Awareness of Palestinian Women About Breast Cancer Risk Factors: A National Cross-Sectional Study

Mohamedraed Elshami, MD, MMSc[1,2]; Faten Darwish Usrof, MSc[3]; Mohammed Alser, MD[2]; Ibrahim Al-Slaibi, MD[4];
Heba Mahmoud Okshiya, MD[5]; Roba Jamal Ghithan[6]; Nouran Ramzi Shaban Shurrab[6]; Islam Osama Ismail[7]; Ibtisam Ismail Mahfouz[8];
Aseel AbdulQader Fannon[8]; Malak Ayman Mousa Qawasmi[9]; Mona Radi Mohammad Hawa[10]; Narmeen Giacaman[6]; Manar Ahmaro[6];
Rula Khader Zaatreh[11]; Wafa Aqel AbuKhalil[6]; Noor Khairi Melhim[12]; Ruba Jamal Madbouh[6]; Hala Jamal Abu Hziema[8];
Raghad Abed-Allateef Lahlooh[6]; Sara Nawaf Ubaiat[6]; Nour Ali Jaffal[6]; Reem Khaled Alawna[6]; Salsabeel Naeem Abed[8];
Bessan Nimer Ali Abuzahra[6]; Aya Jawad Abu Kwaik[13]; Mays Hafez Dodin[6]; Raghad Othman Taha[6]; Dina Mohammed Alashqar[8];
Roaa Abd-al-Fattah Mobarak[6]; Tasneem Smerat, MSc[14]; Nasser Abu-El-Noor, PhD[15]; and Bettina Bottcher, MD, PhD[8]

PURPOSE This study aimed to assess awareness of Palestinian women about breast cancer (BC) age-related and lifetime risks and its risk factors and to identify factors associated with good awareness.

MATERIALS AND METHODS Adult women were recruited from government hospitals, primary health care centers, and public spaces in 11 governorates in Palestine. Recognition of 14 BC risk factors was assessed using a translated-into-Arabic version of the validated BC awareness measure. The level of BC risk factor awareness was determined on the basis of the number of risk factors recognized: poor (0-4), fair (5-9), and good (10-14).

RESULTS Of 6,269 potential participants approached, 5,434 agreed and completed the questionnaire (response rate = 86.7%). A total of 5,257 questionnaires were included: 2,706 from the West Bank and Jerusalem and 2,551 from the Gaza Strip. Only 173 participants (3.3%) recognized the age-related risk of BC. More than one quarter (n = 1,465; 27.9%) recognized the lifetime risk of BC. The most recognized modifiable risk factor was not breastfeeding (n = 4,937; 93.9%), whereas the least recognized was having children later on in life or not at all (n = 1,755; 33.4%). The most recognized nonmodifiable risk factor was radiation exposure (n = 4,579; 87.1%), whereas the least recognized was starting the periods at an early age (n = 1,030; 19.6%). In total, 2,024 participants (38.4%) demonstrated good BC risk factor awareness. Participants from the Gaza Strip had a higher likelihood than participants from the West Bank and Jerusalem to have good awareness (42.0% v 35.2%). Age ≥ 40 years, postsecondary education, and visiting hospitals and primary health care centers were all associated with an increase in the likelihood of having good BC risk factor awareness.

CONCLUSION The awareness of BC risk factors was suboptimal. These findings highlight the need for implementing health education programs combined with consistent use of ad hoc opportunities to raise awareness by health care providers.

