of death among women, accounting for 24% of all female cancer cases diagnosed in Saudi Arabia each year.<sup>1</sup> The incidence of breast cancer in Saudi Arabia is increasing and occurs at a younger age compared to western countries.<sup>2</sup> Awareness is extremely important in combating this disease, as early detection and prompt treatment offers the greatest chance of long-term survival.<sup>3</sup> Therefore, assessing the level of knowledge and awareness of this disease in Saudi Arabia is key.

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Although knowledge of breast cancer and screening among women in Saudi Arabia is weak, it is also important to consider that in patriarchal societies (such as Saudi Arabia, Ghana, South Africa, and Kenya), men are often the primary decision-makers. Therefore, their knowledge can have a major influence on decisions regarding women's health care.<sup>4-6</sup> This is because men will often influence behaviors regarding allocation of money, transport, and time that women can use to access health-care services.<sup>4-7</sup> For example, a recent study in Ghana found that few men are actively involved in issues of maternal health care, which limits women's access to skilled health-care services.<sup>4</sup> Indeed, there is increasing evidence that improving men's knowledge and awareness of maternal health issues can benefit health outcomes among women.<sup>8-10</sup> Therefore, assessing knowledge of breast cancer among men in Saudi Arabia is important. Unfortunately, few studies have examined this issue to date.<sup>11,12</sup>

To the best of our knowledge, only one study has been conducted among adult Saudi men, which included 550 participants who attended the outpatient clinics of King Abdulaziz University Hospital with their female relatives.<sup>11</sup> Similar to the data reported for adult Saudi women, this study showed that men had poor knowledge of breast cancer symptoms, and only 57.6% were aware of the importance of early detection.<sup>11</sup> Furthermore, a cross-sectional report on 824 Saudi male high school students in Jeddah (mean age=17 years) indicated that while two thirds of male students knew that early detection of breast cancer was important, the level of knowledge of breast cancer risk factors among young Saudi men was poor (eg, only 57.9% stated that breast cancer was inherited).<sup>12</sup> Therefore, based on limited available data, knowledge of breast cancer among Saudi men appears to be at a low level.

To date, no single study has directly compared knowledge and awareness of breast cancer among adult Saudi men and women, including women who are at the age where mammograms are required. The aim of this study was to address this gap in the literature by comparing the knowledge of breast cancer, its signs and symptoms, its risk factors, and the awareness of screening programs across a sample of men and women from the five main geographic regions in Saudi Arabia.

## Materials and Methods

### Study Design and Data Collection

A cross-sectional study was conducted among male and female residents of five of the geographic regions of Saudi

Arabia: North, South, East, West, and Central. Questionnaires were distributed electronically through social media platforms. In addition, paper forms of the questionnaire were distributed in the main local shopping malls in each geographic region. They were also distributed in secondary schools and universities to faculty members and students. The data were collected from February 2015 to May 2015.

### Ethical Considerations

A cover letter containing a brief description of the study and its aim was included in the questionnaire, and it was written that participation was voluntary. Participants were informed that completing the questionnaire indicates their consent to participate in the study. Ethical approval was obtained from the Unit of Biomedical Ethics and Research Committee of the Faculty of Medicine in King Abdulaziz University (reference no. 51-15).

### The Questionnaire

A standardized questionnaire was developed based on previous questionnaires used to investigate breast cancer and mammography knowledge,<sup>13</sup> and other relevant questions were added after searching the literature.<sup>13</sup> Experts from various medical fields (oncology, radiology, surgery, and radiation oncology) revised the questionnaire to ensure its relevance and comprehensibility. The questionnaire was designed to assess knowledge about and attitudes towards mammography and breast cancer. It contained five sections: (i) sociodemographic information, (ii) general knowledge about breast cancer and its risk factors, (iii) knowledge about mammography and its use, (iv) barriers to mammography use, and (v) knowledge of breast cancer awareness and screening programs. In this article, the sections concerning sociodemographic information, breast cancer knowledge and its risk factors, and breast cancer awareness and screening programs are assessed.

