

# Community Pharmacists' Readiness for Breast Cancer Mammogram Promotion: A National Survey from Jordan

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**Purpose:** Mammography is the gold standard screening technique for early detection of breast cancer. This study aimed to assess the knowledge of community pharmacists of different aspects emphasized by the JBCP programs. This study also identifies the attitudes and barriers towards promoting early detection services.

**Patients and Methods:** This study was a cross-sectional survey of community pharmacists in Jordan. Pharmacists were randomly selected and asked to complete an electronic questionnaire. Inclusion criteria: a pharmacist with a bachelor's degree or higher and registered at the JPA working in a community pharmacy. The questionnaire included demographic and socioeconomic information, knowledge, attitudes towards breast cancer screening mammography services, and barriers towards participation in the promotion of these services.

**Results:** A total of 1,088 community pharmacists were approached, 1,000 (91.8%) completed the questionnaire. Participants had an average age of 34 years  $\pm$  10.8 and average experience of 9.1  $\pm$  9.5 years. Only 48 (37.8%) of the female pharmacists aged 40 years or older underwent a mammogram. Knowledge of symptoms of breast cancer was the highest with a score of 755, followed by knowledge of risk factors (670) and finally early detection of breast cancer (540). Many barriers were reported by the community pharmacists including lack of educational materials and time constraints. Pharmacists with higher educational levels ( $p < 0.001$ ), of female gender ( $p < 0.001$ ), attended continuous cancer-related education ( $p < 0.001$ ), encountered a higher percentage of female customers ( $p < 0.001$ ), in a certain geographic location ( $p = 0.003$ ), underwent mammography ( $p = 0.014$ ), and encountered high frequency of inquiries on mammogram by the customers ( $p < 0.001$ ) were all associated with higher knowledge scores.

**Conclusion:** Despite the reported barriers and insufficient knowledge in certain aspects of early detection of breast cancer, community pharmacists have positive attitudes and can be a valuable asset for awareness-raising efforts.

**Keywords:** mammography, breast cancer, knowledge, attitude, barriers, Jordan breast cancer program, screening

## Introduction

Breast cancer accounts for 20.6% of all cancer cases in both sexes, and 39.4% of all types of cancer in Jordanian women.<sup>1</sup> Similarly, international statistics show that breast cancer is the most commonly diagnosed cancer (2.26 million cases).<sup>2</sup> This percentage has increased by 69% over the last ten years.<sup>1</sup> Globally, the incidence was highest (112.3 per 100,000 population) in Belgium and lowest (35.8 per 100,000 population) in Iran.<sup>3</sup> The highest incidence of breast cancer in Asian and African countries occurred 10 years earlier than in western countries.<sup>3</sup>

Age at breast cancer diagnosis exhibits different patterns among countries. The median age at diagnosis of breast cancer in the United States is 63 years,<sup>4</sup> 50 years in China,<sup>5</sup> 48.5 years in Arab countries,<sup>6</sup> and 51 years in Jordan.<sup>1</sup> These differences warrant tailored implementation of preventive and screening strategies among countries.

Screening mammography plays a pivotal role in substantially reducing the risk of death from breast cancer, while maintaining a commendably low level of radiation exposure during the procedure.<sup>7</sup> Analysis of the 10-year follow-up data revealed that the fraction of detected small breast tumors increased from 36% to 68%, leading to a decline in the incidence of larger tumors from 64% to 32%.<sup>8</sup>

Globally, improvements in breast cancer health outcomes, particularly decreased mortality rates, have been attributed to early detection. Five-year survival rates for breast cancer are lower in developing countries than in the United States. This is mainly attributed to the scarcity of early detection programs, inadequate diagnosis, and lack of treatment facilities.<sup>9</sup> The effect of screening mammography on the observed reduction in breast cancer mortality is variable and ranges from 28% to 65%, with the rest attributed to adjuvant treatment.<sup>10</sup>

One drawback of mammography identified in developing countries, where the rate of mammography is high, is overdiagnosis and consequent overtreatment, which necessitates the development of procedures that differentiate between very slow-growing and aggressive ones.<sup>11,12</sup> Overdiagnosis exposes women to appreciable physical, psychological, and economic impairments.