INTRODUCTION

Breast cancer (BC) is the most common cancer among women and the second most common cancer globally, with approximately 2.3 million cases diagnosed annually.[1] The incidence of BC has substantially increased in recent years among Arab women in the Eastern Mediterranean Region, and the incidence is expected to double by 2030.[2] In Palestine, BC is the most prevalent cancer among women, accounting for 32.0% of cancer diagnoses in the West Bank and Jerusalem (WBJ) and 18% of these in the Gaza Strip.[3] In 2018, BC was the third leading cause of cancer-related mortality in Palestine with 12.0%, after lung (20.0%) and colon cancer (13.0%).[4]

BC is highly treatable when detected early.[5] Unfortunately, more than 60.0% of BC cases in Palestine are diagnosed at later stages, reducing the chance of survival.[3] One of the contributing factors to this delayed diagnosis could be poor knowledge of the warning signs of BC and limited awareness of risk factors.[6] Lifetime risk assesses the likelihood of developing BC at any point after exposure to risk factors, regardless of when the incident occurred.[7]

Modifiable risk factors of BC include no history of breastfeeding[8]; obesity[9]; physical inactivity[10]; use of some medications, such as oral contraceptives[11]; smoking[12]; and having children later on in life or not at all.[13] By contrast, nonmodifiable risk factors include female sex,

CONTEXT

Key Objective

Breast cancer (BC) is a significant cause of cancer-related morbidity and mortality in Palestine, making it a serious public health concern. Therefore, this national study assessed the awareness of Palestinian women about BC risk factors and examined the sociodemographic factors associated with good awareness.

Knowledge Generated

The awareness of BC risk factors was relatively low, with only 38.4% of participants displaying good awareness. Living in the Gaza Strip, age ≥ 40 years, postsecondary education, and visiting hospitals and primary health care centers were all associated with good awareness.

Relevance

Poor public awareness of BC risk factors may contribute to longer delays in seeking medical advice, leading to diagnosis at advanced stages and eventually lower survival rates. Educational interventions aiming to improve BC awareness are needed and should be tailored to address the knowledge gaps among Palestinian women.

older age, early menarche, late menopause, family or personal history of BC, and radiation exposure.[14-17]

A previous study from the Gaza Strip showed low awareness of symptoms and risk factors of BC.[18] Continuous education programs can raise BC awareness, which could facilitate early diagnosis.[19] However, there is a need to evaluate the baseline knowledge among women in the Palestinian community. Therefore, this study aimed to (1) assess awareness of Palestinian women about age-related and lifetime risks of BC and its risk factors, (2) compare the awareness among women from the Gaza Strip versus the WBJ, and (3) examine the factors associated with good BC risk factor awareness.

MATERIALS AND METHODS

Study Design and Population

Detailed methods are as published.[19] Briefly, a national cross-sectional study was conducted between July 2019 and March 2020 in the two main geographical areas of Palestine: the Gaza Strip and the WBJ. Adult Palestinian women (age ≥ 18 years) were the target population. Women visiting Palestinian government hospitals; primary health care centers; and public venues, such as malls, restaurants, markets, gardens, transportation hubs, churches, and mosques, were recruited. Exclusion criteria were working or studying in a health-related field, non-Palestinian citizenship, and attending oncology departments or clinics.

Sampling Methods

Eligible women were recruited using a convenience sampling method from the specified data collecting sites at 11 governorates in Palestine. This facilitated recruitment of women from a wide variety of backgrounds to the study cohort and was intended to make it resemble the Palestinian community.[19-24]

Questionnaire and Data Collection

A modified version of the BC Awareness Measure (BCAM) was used for data collection. The BCAM is a validated questionnaire that was created to assess public awareness of BC.[25] A back-to-back translation was performed, where the original BCAM was translated into Arabic by two bilingual experts and the Arabic version was subsequently translated back into English by two additional bilingual experts. The Arabic version of the BCAM was then evaluated by five professionals in the areas of BC, public health, and survey design for content validity and translation accuracy. This was followed by running a pilot study (n = 35) to assess the clarity of the Arabic questionnaire. Cronbach's Alpha was used to examine the internal consistency of the Arabic questionnaire, which reached an acceptable value of 0.72.