The following questions were used to assess general knowledge about breast cancer and its symptoms: "Is breast cancer widely spread in Saudi Arabia?", "Is breast cancer associated with death?", "Can breast cancer be inherited?", "Can early detection of breast cancer improve the outcome of treatment?", and "Is a mass or swelling in the breast or armpit related to breast cancer?". To assess the participants' knowledge of breast cancer risk factors, they were asked what the effect of the following were on

the possibility of a woman developing breast cancer: aging, first delivery above age 30 years, smoking, obesity, use of oral contraceptives, family history of breast cancer, puberty below the age of 11 years, breastfeeding, large breast size, and menopause after 55 years. Three questions were asked in the awareness of campaigns and screening programs section, including: “Do you think there are enough breast cancer awareness campaigns in Saudi Arabia?”, “how do you evaluate awareness of breast cancer in our society?”, and “are you aware of breast cancer screening programs in Saudi Arabia?”.

## Statistical Analyses

The sociodemographic characteristics of the participants were presented as frequencies and percentages. The general breast cancer knowledge questions had the following response options: “yes,” “no,” “don’t know.” The risk factor knowledge questions had the following response options: “increases risk,” “decreases risk,” “no effect on risk,” “don’t know”. These responses were recategorized into two categories: 0: correct, which included the correct answer, and 1: incorrect, which included the wrong answers and “don’t know” responses. The binary knowledge variables were presented as frequency distributions for all participants and stratified by gender. Chi-squared tests were used to compare the binary knowledge variables (correct/incorrect) between men and women.

The sum of the responses of the breast cancer knowledge questions was used to create a breast cancer knowledge score, which ranged from 0 to 5. The median of the score variable was used to categorize it into: low knowledge (0–3), and high knowledge (4–5). The predictors of breast cancer knowledge were assessed by a logistic regression, and OR and 95%CI were estimated for each variable. The following variables were assessed as independent variables: age, number of children, marital status, occupation, education, family income, and family history of breast cancer.

Frequency distributions were also produced for participant’s perceptions about breast cancer awareness and campaigns in Saudi Arabia for all subjects and stratified by gender. Chi-squared tests were used to compare the responses between men and women. A *p*-value of <0.05 was considered statistically significant. Data analyses were conducted using Stata version 13.0 (StataCorp LP, College Station, TX, USA).

## Results

A total of 40,859 participants were included in this study. We excluded 146 participants from the current analyses because of missing information on gender, resulting in 9691 men and 31,022 women. As Table 1 shows, approximately 70% of the participants were younger than 31 years old, and 76% were women. Most men (92%) and women (92%) were educated to high school level or above. More than half of the male participants were employed (57%) compared to 27% of women. Approximately 70% of participants had an income below 16,000 SAR per month (67% of men and 70% of women). Most participants had either no previous family history of breast cancer (72%) or were unsure (10%).

Table 2 shows the responses of the participants to general knowledge questions about breast cancer and its symptoms. The majority of participants (91%) knew that early detection of breast cancer improves treatment outcomes, and that breast cancer is widespread in Saudi Arabia (72%). A large percentage of participants recognized that a mass or swelling in the breast or armpit is related to breast cancer (81%). Around half of the participants reported that these cancers are associated with death (54%), and that they can be inherited (50%). A significantly higher percentage of women answered the questions correctly compared with men ( $p < 0.01$ ), except for the association of breast cancer with death, where more men (56%) than women (54%) answered correctly.