A recent review of 23 guidelines published between 2010 and 2021 in 11 countries or regions demonstrated that most guidelines recommend yearly or every other year mammographic screening between the age of 40 and 74 years for women with an average risk of breast cancer.<sup>13</sup> For average-risk women, the World Health Organization (WHO) recommends mammography screening for women after the age of 40,<sup>14</sup> the American College of Radiology (ACR) recommends mammography beginning at the age of 40,<sup>15</sup> the US Preventive Services Task Force (USPSTF) at the age of 40 years or older,<sup>16</sup> and the National Comprehensive Cancer Network (NCCN) for all women over the age of 40.<sup>17</sup>

According to USPSTF guidelines, women under 50 years of age should receive consultation from healthcare providers to decide on the start and frequency of breast cancer screening to obtain individualized management.<sup>18</sup> However, less than half of women in the United States communicated with a healthcare provider on mammogram choice.<sup>19</sup> These findings warrant the need to train healthcare providers in decision-making based on evidence-based information to effectively engage them in mammogram promotion services. Adequate training and mentoring of healthcare providers to become advocates of mammography services have been successful.<sup>20</sup>

The valuable contributions and positive effects of pharmacists in many breast cancer services include psychological outcomes,<sup>21</sup> patient satisfaction,<sup>22</sup> and quality of life<sup>23</sup> was established. Community pharmacists are an accessible source for medication management services, information, and counselling<sup>24</sup> and can be easily oriented with appropriate, focused workshops and training sessions.

Health promotion involves the implementation of social and environmental measures to empower individuals and communities to control their health. It is important to engage communities and stakeholders in health promotion efforts to improve health outcomes. Community engagement, as defined by the WHO, fosters collaboration among stakeholders to address health issues and promote well-being.<sup>25</sup> It drives changes in behavior, the environment, policies, programs, and practices within communities.

The Jordan Breast Cancer Program is a national program led by the King Hussein Cancer Foundation and Center, established in response to the rising burden of breast cancer. It recognizes the strength of communities and health promotion as essential factors for achieving health improvements, particularly those related to cancer prevention and early detection. It employs many strategies to engage people and stakeholders, ensuring that the message of early detection, including screening mammography, reaches everyone with their help.

It focuses on promoting health behaviors related to breast cancer screening and early detection, creating enabling environments, and advocating healthy public policies. Increasing health literacy is crucial for enabling citizens to actively participate in improving their health and engaging in community health efforts. The cornerstone of the Jordan Breast Cancer Program (JBCP) work lies in the participatory approach combined with the adaptability of evidence-based methodology and behavior-change interventions that stimulate demand for services, sensitize communities, and enhance individual and community skills.

Community pharmacies are widely spread in Jordan (in rural and urban areas) and pharmacists represent a valuable source for scientific and educational information for the public and can promote early detection services for breast cancer. Their involvement can improve the awareness among women of the importance of mammogram. This study

was conducted as a first step in a plan for inclusion of community pharmacists (CPs) in breast cancer mammogram promotion services at the national level in all 12 governances of Jordan. The objective of the study was to evaluate the readiness of community pharmacists for promoting the mammogram service through exploring the extent of knowledge community pharmacists had in areas emphasized by JBCP workshops and programs for educators. The study also assessed community pharmacists' attitudes towards being active promoters of these services and the perceived barriers that the JBCP must overcome to encourage their effective involvement in breast cancer mammography promotion services.

## Patients and Methods

This study was a cross-sectional survey of community pharmacists in Jordan. The Jordanian Pharmacists Association (JPA) provided the research team with a list of all the registered community pharmacies in Jordan. A stratified random sample of community pharmacies was selected from the list of JPA pharmacies. Stratification was conducted at the level of 12 Jordanian governances.

## Sample Size

The sample size for this random sample was calculated using the following equation:

$$N = (Z^2 * P * (1 - P)) / (d^2)^{26}$$

where N is the sample size, and Z is the standard normal deviation corresponding to the desired level of confidence (1.96 for a 95% confidence interval for this study). P is the estimated prevalence based on pharmacists' knowledge, attitudes, and practices regarding breast cancer screening in Jordan (85.8%).<sup>27</sup> In this study, d is the desired level of precision.  $N = (1.962 * 0.85 * 0.15) / (0.026452) = 700.12$ . The response rate was estimated to be 70% and the calculated sample size was approximately 1000.

Participants were recruited through JBCP volunteers who visited randomly selected pharmacies and asked pharmacists to complete an electronic questionnaire on their mobile phones. When multiple pharmacists were present in the community pharmacy during the visit, only the senior pharmacist was asked to complete the questionnaire. Participants were included in the study if they met the following inclusion criteria: a pharmacist with a bachelor's degree or higher and registered at the JPA. Pharmacy employees with a diploma or other non-pharmacy degree and those who refused to participate in this survey were excluded from this study. This study was conducted between January 2023 and June 2023.

## Development of the Questionnaire

The questionnaire was developed after an extensive review of the related literature. It was validated by a focus group of educators and experts from the JBCP to check for the inclusion of relevant topics and information on different aspects addressed by the program. Agreement among experts on the relevance of each item in the questionnaire was obtained for the final version of the questionnaire. The questionnaire was developed in English, translated into Arabic by two experts, and back-translated into English by different experts to ensure the correct meaning and wording. A pilot study was conducted with 15 community pharmacists to provide feedback on the length, clarity, readability, and feasibility of the questionnaire. Comments from community pharmacists and volunteers were considered and modifications were made accordingly.