The questionnaire comprised three sections. The first section described the sociodemographic factors of study participants. The second section evaluated the awareness of age-related and lifetime risks to develop BC. The third section evaluated the recognition of 14 BC risk factors on the basis of a 5-point Likert scale (1 = strongly disagree and 5 = strongly agree). Of those 14 factors, eight were adapted from the original BCAM[25] and six (not breastfeeding, long-term use of the contraceptive pill, smoking, passive smoking, consumption of fatty foods, and radiation exposure) were added as they were deemed to be important to assess the awareness of these additional factors in the Palestinian community.[22,23,26-30]

The electronic tool Kobo Toolbox, which can be used by smartphones, was used to collect data.[31] In a face-to-face interview with the data collector present, recruited women were asked to complete the questionnaire. A special training was conducted to help female data collectors, who had a medical background, learn using Kobo Toolbox, approach study participants, and facilitate the completion of the questionnaire.

Statistical Analysis

In Palestine, women are first invited to get a BC screening at the age of 40 years.[32] On the basis of this cutoff, age was divided into two categories: 18-39 years and ≥ 40 years. Menarche, the age at which periods begin, was also divided into three categories: early (under 11 years), normal (between 11 and 15

TABLE 1. Characteristics of Study Participants

Characteristic	Total (n = 5,257)	Gaza Strip (n = 2,551)	WBJ (n = 2,706)	P
Age, years, median (IQR)	31.0 (24.0-43.0)	30.0 (24.0-40.0)	33.0 (24.0-45.0)	< .001
Age group, years, No. (%)				< .001
18 to 39	3,615 (68.8)	1,859 (72.9)	1,756 (64.9)	
40 or older	1,642 (31.2)	692 (27.1)	950 (35.1)	
Menarche, No. (%)				.003
Normal (11-15 years)	4,608 (87.7)	2,237 (87.7)	2,371 (87.6)	
Early (≤ 10 years)	72 (1.4)	21 (0.8)	51 (1.9)	
Late (≥ 16 years)	577 (10.9)	293 (11.5)	284 (10.5)	
Educational level, No. (%)				.460
Secondary or below	3,030 (57.6)	1,457 (57.1)	1,573 (58.1)	
Postsecondary	2,227 (42.4)	1,094 (42.9)	1,133 (41.9)	
Occupation, No. (%)				< .001
Unemployed/housewife	3,568 (67.9)	1,868 (73.2)	1,700 (62.8)	
Employed	1,052 (20.0)	380 (14.9)	672 (24.9)	
Retired	13 (0.3)	5 (0.2)	8 (0.3)	
Student	624 (11.8)	298 (11.7)	326 (12.0)	
Monthly income ≥ 1,450 NIS, No. (%)	3,055 (58.1)	716 (28.1)	2,339 (86.4)	< .001
Marital status, No. (%)				< .001
Single	1,301 (24.8)	626 (24.5)	675 (24.9)	
Married	3,658 (69.6)	1,812 (71.0)	1,846 (68.2)	
Divorced/widowed	298 (5.6)	113 (4.5)	185 (6.9)	
Having a chronic disease, No. (%)	1,058 (20.1)	397 (15.6)	661 (24.4)	< .001
Knowing someone with cancer, No. (%)	2,520 (47.9)	1,083 (42.5)	1,437 (53.1)	< .001
Site of data collection, No. (%)				< .001
Public spaces	1,821 (34.6)	809 (31.7)	1,012 (37.4)	
Hospitals	2,116 (40.3)	919 (36.0)	1,197 (44.2)	
Primary health care centers	1,320 (25.1)	823 (32.3)	497 (18.4)	

Abbreviations: IQR, interquartile range; NIS, New Israeli Shekel; WBJ, West Bank and Jerusalem.

years), and late (beyond 16 years).[33] Since 1,450 New Israeli Shekel (NIS) (about $450 US dollars) was the minimum wage of Palestinian employees,[34] it was chosen to categorize monthly income into two categories: < 1,450 and ≥ 1450 NIS.