Table 3 shows the participants’ responses to questions about breast cancer risk factors. The majority of participants correctly reported that smoking is a risk factor for breast cancer (72%). A total of 65% and 60% of participants were aware that a family history of breast cancer and aging are risk factors, respectively. Breastfeeding was correctly recognized by 57% of the participants to reduce the risk of breast cancer. About half of the participants identified obesity (52%) and contraceptive use (48%) as breast cancer risk factors. Large breast size was correctly recognized to have no effect on breast cancer by 43% of the participants. Slightly more than 30% correctly reported that the first delivery above age 30 years and menopause after age 55 years are breast cancer risk factors, while only 18% of the participants correctly reported that experiencing puberty below age 11 years is a risk factor. A significantly larger percentage of women than men correctly identified most of the breast cancer risk factors in this study. However, more men

**Table 1** Socio-Demographic Characteristics of Participants

Sociodemographic Variables	Total n (%)	Men n (%)	Women n (%)
<b>Total</b>	40,713	9691	31,022
<b>Age</b>			
<20	11,631 (29)	1929 (20)	9702 (31)
21–30	16,231 (40)	3849 (40)	12,382 (40)
31–40	8052 (20)	2359 (24)	5693 (18)
40+	4654 (11)	1536 (16)	3118 (10)
<b>Number of children</b>			
No children	24,432 (61)	5181 (54)	19,251 (63)
One or more children	15,840 (39)	4406 (46)	11,434 (37)
<b>Marital status</b>			
Married	16,975 (42)	4697 (49)	12,278 (40)
Single	21,479 (53)	4468 (46)	17,011 (55)
Widowed/divorced	2076 (5)	488 (5)	1588 (5)
<b>Occupation</b>			
Unemployed	3729 (39)	3729 (39)	21,898 (71)
Employed	5505 (57)	5505 (57)	8345 (27)
Retired	348 (4)	348 (4)	541 (2)
<b>Education</b>			
Below high school	3320 (8)	795 (8)	2525 (8)
High school/diploma	15,597 (39)	3940 (41)	11,657 (38)
University	19,020 (47)	3982 (41)	15,038 (49)
Postgraduate	2588 (6)	920 (10)	1668 (5)
<b>Family income (SAR/month)</b>			
<8000	11,956 (30)	2730 (29)	9226 (31)
9000–15,000	15,288 (39)	3618 (38)	11,670 (39)
16,000–25,000	7983 (20)	2050 (22)	5933 (20)
>26,000	4147 (11)	1136 (12)	3011 (10)
<b>Region</b>			
Western	10,586 (26)	2705 (28)	7881 (26)
Eastern	6653 (16)	1401 (15)	5252 (17)
Central	10,524 (26)	1944 (20)	8580 (28)
Northern	5469 (14)	1622 (17)	3847 (12)
Southern	7200 (18)	1970 (20)	5230 (17)
<b>Family history of breast cancer</b>			
Yes	7178 (18)	1532 (16)	5646 (18)
No	28,752 (72)	6712 (71)	22,040 (72)
I do not know	4185 (10)	1271 (13)	2914 (10)

recognized that the first delivery above age 30 years (35%) and obesity (54%) are risk factors for breast cancer compared to 33% and 51% of women, respectively. There was no statistically significant difference between men and women in identifying puberty below 11 years of age as a risk factor for breast cancer.

Table 4 illustrates the predictors of breast cancer knowledge among the participants stratified by gender. Participants of older age seemed to be more likely to have high knowledge about breast cancer, and this was more pronounced among men. In addition, divorced and widowed participants were less likely to have high breast cancer knowledge, compared with those who are married. Employment was a predictor for better knowledge among women, and worse knowledge among men. The higher the education level of the participants the more likely it was that they had good knowledge, and this was more pronounced among men. Among men, (OR: 2.2, 95% CI: 1.7–2.7) and (OR: 3.0 95% CI: 2.3–3.8) for postgraduate and university attainers compared with participants with less than high a school degree, respectively. While among women, (OR: 1.4, 95% CI: 1.3–1.5) and (OR: 1.4 95% CI: 1.2–1.6) for those with postgraduate and university degrees, compared with participants with less than a high school degree, respectively. Participants with income higher than 8000 SAR/month, were more likely to have good breast cancer knowledge. While, participants with no family history of breast cancer were less likely to have good knowledge.