The questionnaire included four sections: demographic and socioeconomic information, knowledge, attitudes towards breast cancer screening mammography services, and barriers to participation in the promotion of these services. Knowledge of the symptoms of breast cancer, risk factors of breast cancer, and early detection of breast cancer were assessed.

Ethical approval for this study was obtained from the Al-Ahliyya Amman University Ethics Review Board (IRB number: AAU/3/15/2021-2022). All participants provided informed consent in the form of an approval to participate in

a cover letter that explained the objectives of the study and ensured the anonymity of the information. All collected data was de-identified and the study was conducted in accordance with the Declaration of Helsinki.

## Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows version 23 (IBM Corp., Armonk, N.Y., USA). Categorical data are presented as frequencies (%). Associations between continuous variables were analyzed using one-way ANOVA among three or more independent groups and independent sample t-tests between two independent groups. Pearson's correlation analysis was conducted to investigate potential correlations between the variables of interest. Statistical significance was set at  $P \leq 0.05$ .

## Results

A total of 1,088 community pharmacists were approached to participate in the study, and 1,000 (91.8%) agreed to participate and complete the questionnaire. Pharmacists had an average age of 34 years  $\pm$  10.8 and an average experience

**Table 1** General Characteristics of the Participants, N=1000

	Frequency (%)		Frequency (%)
<b>Gender</b>		<b>Province</b>	
Male	305 (30.5%)	Amman	460 (46.0%)
Female	695 (69.5%)	Alzarqa	146 (14.6%)
<b>Social status</b>		Irbid	124 (12.4%)
Single	436 (43.6%)	Albalqa	57 (5.7%)
Married	521 (52.1%)	Almafraq	51 (5.1%)
Divorced	28 (2.8%)	Alkarak	50 (5.0%)
Widower	15 (1.5%)	Jarash	48 (4.8%)
<b>Education level</b>		Madaba	20 (2.0%)
B.Sc. pharmacy	823 (82.3%)	Ajloun	16 (1.6%)
Pharm D	115 (11.5%)	Altafileh	13 (1.3%)
M.Sc. pharmacy	62 (6.2%)	Alaqaba	9 (0.9%)
<b>Type of university</b>		Maan	6 (0.6%)
Government university in Jordan	521 (52.1%)	<b>Type of pharmacy</b>	
Private university in Jordan	383 (38.3%)	Independent	803 (80.3%)
University outside Jordan	96 (9.6%)	Chain	197 (19.7%)
<b>Employment status</b>		<b>Percentage of female costumers</b>	
Full time	698 (69.8%)	< 25%	144 (14.4%)
Part time	302 (30.2%)	25–50%	493 (49.3%)
Pharmacy ownership		51%-75%	300 (30.0%)
Employee	699 (69.9%)	> 75%	63 (6.3%)
Owner	301 (30.1%)		

(Continued)

**Table 1** (Continued).

	Frequency (%)		Frequency (%)
<b>Number of cancer-related continuous education activities in the last two years</b>		<b>Number of continuous education activities related to early detection of breast cancer in the last two years</b>	
0	667 (66.7%)	0	691 (69.1%)
1	221 (22.1%)	1	212 (21.2%)
2	61 (6.1%)	2	58 (5.8%)
>2	51 (5.1%)	>2	39 (3.9%)

of  $9.1 \pm 9.5$  years. Pharmacies had on average  $2.8 \pm 2.7$  working pharmacists and  $1.2 \pm 1.9$  technicians. The median daily prescription was 12, with an interquartile range (IQR) of 24. The general characteristics of the participants are presented in Table 1.

Fifty-one (5.1%) participants had breast cancer, 97 (9.7%) had a first-degree relative with breast cancer, and 232 (23.2%) had a second degree relative with breast cancer. Almost one-fourth of the participants, 231 (23.1%) sold anticancer drugs in their pharmacies, 415 (41.5%) agreed that they had appropriate undergraduate cancer-related education, and 579 (57.9%) thought they had adequate information concerning the early detection of breast cancer. Pharmacists were not a source of information for women regarding mammogram, only 55 (5.5%) pharmacists were frequently asked questions by consumers concerning mammogram, 601 (60.1%) rarely, and 344 (34.4%) were never asked.