The median (interquartile range) was used to describe continuous, non-normally distributed variables, and the Kruskal-Wallis test was used for baseline comparisons. Frequencies and percentages were used to describe categorical variables, and Pearson's chi-square test was used for baseline comparisons.

On the basis of the original BCAM,[25] a 70-year-old woman and one in eight women were considered as correct answers for age-related and lifetime risks of BC, respectively. Recognition of both the age-related and lifetime risks was described using frequencies and percentages. Bi- and multivariable logistic regression analyses were used to test the association between participant characteristics and recognition of the age-related and lifetime risks of BC.

Responses with strongly agree and agree were considered correct for questions on the basis of a 5-point Likert scale, whereas those with strongly disagree, disagree, and not sure were considered incorrect. BC risk factors were categorized into two main categories: modifiable and nonmodifiable risk factors. Frequencies and percentages were used to describe the recognition of each BC risk factor with comparisons performed using Pearson's chi-square test. This was followed by running bi- and multivariable logistic regression analyses to examine the association between recognizing each BC risk factor and participant characteristics.

To assess the awareness of BC risk factors, a scoring system was used. A similar scoring system was also used in previous studies.[19-24,35] One point was given for each correctly recognized BC risk factor. The total score (ranging from 0 to 14) was then calculated and categorized into three categories on the basis of the number of BC risk factors recognized: poor (0-4), fair (5-9), and good (10-14).

TABLE 2. Multivariable Logistic Regression Analyzing the Association Between Recognizing Each of the Age-Related and Lifetime Risks of Breast Cancer and Participant Characteristics

Characteristic	Age-Related Risk[a]		Lifetime Risk[b]	
	AOR (95% CI)[c]	P	AOR (95% CI)[c]	P
Age group, years				
18-39	Ref	Ref	Ref	Ref
40 or older	1.27 (0.86 to 1.88)	.240	1.18 (1.00 to 1.38)	.048
Menarche				
Normal (11-15 years)	Ref	Ref	Ref	Ref
Early (≤ 10 years)	1.43 (0.48 to 4.25)	.520	1.14 (0.67 to 1.93)	.630
Late (≥ 16 years)	1.12 (0.70 to 1.79)	.640	0.83 (0.68 to 1.02)	.080
Educational level				
Secondary or below	Ref	Ref	Ref	Ref
Postsecondary	0.97 (0 .67 to 1.40)	.880	1.49 (1.29 to 1.72)	< .001
Occupation				
Unemployed/housewife	Ref	Ref	Ref	Ref
Employed	1.73 (1.12 to 2.65)	.013	1.08 (0.91 to 1.29)	.370
Retired	1.27 (0.07 to 22.05)	.870	1.25 (0.40 to 3.91)	.710
Student	2.48 (1.41 to 4.35)	.002	1.46 (1.16 to 1.85)	.002
Monthly income				
< 1,450 NIS	Ref	Ref	Ref	Ref
≥ 1,450 NIS	0.88 (0.58 to 1.31)	.520	1.23 (1.05 to 1.45)	.011
Marital status				
Single	Ref	Ref	Ref	Ref
Married	0.93 (0.60 to 1.46)	.760	0.94 (0.79 to 1.13)	.520
Divorced/widowed	0.93 (0.44 to 1.99)	.850	0.72 (0.51 to 1.00)	.051
Residency				
Gaza strip	Ref	Ref	Ref	Ref
WBJ	1.24 (0.84 to 1.84)	.270	0.58 (0.50 to 0.68)	< .001
Having a chronic disease				
No	Ref	Ref	Ref	Ref
Yes	1.04 (0.68 to 1.59)	.860	0.87 (0.73 to 1.04)	.130
Knowing someone with cancer				
No	Ref	Ref	Ref	Ref
Yes	0.69 (0.51 to 0.95)	.023	1.32 (1.16 to 1.49)	< .001
Site of data collection				
Public spaces	Ref	Ref	Ref	Ref
Hospitals	1.73 (1.17 to 2.53)	.005	1.20 (1.03 to 1.40)	.019
Primary health care centers	1.30 (0.83 to 2.03)	.250	1.33 (1.12 to 1.57)	.001

Abbreviations: AOR, adjusted odds ratio; NIS, New Israeli Shekel; WBJ, West Bank and Jerusalem.