The participants' perceptions about breast cancer awareness and campaigns in Saudi Arabia are summarized in Table 5. About half of the women (56%) reported there are enough breast cancer awareness campaigns in Saudi Arabia, compared to 37% of men. Most participants (84%) reported that the awareness of breast cancer in Saudi society is average to weak, compared with only 16% who believed it was excellent. More men (42%) compared to women (22%) reported that this awareness was weak. A lack of awareness of breast cancer screening programs in Saudi Arabia was reported by 77% of the participants. Significantly more women than men (24% vs 19%, respectively;  $p < 0.01$ ) were aware of these programs.

## Discussion

Men's knowledge of women's health care issues in patriarchal societies, such as Saudi Arabia, can affect women's access to relevant health care and screening programs.<sup>6,7,10</sup> In this study, we found that the level of knowledge of breast cancer both among men and women in Saudi Arabia was poor; however, women had slightly better knowledge than men. Therefore, improving knowledge of breast cancer, particularly among men, may facilitate early detection of this disease.

**Table 2** Participants' Responses to General Knowledge Questions About Breast Cancer and its Symptoms

General Knowledge Questions	Total n (%)		Men n (%)		Women n (%)		p-value*
	Correct <sup>a</sup>	Incorrect/ Do Not Know	Correct <sup>a</sup>	Incorrect/ Do Not Know	Correct <sup>a</sup>	Incorrect/ Do Not Know	
Do you think that breast cancer is widely spread in Saudi Arabia?	29,205 (72)	11,446 (28)	6031 (62)	3646 (38)	23,174 (75)	7800 (25)	<0.001
Do you think that breast cancer is associated with death?	21,971 (54)	18,651 (46)	5404 (56)	4273 (44)	16,567 (54)	14,378 (46)	<0.001
Can breast cancer be inherited?	20,458 (50)	20,166 (50)	3980 (41)	5698 (59)	16,478 (53)	14,468 (47)	<0.001
Can early detection of breast cancer improve the outcome of treatment?	37,046 (91)	3545 (9)	8178 (85)	1495 (15)	28,868 (93)	2050 (7)	<0.001
Do you think a mass or swelling in the breast or the armpit is related to breast cancer?	32,759 (81)	7790 (19)	6447 (67)	3206 (33)	26,312 (85)	4584 (15)	<0.001

**Notes:** <sup>a</sup>The correct answer is the "yes" response category. \*The p-value of differences between men and women.

**Table 3** Participants' Responses to Questions About Breast Cancer Risk Factors

What is the effect of the following on the possibility of a woman developing breast cancer?	Total n (%)		Men n (%)		Women n (%)		p-value*
	Correct <sup>a</sup>	Incorrect/ Do Not Know	Correct <sup>a</sup>	Incorrect/ Do Not Know	Correct <sup>a</sup>	Incorrect/ Do Not Know	
Aging	24,313 (60)	16,106 (40)	5647 (59)	3982 (41)	18,666 (61)	12,124 (39)	<0.001
First delivery above age 30 years	13,314 (33)	26,895 (67)	3307 (35)	6274 (65)	10,007 (33)	20,621 (67)	<0.001
Smoking	29,142 (72)	11,234 (28)	6619 (69)	2998 (31)	22,523 (73)	8236 (27)	<0.001
Obesity	20,782 (52)	19,366 (48)	5169 (54)	4424 (46)	15,613 (51)	14,942 (49)	<0.001
Contraceptives use	19,276 (48)	20,773 (52)	4320 (45)	5208 (55)	14,956 (49)	15,565 (51)	<0.001
Family history of breast cancer	26,293 (65)	13,936 (35)	5326 (56)	4262 (44)	20,967 (68)	9674 (32)	<0.001
Puberty below 11 years	7,040 (18)	33,084 (82)	1743 (18)	7801 (82)	5297 (17)	25,283 (83)	0.035
Breast feeding	22,895 (57)	17,342 (43)	4507 (47)	5043 (53)	18,388 (60)	12,299 (40)	<0.001
Large breast size	17,185 (43)	23,079 (57)	3103 (32)	6488 (68)	14,082 (46)	16,591 (54)	<0.001
Menopause after age 55	13,921 (34)	26,455 (66)	3077 (32)	6537 (68)	10,844 (35)	19,918 (65)	<0.001