**Table 2** Knowledge of Community Pharmacists on Symptoms and Risk Factors of Breast Cancer

	Frequency (%)	Total score <sup>a</sup>
<b>Symptoms</b>		
<b>Unusual pain in breasts</b>		732
Yes <sup>€</sup>	732 (73.2%)	
No	208 (20.8%)	
I do not know	60 (6.0%)	
<b>Unusual pain under the armpits</b>		774
Yes <sup>€</sup>	774 (77.4%)	
No	153 (15.3%)	
I do not know	73 (7.3%)	
<b>Orange-peel skin texture of breasts</b>		769
Yes <sup>€</sup>	769 (76.9%)	
No	98 (9.8%)	
I do not know	133 (13.3%)	

(Continued)

**Table 2** (Continued).

	Frequency (%)	Total score <sup>a</sup>
<b>Abnormal secretions from the nipples</b>		840
Yes <sup>€</sup>	840 (84.0%)	
No	83 (8.3%)	
I do not know	77 (7.7%)	
<b>Nipple retraction or turning inward</b>		775
Yes <sup>€</sup>	775 (77.5%)	
No	92 (9.2%)	
I do not know	133 (13.3%)	
<b>Itching and flaking of the nipple</b>		600
Yes <sup>€</sup>	600 (60.0%)	
No	198 (19.8%)	
I do not know	202 (20.2%)	
<b>Changes in the shape and size of the breasts</b>		893
Yes <sup>€</sup>	893 (89.3%)	
No	51 (5.1%)	
I do not know	56 (5.6%)	
<b>Presence of wrinkles in the breasts</b>		643
Yes <sup>€</sup>	643 (64.3%)	
No	163 (16.3%)	
I do not know	194 (19.4%)	
<b>Changes in the color and temperature of the breasts</b>		765
Yes <sup>€</sup>	765 (76.5%)	
No	94 (9.4%)	
I do not know	141 (14.1%)	
Average score per question		6,791/9 = 755
<b>Risk factors</b>		
<b>Menstruation before the age of 12</b>		355
Yes <sup>€</sup>	355 (35.5%)	
No	257 (25.7%)	
I do not know	388 (38.8%)	
<b>Postmenopausal after the age of 55</b>		512
Yes <sup>€</sup>	512 (51.2%)	
No	253 (25.3%)	

(Continued)

**Table 2** (Continued).

	Frequency (%)	Total score <sup>a</sup>
I do not know	235 (23.5%)	
<b>Postmenopausal /overweight after the age of 55</b>		621
Yes <sup>€</sup>	621 (62.1%)	
No	155 (15.5%)	
I do not know	224 (22.4%)	
<b>First pregnancy after the age of 30</b>		369
Yes <sup>€</sup>	369 (36.9%)	
No	304 (30.4%)	
I do not know	327 (32.7%)	
<b>Family history from the father's side</b>		741
Yes <sup>€</sup>	741 (74.1%)	
No	136 (13.6%)	
I do not know	123 (12.3%)	
<b>Family history from the mother's side</b>		893
Yes <sup>€</sup>	893 (89.3%)	
No	32 (3.2%)	
I do not know	75 (7.5%)	
<b>Using hormone replacement therapy</b>		741
Yes <sup>€</sup>	741 (74.1%)	
No	126 (12.6%)	
I do not know	133 (13.3%)	
<b>Presence of a mass under the armpit</b>		877
Yes <sup>€</sup>	877 (87.7%)	
No	65 (6.5%)	
I do not know	58 (5.8%)	
<b>Presence of a mass in the breast</b>		917
Yes <sup>€</sup>	917 (91.7%)	
No	42 (4.2%)	
I do not know	41 (4.1%)	
Average score per question		6,026/9 = 670

**Notes:** <sup>€</sup>: Correct answers; <sup>a</sup>: Correct answers were given a score of 1; incorrect answers/I do not know were assigned a score of 0. The scores of all the participants for each question were summed up.

Knowledge of the symptoms of breast cancer, risk factors, and early detection was assessed. The knowledge score for the symptoms of breast cancer was the highest (755), and the lowest was for itching and flaking of the nipples (Table 2). Knowledge of the risk factors was evaluated with a score of 670, and many pharmacists did not know that menstruation before the age of 12 and first pregnancy after the age of 30 were risk factors, with scores of 355 and 369, respectively (Table 2). Low scores were obtained for early detection of breast cancer (540). Many pharmacists did not know that the

**Table 3** Knowledge of Community Pharmacists on Early Detection of Breast Cancer

	Frequency (%)	Total score
<b>Mammogram is important because</b>		878
Early detection of breast cancer <sup>€</sup>	878 (87.8%)	
Reduces the risk of having breast cancer	80 (8.0%)	
Treats breast cancer	26 (2.6%)	
I do not know	16 (1.6%)	
<b>The most efficient method for early detection of breast cancer</b>		531
Self-exam	355 (35.5%)	
Clinical exam	114 (11.4%)	
Mammogram <sup>€</sup>	531 (53.1%)	
<b>According to Jordanian guidelines, when should women start the mammogram</b>		442
Starting from 30 years	480 (48.0%)	
Starting from 40 years <sup>€</sup>	442 (44.2%)	
Starting from 50 years	13 (1.3%)	
Starting from 60 years	2 (0.2%)	
I do not know	63 (6.3%)	
<b>Who should have a mammogram</b>		763
All women <sup>€</sup>	763 (76.3%)	
Women with a history of breast cancer in first degree relatives	214 (21.4%)	
Women with a history of breast cancer in second degree relatives	23 (2.3%)	
<b>How often should women have a mammogram</b>		713
Once in a lifetime	24 (2.4%)	
Every one or two years <sup>€</sup>	713 (71.3%)	
Every three years	195 (19.5%)	
Every five years	68 (6.8%)	
<b>Is the mammogram harmful?</b>		629
No <sup>€</sup>	629 (62.9%)	
Yes	138 (13.8%)	
I do not know	233 (23.3%)	