[a]The correct answer was "A 70-year-old woman," and all other answers were considered incorrect.

[b]The correct answer was "one in eight women," and all other answers were considered incorrect.

[c]Adjusted for age group, menarche, educational level, occupation, monthly income, marital status, residency, having a chronic disease, knowing someone with cancer, and site of data collection.

Comparisons in BC risk factor awareness level between the Gaza Strip versus the WBJ were performed using Pearson's chi-square test. This was followed by running bi- and multivariable logistic regression analyses to test the association between having a good awareness level of BC risk factors and participant characteristics.

All multivariable logistic regression analyses were adjusted for age group, menarche, education, occupation, monthly income, place of residence, marital status, having a chronic disease, knowing someone with cancer, and site of data collection. This model was determined a priori on the basis of previous studies.[18,19,36-41] Results of the bivariable logistic regression analyses are provided in Appendix Tables A1-A4.

Missing data occurred completely at random and were handled using a complete case analysis approach. Data were analyzed using Stata software version 16.0 (Stata-Corp, College Station, TX).

Ethical Considerations

This study was approved by the ministry of health's Helsinki Committee in the Gaza Strip, which reviews and approves human studies. In addition, this study was approved by the Palestinian MOH's Human Resources Development department and the Islamic University of Gaza University's Ethics Committee. Before beginning the interview, study participants provided written informed consent. All participants received a thorough explanation of the study before starting the interview, with the emphasis on the fact that participation was entirely voluntary and would not have any impact on the medical care that they would receive. Data confidentiality was maintained throughout the study.

RESULTS

Participant Characteristics

Of 6,269 potential participants approached, 5,434 agreed and completed the questionnaire (response rate = 86.7%). A total of 5,257 questionnaires were included in the final analysis (164 had missing data, and 13 did not meet inclusion criteria). Of those 5,257 participants, 2,706 were from the WBJ and 2,551 were from the Gaza Strip. Among all participants, the median age (interquartile range) for was 31.0 years (24.0-43.0 years; Table 1). Participants from the Gaza Strip were younger and had lower monthly income, but suffered from fewer comorbidities than participants from the WBJ. These sociodemographic data are similar to those presented in Table 1 in another study by our group.[19]

Recognition of Age-Related and Lifetime Risks of BC

Only 173 participants (3.3%) recognized the age-related risk of BC. Employees, students, and participants recruited from hospitals were more likely to recognize the age-related risk of BC (Table 2). Conversely, participants who knew someone with cancer were less likely to recognize the age-related risk of BC.

More than one quarter (n = 1,465; 27.9%) recognized the lifetime risk of BC. Participants from the WBJ were less likely than participants from the Gaza Strip to recognize the lifetime risk of BC. By contrast, participants who completed postsecondary education, had a higher monthly income, knew someone with cancer, and visited hospitals or primary health care centers were more likely to recognize the lifetime risk of BC.

Recognition of BC Risk Factors

Among all participants, the most recognized modifiable BC risk factor was not breastfeeding (n = 4,937; 93.9%) followed by not doing 30 minutes of moderate physical activity 5 times a week (n = 4,851; 92.3%; Table 3). The least recognized modifiable BC risk factors were having children later on in life or not at all (n = 1,755; 33.4%) and being overweight (n = 2,420; 46.0%). The most recognized nonmodifiable BC risk factor was radiation exposure (n = 4,579; 87.1%) followed by having a history of BC (n = 4,227; 80.4%). The least recognized nonmodifiable BC risk factors were starting the periods at an early age (n = 1,030; 19.6%) and having a late menopause (n = 1,346; 25.6%). Trends to recognize both modifiable and nonmodifiable BC risk factors were similar in the Gaza Strip and the WBJ.