**Notes:** <sup>a</sup>The correct answer is the "increase" response category. The exceptions are breastfeeding and large breast size, where "decrease" and "no effect" are the correct response categories, respectively. \*The p-value of differences between men and women

With regard to breast cancer symptoms, we found that Saudi men had poorer knowledge than Saudi women. In particular, more women (85%) than men (67%) were aware that a mass in the breast or armpit was related to breast cancer. Meanwhile, Saudi women showed better knowledge regarding breast cancer symptoms than rural women in Iran, where most women did not know that changes in breast shape (88.2%), dimpling of breast skin (72.3%), and nipple discharge (69.6%) are the main symptoms of breast cancer.<sup>14</sup> However, these differences may have been due to the fact that the majority of the women in Iran had poor education and limited access to medical

facilities compared to the women in our study, who were mostly educated. Indeed, knowledge of breast cancer was previously found to be suboptimal in men and women with poor education and low socioeconomic status in India,<sup>15</sup> and women with less formal education in the US were more likely to have inaccurate knowledge concerning breast cancer.<sup>16</sup>

Previous studies have indicated poor knowledge of breast cancer risk factors among both genders in Saudi Arabia.<sup>12,17,18</sup> For example, 59.5% of Saudi women respondents in Abha (n=1140; mean age=33.6±11.9 years) had poor level of knowledge regarding breast