(Continued)



**Table 3** (Continued).

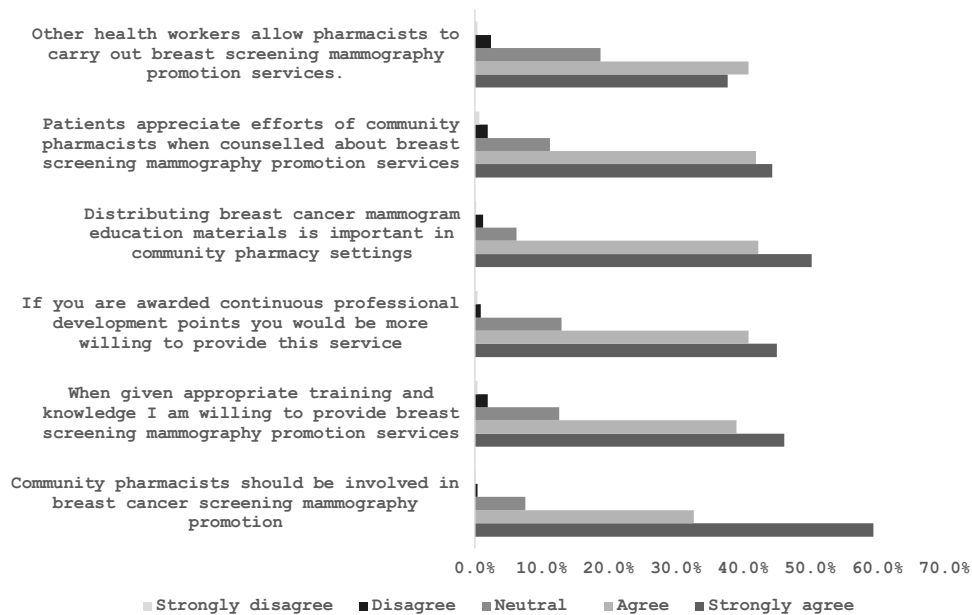
	Frequency (%)	Total score
<b>Is the mammogram a type of x-ray?</b>		367
Yes <sup>€</sup>	367 (36.7%)	
No	251 (25.1%)	
I do not know	382 (38.2%)	
<b>Is mammogram painful?</b>		523
No <sup>€</sup>	523 (52.3%)	
Yes	191 (19.1%)	
I do not know	286 (28.6%)	
Average score per question		4,323/8 = 540

**Note:** €: Correct answer.

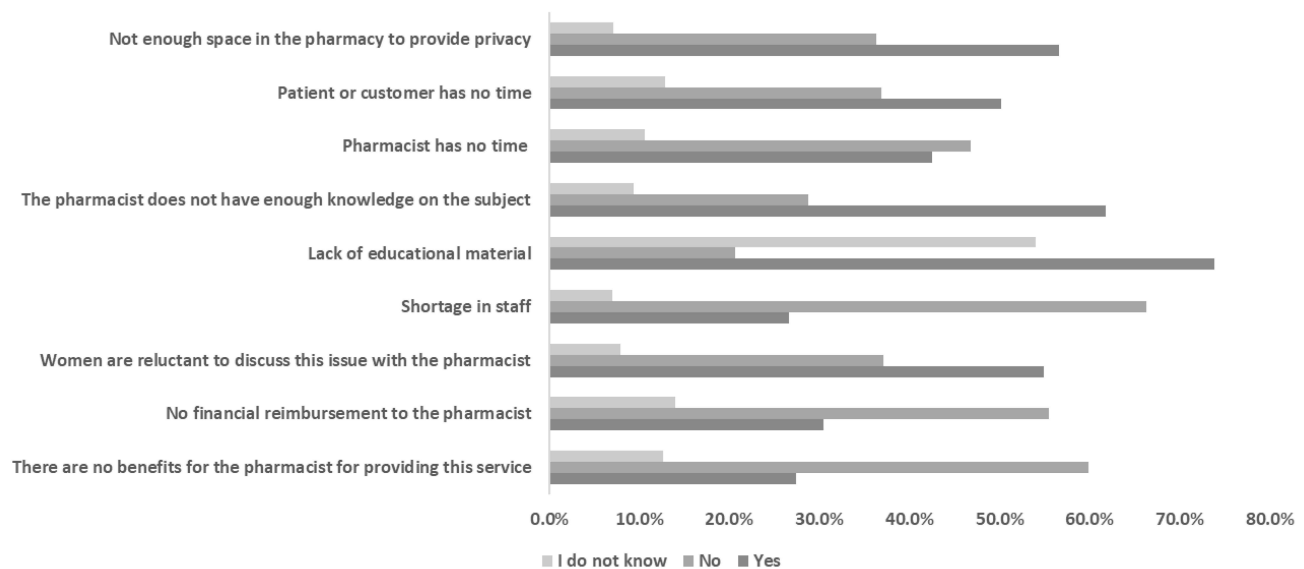
mammogram was a type of X-ray (score=367), and less than half 442 (44.2%) stated that women should begin mammography at 40 years of age (Table 3).