Good BC Risk Factor Awareness and Its Associated Factors

In total, 2024 participants (38.4%) demonstrated good BC risk factor awareness (Table 4). Participants from the Gaza Strip had a higher likelihood than participants from the WBJ to have good awareness (42.0% v 35.2%). In the multivariable analysis, age ≥ 40 years, postsecondary education, and visiting governmental hospitals and primary health care centers were all associated with an increase in the likelihood of having good BC risk factor awareness (Table 5). On the other hand, having late menarche and living in the WBJ were associated with a decrease in the likelihood of having good awareness.

Association Between Recognizing Modifiable BC Risk Factors and Participant Characteristics

In the multivariable analysis, participants recruited from hospitals and primary health care centers were more likely to recognize eight and seven risk factors, respectively, of nine modifiable BC risk factors (Table 6). In addition, participants who completed postsecondary education were more likely to recognize four of the nine modifiable BC risk factors.

On the contrary, participants from the WBJ were less likely to recognize six of the nine modifiable BC risk factors. Married women were less likely to recognize being overweight (odds ratio [OR], 0.84; 95% CI, 0.71 to 0.99) and having children later on in life or not at all (OR, 0.81; 95% CI, 0.68 to 0.96).

Association Between Recognizing Nonmodifiable BC Risk Factors and Participant Characteristics

Participants recruited from hospitals had a higher likelihood to recognize all nonmodifiable BC risk factors (Table 7). Furthermore, participants recruited from primary health care centers were more likely to recognize four of the five nonmodifiable BC risk factors. Participants who completed postsecondary education or had a higher monthly income were more likely to recognize three of the five nonmodifiable BC risk factors. By contrast, participants from the WBJ were

TABLE 3. Recognition of Breast Cancer Risk Factors Among Study Participants

Risk Factor	Total (n = 5,257) No. (%)	Gaza Strip (n = 2,551) No. (%)	WBJ (n = 2,706) No. (%)	P
Modifiable risk factors				
Not breastfeeding	4,937 (93.9)	2,423 (95.0)	2,514 (92.9)	.002
Not doing 30 minutes of moderate physical activity five times a week	4,851 (92.3)	2,370 (92.9)	2,481 (91.7)	.100
Smoking	4,145 (78.8)	2,042 (80.0)	2,103 (77.7)	.039
Passive smoking	3,342 (63.6)	1,648 (64.6)	1,694 (62.6)	.130
Consumption of fatty foods	3,291 (62.6)	1,627 (63.8)	1,664 (61.5)	.090
Long-term use of the contraceptive pill	2,920 (55.5)	1,503 (58.9)	1,417 (52.4)	< .001
Using hormone replacement therapy	2,872 (54.6)	1,408 (55.2)	1,464 (54.1)	.430
Being overweight	2,420 (46.0)	1,254 (49.2)	1,166 (43.1)	< .001
Having children later on in life or not at all	1,755 (33.4)	964 (37.8)	791 (29.2)	< .001
Nonmodifiable risk factors				
Radiation exposure	4,579 (87.1)	2,167 (84.9)	2,412 (89.1)	< .001
Having a history of BC	4,227 (80.4)	2,091 (82.0)	2,136 (78.9)	.006
Having a close relative with BC	3,687 (70.1)	1,749 (68.6)	1,938 (71.6)	.015
Having a late menopause	1,346 (25.6)	672 (26.3)	674 (24.9)	.230
Starting the periods at an early age	1,030 (19.6)	559 (21.9)	471 (17.4)	< .001

Abbreviations: BC, breast cancer; WBJ, West Bank and Jerusalem.

less likely than participants from the Gaza Strip to recognize having a history of BC (OR, 0.63; 95% CI, 0.52 to 0.75) and starting the periods at an early age (OR, 0.75; 95% CI, 0.63 to 0.89).