**Table 4** Predictors of Breast Cancer Knowledge Among Men and Women

Variables	Men				Women			
	Low Knowledge n=5533	High Knowledge n=4086	Univariate OR (95% CI)	Multivariate OR (95%CI)	Low Knowledge n=13,222	High Knowledge n=17,477	Univariate OR (95% CI)	Multivariate OR (95%CI)
<b>Total</b>								
<b>Age</b>								
<20	1291	615	1.00	1.00	4353	5222	1.00	1.00
21–30	2130	1700	1.7 (1.5–1.9)	1.5 (1.3–1.7)	5120	7164	1.2 (1.1–1.2)	1.1 (1.0–1.2)
31–40	1282	1057	1.7 (1.5–2.0)	1.5 (1.3–1.9)	2382	3247	1.1 (1.1–1.2)	1.0 (0.9–1.2)
40+	822	705	1.8 (1.6–2.1)	1.4 (1.1–1.8)	1298	1789	1.1 (1.1–1.2)	1.0 (0.9–1.2)
<b>Number of children</b>								
No children	3045	2100	1.00	1.00	8,126	10,937	1.00	1.00
≥1 child	2440	1933	1.1 (1.1–1.2)	1.0 (0.8–1.1)	4938	6384	1.0 (0.9–1.0)	0.9 (0.8–1.0)
<b>Marital status</b>								
Married	2566	2100	1.00	1.00	5256	5256	1.00	1.00
Single	2631	1806	0.8 (0.8–0.9)	1.0 (0.8–1.2)	7184	9644	1.0 (1.0–1.1)	1.1 (1.0–1.2)
Widowed/divorced	313	169	0.7 (0.5–0.8)	0.7 (0.5–0.9)	713	858	0.9 (0.8–1.0)	0.9 (0.8–1.0)
<b>Occupation</b>								
Unemployed	2185	1512	1.00	1.00	9641	12,055	1.00	1.00
Employed	3089	2381	1.1 (1.0–1.2)	0.8 (0.7–0.9)	3,269	4974	1.2 (1.2–1.3)	1.2 (1.1–1.3)
Retired	191	155	1.2 (0.9–1.5)	0.9 (0.6–1.2)	220	319	1.2 (1.0–1.4)	1.0 (0.8–1.2)
<b>Education</b>								
<High school	588	194	1.00	1.00	1326	1151	1.00	1.00
High school/Diploma	2471	1440	1.8 (1.5–2.1)	1.6 (1.3–1.9)	5205	6303	1.4 (1.3–1.5)	1.3 (1.1–1.4)
University	2047	1911	2.8 (2.4–3.4)	2.2 (1.7–2.7)	6012	8910	1.7 (1.6–1.9)	1.4 (1.3–1.5)
Postgraduate	395	521	4.0 (3.2–4.9)	3.0 (2.3–3.8)	618	1047	2.0 (1.7–2.2)	1.4 (1.2–1.6)
<b>Family income (SAR/ month)</b>								
<8000	1708	997	1.00	1.00	4488	4634	1.00	1.00
9000–15,000	2096	1505	1.2 (1.1–1.4)	1.1 (1.0–1.2)	4893	6680	1.3 (1.3–1.4)	1.3 (1.2–1.3)
16,000–25,000	1091	949	1.5 (1.3–1.7)	1.4 (1.2–1.6)	2221	3673	1.6 (1.5–1.7)	1.5 (1.4–1.6)
>26,000	540	585	1.9 (1.6–2.1)	1.5 (1.3–1.8)	1105	1882	1.6 (1.5–1.8)	1.5 (1.4–1.7)
<b>Family history of breast cancer</b>								
Yes	656	856	1.00	1.00	1762	3828	1.00	1.00
No	3892	2781	0.5 (0.5–0.6)	0.5 (0.5–0.6)	9882	11,945	0.6 (0.5–0.6)	0.6 (0.5–0.6)

cancer risk factors (ie, <50% correctly identified risk factors such as contraceptive pills, hormone replacement therapy, and age).<sup>19</sup> Similarly, a recent survey of 40 Saudi women in Makkah aged 25–65 years confirmed they had poor knowledge of breast cancer (only 10% responded correctly to the questions on breast cancer risk factors).<sup>20</sup> Moreover, a recent cross-sectional study among Saudi women in Madinah (n=465; mean age=34.9 years) confirmed they had poor knowledge of breast cancer (<50% reported correct answers to questions relating breast cancer risk factors).<sup>21</sup> In a study conducted among

200 women residing in Jeddah, investigators found that women had poor knowledge about breast cancer and more than 50% identified family history as a risk factor of breast cancer.<sup>17</sup> Two years later, the results from 764 questionnaires completed by Saudi women aged 20 to >60 years revealed that breast cancer and screening knowledge among Saudi women remained limited (eg, only 34% of the respondents identified the recommended age for breast cancer screening).<sup>18</sup> In the present study, more women than men correctly identified most of the breast cancer risk factors, although the differences between men and

**Table 5** Participants' Perceptions About Breast Cancer Awareness and Campaigns in Saudi Arabia

Variable	Total n (%)	Men n (%)	Women n (%)	p-value*
<b>Do you think there are enough breast cancer awareness campaigns in Saudi Arabia?</b>				
No	13,594 (34)	4393 (46)	9201 (30)	<0.001
Yes	20,818 (52)	3581 (37)	17,237 (56)	
Do not know	5961 (15)	1669 (17)	4292 (14)	
<b>How do you evaluate awareness of breast cancer in our society?</b>				
Excellent	6613 (16)	1143 (12)	5470 (18)	<0.001
Average	22,993 (57)	4408 (46)	18,585 (60)	
Weak	10,770 (27)	4088 (42)	6682 (22)	
<b>Are you aware of breast cancer screening programs in Saudi Arabia?</b>				
No	17,850 (44)	4672 (48)	13,178 (43)	<0.001
Yes	9281 (23)	1833 (19)	7448 (24)	
Do not know	13,232 (33)	3135 (33)	10,097 (33)	