Correlations between the three different knowledge themes (symptoms, risk factors, and early detection) scores were examined. The correlation between knowledge of symptoms and risk factors for breast cancer was positive and moderate ( $r=0.509$ ,  $p$  value  $< 0.001$ ). The correlation between knowledge of symptoms and the early detection of breast cancer was positive and weak ( $r=0.220$ ,  $p < 0.001$ ). The correlation between knowledge of risk factors and the early detection of breast cancer was positive and weak ( $r=0.272$ ,  $p < 0.001$ ). This poor correlation with the early detection of breast cancer suggests that appropriate knowledge of symptoms and risk factors does not guarantee adequate knowledge of the early detection of breast cancer.

Community pharmacists' attitudes towards participation in breast cancer mammography screening promotion services are encouraging (Figure 1). Most pharmacists agreed that they should be involved in these services when given



**Figure 1** Attitudes towards breast screening mammography promotion services among community pharmacists.



**Figure 2** Perceived barriers towards breast screening mammography promotion services among community pharmacists.

appropriate training and mammography education material. Incentives, such as continuous professional development points, are also crucial for motivating pharmacists and encouraging their active participation in the promotion of these activities.

There are many barriers to involvement in mammogram promotion services, most importantly, lack of educational material, followed by insufficient knowledge, inadequate space in the pharmacy to provide privacy to customers, and reluctance to discuss these issues with the pharmacist (Figure 2).

**Table 4** Association Between Total Knowledge Score and Characteristics of the Participants

	Mean $\pm$ SD	P value <sup>a</sup>
<b>Gender</b>		< 0.001
Male	16.3 $\pm$ 5.1	
Female	17.5 $\pm$ 4.0	
<b>Social status</b>		0.002
Single	17.2 $\pm$ 4.1	
Married	16.9 $\pm$ 4.7	
Divorced	18.0 $\pm$ 4.1	
Widower	21.1 $\pm$ 2.7	
<b>Education level</b>		< 0.001
B.Sc. pharmacy	16.7 $\pm$ 4.3	
Pharm D	19.0 $\pm$ 4.5	
M.Sc. pharmacy	19.5 $\pm$ 4.3	
<b>Type of university</b>		< 0.001
Government university in Jordan	17.5 $\pm$ 4.2	

(Continued)

**Table 4** (Continued).

	Mean $\pm$ SD	P value <sup>a</sup>
Private university in Jordan	16.4 $\pm$ 4.4	
University outside Jordan	18.3 $\pm$ 5.4	
<b>Type of pharmacy</b>		0.366
Independent	17.1 $\pm$ 4.4	
Chain	17.4 $\pm$ 4.4	
<b>Employment status</b>		0.493
Full time	17.1 $\pm$ 4.3	
Part time	17.3 $\pm$ 4.7	
<b>Pharmacy ownership</b>		0.617
Employee	17.2 $\pm$ 4.4	
Owner	17.0 $\pm$ 4.6	
<b>Percentage of female costumers</b>		< 0.001
< 25%	17.3 $\pm$ 5.0	
25–50	16.7 $\pm$ 4.4	
51–75	17.2 $\pm$ 4.1	
>75	20.4 $\pm$ 3.8	
<b>Number of cancer-related continuous education activities in the last two years</b>		< 0.001
0	16.6 $\pm$ 4.2	
1	17.9 $\pm$ 4.5	
2	18.4 $\pm$ 4.7	
>2	19.6 $\pm$ 4.5	
<b>Have you ever done a Mammogram? (Female pharmacists)</b>		0.014
Yes	18.6 $\pm$ 4.3	
No	17.4 $\pm$ 3.9	
<b>How often are you asked about the Mammogram by the customers?</b>		< 0.001
Never	16.3 $\pm$ 4.7	
Rare	17.5 $\pm$ 4.1	
Frequent	18.5 $\pm$ 5.4	
<b>Province</b>		0.003
Amman	17.6 $\pm$ 4.5	
Irbid	17.1 $\pm$ 4.2	
Alzarqa	16.8 $\pm$ 4.1	
Alkarak	17.2 $\pm$ 4.3	