DISCUSSION

The recognition of age-related and lifetime risks of developing BC was poor in this study, with 3.3% and 27.9% of the participants recognizing them correctly, respectively. Awareness of BC risk factors was also low, with only 38.4% of the participants having good awareness. Compared with participants from the WBJ, participants from the Gaza Strip were more likely to demonstrate good BC risk factor awareness. Age 40 years or older, postsecondary education, and visiting hospitals and primary health care centers were all associated with good BC risk factor awareness. Not breastfeeding and not doing physical activity were the most recognized modifiable risk factors, whereas having children later on in life was the least recognized.

In line with a previous study from the Gaza Strip,[18] Palestinian women displayed poor awareness of greater risk of

TABLE 4. Awareness Level of Breast Cancer Risk Factors Among Study Participants

Level	Total (N = 5,257) No. (%)	Gaza Strip (n = 2,551) No. (%)	WBJ (n = 2,706) No. (%)	P
Poor	339 (6.5)	167 (6.5)	172 (6.4)	< .001
Fair	2,894 (55.1)	1,313 (51.5)	1,581 (58.4)	
Good	2,024 (38.4)	1,071 (42.0)	953 (35.2)	

Abbreviation: WBJ, West Bank and Jerusalem.

BC with increased age in this study. However, lifetime risk for women to get BC was recognized by a larger proportion in both studies with 42.6% in the previous study and only 27.6% in this study.[18] Poor awareness of age-related and lifetime risks of BC, as in this study, appears to be a global finding in low-income and high-income settings although awareness was shown to be consistently lower in the former.[36,42-45] Regular awareness campaigns and organized BC screening systems in high-income countries could be contributing factors to this difference. Interestingly, older women, who indicated a higher level of risk awareness, rarely perceived age as a risk factor. Furthermore, older age groups showed lower cancer awareness.[46] Future educational interventions should be targeting this knowledge gap among older women.

In line with a previous study,[47] not breastfeeding was the most recognized modifiable BC risk factor in this study. It appears that women are more aware of breastfeeding as a protective factor for BC than other factors. Globally, many initiatives have promoted breastfeeding and included education on the benefits of breastfeeding, which could have contributed to the knowledge acquisition by women on this issue.[48] This demonstrates the potential impact on awareness by education campaigns and contact with health care professionals, which could be a powerful tool for improving health literacy.[49]

Around 92.0% of the study participants believed that physical inactivity was a risk factor for the development of BC, which was a substantially higher percentage than the 75.0% reported by Lahart et al[50] from the United Kingdom. However, despite this knowledge, 57.8% of Palestinians

TABLE 5. The Association Between Having a Good Awareness of Breast Cancer Risk Factors and Participant Characteristics