Note: \*The p-value of differences between men and women.

women in their knowledge of these factors were small. Most participants correctly reported smoking (72%), family history of breast cancer (65%), and aging (60%) as breast cancer risk factors; however, only 18% of the participants correctly reported that experiencing puberty below the age of 11 years is a risk factor. Our findings are consistent with a previous large population-based study, which indicated limited awareness of risk factors among women in Iran (eg, less than one third of the 2250 respondents recognized that age at menarche was a risk factor for breast cancer).<sup>22</sup> Therefore, the level of knowledge of breast cancer risk factors both among men and women in Saudi Arabia could be improved.

In agreement with other studies,<sup>23</sup> we found that higher socioeconomic status was related to better breast cancer knowledge, which is not surprising, as it is well known that higher socioeconomic status is related to more health self-awareness.<sup>24</sup> This could even be reflected on mammography utilization, as higher socioeconomic status has been linked with more breast cancer screening.<sup>25</sup>

Mammography has been available in all regions of Saudi Arabia since 2005<sup>26</sup> and in 2007, a nationwide breast cancer screening facility in Riyadh was established.<sup>27</sup> However, only 19% of men and 24% of women in our study were aware of these breast cancer screening programs. Similarly, a recent study reported low rates of breast cancer screening in

Saudi Arabia, despite the fact that mammography is free and widely available.<sup>26</sup> Furthermore, while breast cancer awareness campaigns are widespread in Saudi Arabia (eg, the "Think Pink" campaign), it has been reported that they are not providing sufficient knowledge about the disease.<sup>13</sup> Indeed, only 37% of men and half of the women in this study (56%) reported there are enough breast cancer awareness campaigns in Saudi Arabia. Therefore, more aggressive campaigns and approaches may need to be investigated (encompassing media, religious leaders, schools, among others) to inform men and women about breast cancer.<sup>26</sup> Such a lack of awareness of public health issues seems to be a recurring theme in Saudi Arabia; for example, poor awareness of cervical cancer and its risk factors among Saudi women was recently reported.<sup>28</sup> This highlights a general need for improved education on key public health matters in this country.

There are some limitations to our study. First, our study may not be fully representative of the Saudi population, as we primarily assessed individuals living in urban/cosmopolitan areas. Indeed, there may be differences in breast cancer awareness between rural and urban/cosmopolitan areas (eg, Riyadh or Jeddah), which were not examined in this study. Second, the use of social media for part of the survey could also have biased the outcomes, as these participants have access to the internet, which tends to be a key source of knowledge of health issues. Third, our study relied on voluntary participation and self-reported data. Consequently, our results may be biased if there are systematic differences between people who responded and those who did not.

## Conclusions

Overall, knowledge regarding breast cancer remains limited among men and women in Saudi Arabia. Men appear to have slightly lower levels of knowledge of breast cancer symptoms and lower awareness of screening programs than women in this country. There is a need to implement awareness campaigns in Saudi Arabia, especially aimed at men, to increase knowledge and change behavior toward the early detection and cure of breast cancer.

## Data Sharing Statement

Data can be shared upon request from the corresponding author.

## Ethics Approval and Informed Consent

A cover letter containing a brief description of the study and its aim was included in the questionnaire, and it was written that participation was voluntary. Participants were informed that completing the questionnaire indicates their consent to participate in the study. Ethical approval was obtained from the Unit of Biomedical Ethics and Research Committee of the Faculty of Medicine in King Abdulaziz University (reference no. 51-15).

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors have no conflicts of interest to disclose in this work.

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