(Continued)

**Table 4** (Continued).

	Mean $\pm$ SD	P value <sup>a</sup>
Almafraq	16.8 $\pm$ 4.6	
Albalqa	15.5 $\pm$ 4.1	
Jarash	17.0 $\pm$ 4.1	
Ajloun	15.4 $\pm$ 5.5	
Maan	16.2 $\pm$ 2.6	
Altafileh	17.2 $\pm$ 4.5	
Madaba	14.9 $\pm$ 5.1	
Alaqaba	20.9 $\pm$ 3.6	

Notes: <sup>a</sup>: ANOVA for more than two independent groups and independent sample t-test for two independent groups.

Associations between the total knowledge scores and different attributes of the pharmacists were investigated. Female sex, master's degree, more cancer-related and early detection of breast cancer-related continuous educational activities, geographic location, frequent inquiries on mammogram information, and pharmacies with a high percentage of female customers were all associated with statistically significant high total knowledge scores. Female community pharmacists had significantly higher knowledge score than male pharmacists, 17.5 and 16.3, respectively, with a P value < 0.001 (Table 4).

Participants who had breast cancer had a higher knowledge score than those who did not, 18.4  $\pm$  4.3 and 17.1  $\pm$  4.4, respectively,  $p = 0.032$ . Additionally, those with a first-degree relative with breast cancer had a higher knowledge score than those who did not, 18.1  $\pm$  4.1 and 17.0  $\pm$  4.5, respectively,  $p = 0.019$ .

Among the female participants, there was a statistically significant difference between those who had a mammogram and those who did not, 18.6  $\pm$  4.3 and 17.4  $\pm$  3.9, respectively,  $p = 0.011$ . Moreover, pharmacists 40 years or older had higher total knowledge scores than those younger than 40, 17.8  $\pm$  4.7 and 16.9  $\pm$  4.3, respectively,  $p = 0.006$ .

## Discussion

This is the first study to assess numerous aspects of breast cancer symptoms, risks, early detection, attitudes, and barriers at a national level in Jordan. Pharmacies were randomly selected across 12 governances, providing an excellent and true representation of community pharmacists in Jordan. Randomization and comprehensiveness in the inclusion of community pharmacies from all over Jordan was important since the goal of the JBCP is to reach Jordanian women in all geographic areas, hence the involvement of community pharmacists in the promotion process is required from all the provinces in Jordan.

Only half of the CPs thought that they received appropriate education related to cancer or early detection of breast cancer, which emphasizes the importance of regular training workshops on different issues related to cancer. If CPs do not have appropriate education, they cannot act as credible sources of information concerning symptoms, risk factors, and early detection of breast cancer. Unfortunately, few studies have evaluated oncology education received by pharmacists in Jordan or other parts of the world. In the United States, Kwon et al revealed that, among the 62 schools included in the study, didactic courses teaching oncology pharmacotherapy had an average of 20 hours. The authors recommended increasing the didactic and experiential rotations related to oncology.<sup>28</sup>

Almost one third (37.8%) of female pharmacists in our study underwent a mammogram, a comparable percentage of 40% was identified by Ayoub et al in a study that included only female community pharmacists.<sup>27</sup> This rate was lower than that in Palestine, where Nazzal et al revealed that 50% of the female healthcare providers underwent a mammogram.<sup>29</sup>

In the public, the frequency of women who had a mammogram is lower. A recent national study by JBCP revealed that only 27.5% in the target screening age group (40 years and above) self-reported having a mammography in the last five years.<sup>30</sup> This rate also represents an increase compared to a study in 2020 conducted by Al-Mousa et al and showed that among the 1,353 Jordanian women enrolled in the study, only 17.2% had mammography. The high rate in our study

may be attributed to the nature of the study population, in which all our participants were pharmacists.<sup>31</sup> The prevalence of other breast cancer screening methods, such as breast self-examination and clinical breast examination, among the public was also low in Jordan.<sup>32</sup> A study conducted by Qin et al that enrolled 8,324 women aged 18–39 years revealed that 14% of the participants had mammogram, even in those with no family history of breast cancer.<sup>33</sup> Strangely enough, CPs were not approached for information concerning mammograms, although research has shown that women refer to physicians for advice on mammogram.<sup>31</sup> Healthcare providers have a huge impact on mammography choice, and this effect might differ from one age group to another.<sup>19</sup> A healthy and strong relationship between the healthcare provider and consumer/patient promotes shared decision making.<sup>34</sup> The public should be encouraged to consult CPs for information on mammograms, provided pharmacists are equipped with appropriate information and educational materials. Pharmacists who can provide such information should have adequate advertising materials, certain labels, and banners that inform the public that the pharmacist is qualified to provide this information.

The highest knowledge score was related to symptoms. Most CPs seemed to be aware of the symptoms of breast cancer. Ayoub et al identified good knowledge of symptoms among Jordanian female CPs.<sup>27</sup> Rehman et al assessed breast cancer knowledge among health professionals before and after intervention; more than half of the participants identified an axillary lump as a symptom; however, similar to our population, few recognized changes in nipples in breast cancer.<sup>35</sup>

The lowest knowledge of risk factors was menstruation before the age of 12 years and first pregnancy after the age of 30 years. Similar results regarding these risk factors (early puberty and late first pregnancy) were found in a study conducted in North Saudi Arabia that evaluated the knowledge of female healthcare workers.<sup>36</sup>

Less than half of the CPs recognized the mammogram as a type of X-ray, and the age at which women should start mammography. This is alarming because clinical recommendations in Jordan advise women to begin mammography at the age of 40, which implies that CPs are not ready or qualified to provide advice on this aspect.

Correlations between different aspects of knowledge were assessed, and a weak correlation was found between knowledge of early detection and other fields of knowledge, which suggests that having a higher knowledge in one aspect does not necessarily imply adequate knowledge of other aspects.

CPs had a positive attitude towards participation in breast cancer mammography promotion services. This provides a basis for the involvement and incorporation of CPs in JBCP activities. CPs expressed the importance of incentives, especially in the form of continuous professional development points which can be arranged between the JBCP and Ministry of Health. These hours can be granted to CPs who participate in workshops organized by the JBCP, and after completion, they are given certificates that qualify them as providers of breast cancer mammography promotion services. Pharmacies that employ these qualified pharmacists are eligible to showcase promotions/stickers, informing the public that the pharmacist is accredited for providing such services.

Several barriers to providing these services must be addressed, such as lack of educational material, which can be easily managed by distributing these materials regularly to the pharmacies. Lack of knowledge can also be dealt with by providing workshops and lectures. Time constraint is an issue that has been identified as a barrier in many studies; pharmacists do not have time to effectively discuss issues related to breast cancer and mammogram.<sup>34,37</sup>

Female CPs who had higher educational levels and who were asked about mammograms more frequently had higher knowledge scores than other pharmacists. CPs who were more frequently asked by their customers on issues related to breast cancer had better knowledge, this was probably a motive for CPs to acquire information to provide their customers with credible answers to their questions. CPs whose customers were mostly females, also had better knowledge. In Jordan, breast cancer is mainly perceived as a female-related disease, and CPs with many encounters with females will expect to be subjected to questions concerning mammogram and will probably seek information in order to be prepared for related inquiries. Additionally, as the number of cancer-related and early detection of breast cancer-related continuous educational activities increased from zero to more than two, the knowledge score increased. This is expected because the positive effect of sessions and interventions on knowledge has been established by many studies among healthcare providers, the public, and university students.<sup>35,38,39</sup> Male pharmacists had lower knowledge score compared to female pharmacists. Many community pharmacies in Jordan are run by male pharmacists. They provide healthcare services and are considered a valuable source of information to all customers (males and females) who inquire about mammogram and breast cancer. They are also sons, husbands, brothers,

and fathers of potential breast cancer patients. Therefore, efforts in improving the role of community pharmacists in the promotion of mammogram services should encourage their involvement and address gaps in their knowledge.

The strengths of this study include large sample size and high response rate. Additionally, pharmacists were randomly selected using SPSS software from a list provided by the JPA for all pharmacies in the country. Random selection was performed for every governance; consequently, it was a true representation of community pharmacists in Jordan. This study included both sexes, unlike many studies that included only female pharmacists. Another strength is that the questionnaire involved data based on literature review and information included in JBCP workshops and educational training sessions. Consequently, the study examined the exact information that community pharmacists would provide if they were part of mammogram promotion activities.

Limitations include the fact that the questionnaire was developed based on the needs of the JBCP. Although the information is almost universal, this may be considered a limitation in comparing our results with those of other studies. This self-administered questionnaire was subject to bias and lack of guidance in the case of inquiries or incorrect interpretation of questions. The volunteers who distributed the questionnaire among pharmacists were instructed not to answer any questions to maintain uniformity of the process.

## Conclusion

This is the first comprehensive study in Jordan at the national level to evaluate the knowledge of community pharmacists on different aspects of symptoms, risk factors, and early detection of breast cancer. Attitudes and barriers towards participation as active providers and contributors to breast cancer mammogram promotion services were also evaluated. The gaps in knowledge identified in this study should be emphasized in workshops, and areas of concern and barriers should be discussed to find solutions. Recommendations on incentives to motivate community pharmacists must be considered by policy makers. Community pharmacists have adequate basic medical knowledge that is valuable for campaigns to advocate for the promotion of early detection of breast cancer using mammography.

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