Characteristic	Good Awareness			
	COR (95% CI)	P	AOR (95% CI)[a]	P
Age group, years				
18-39	Ref	Ref	Ref	Ref
40 or older	1.12 (0.99 to 1.26)	.070	1.19 (1.024 to 1.37)	.023
Menarche				
Normal (11-15 years)	Ref	Ref	Ref	Ref
Early (≤ 10 years)	1.49 (0.93 to 2.37)	.100	1.61 (1.00 to 2.59)	.051
Late (≥ 16 years)	0.81 (0.67 to 0.97)	.022	0.80 (0.66 to 0.96)	.019
Educational level				
Secondary or below	Ref	Ref	Ref	Ref
Postsecondary	1.21 (1.09 to 1.36)	.001	1.37 (1.20 to 1.58)	< .001
Occupation				
Unemployed/housewife	Ref	Ref	Ref	Ref
Employed	0.99 (0.86 to 1.14)	.910	1.08 (0.91 to 1.27)	.380
Retired	1.35 (0.45 to 4.03)	.590	0.94 (0.31 to 2.86)	.910
Student	0.91 (0.76 to 1.08)	.290	1.17 (0.93 to 1.47)	.190
Monthly income				
< 1,450 NIS	Ref	Ref	Ref	Ref
≥ 1,450 NIS	0.93 (0.83 to 1.04)	.220	0.10 (0.95 to 1.28)	.220
Marital status				
Single	Ref	Ref	Ref	Ref
Married	1.16 (1.01 to 1.32)	.031	1.00 (0.84 to 1.18)	.970
Divorced/widowed	1.13 (0.88 to 1.47)	.340	1.07 (0.80 to 1.44)	.650
Residency				
Gaza strip	Ref	Ref	Ref	Ref
WBJ	0.75 (0.67 to 0.84)	< .001	0.73 (0.63 to 0.85)	< .001
Having a chronic disease				
No	Ref	Ref	Ref	Ref
Yes	1.05 (0.92 to 1.21)	.450	1.06 (0.90 to 1.24)	.500
Knowing someone with cancer				
No	Ref	Ref	Ref	Ref
Yes	0.88 (0.79 to 0.99)	.030	0.96 (0.86 to 1.08)	.540
Site of data collection				
Public spaces	Ref	Ref	Ref	Ref
Hospitals	1.89 (1.65 to 2.16)	< .001	2.07 (1.79 to 2.39)	< .001
Primary health care centers	2.42 (2.09 to 2.81)	< .001	2.52 (2.15 to 2.95)	< .001

Abbreviations: AOR, adjusted odds ratio; COR, crude odds ratio; NIS, New Israeli Shekel; WBJ, West Bank and Jerusalem.

[a]Adjusted for age group, menarche, educational level, occupation, monthly income, marital status, residency, having a chronic disease, knowing someone with cancer, and site of data collection.

are overweight and this might be an average percentage in the international context.[51] This demonstrates that awareness and knowledge of risk factors alone do not necessarily translate into adoption of healthier lifestyles. Therefore, increased awareness might need to be coupled with effective public health strategies to promote the adoption of healthy lifestyles for greatest impact on reduction of disease burden.

Good awareness of the risk factors of BC is the essence of primary prevention as it might empower women to make healthy lifestyle choices.[18] Although nonmodifiable risk factors such as female sex, advanced age, and genetic

TABLE 6. Multivariable Logistic Regression Analyzing the Association Between Recognizing the Modifiable Risk Factors for Breast Cancer and Participant Characteristics

Characteristic	Not Breastfeeding AOR (95% CI)[a]	P	Not Doing 30 Minutes of Moderate Physical Activity Five Times a Week AOR (95% CI)[a]	P	Smoking AOR (95% CI)[a]	P	Passive Smoking AOR (95% CI)[a]	P	Consumption of Fatty Foods AOR (95% CI)[a]	P
Age group, years										
18-39	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
40 or older	1.46 (1.05 to 2.03)	.025	1.22 (0.93 to 1.61)	.150	0.87 (0.73 to 1.03)	.110	1.08 (0.93 to 1.25)	.320	1.13 (0.97 to 1.30)	.110
Menarche										
Normal (11-15 years)	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Early (≤ 10 years)	1.60 (0.49 to 5.18)	.440	0.57 (0.28 to 1.16)	.120	1.43 (0.76 to 2.68)	.270	2.09 (1.19 to 3.67)	.010	1.04 (0.64 to 1.70)	.860
Late (≥ 16 years)	1.00 (0.69 to 1.44)	1.000	0.68 (0.51 to 0.91)	.009	0.95 (0.77 to 1.18)	.650	0.95 (0.79 to 1.13)	.560	0.86 (0.72 to 1.02)	.090
Educational level										
Secondary or below	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Postsecondary	1.57 (1.19 to 2.06)	.001	1.19 (0.93 to 1.52)	.170	1.13 (0.96 to 1.33)	.140	1.17 (1.02 to 1.33)	.027	0.98 (0.86 to 1.12)	.750
Occupation										
Unemployed/housewife	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Employed	0.59 (0.43 to 0.80)	.001	1.01 (0.75 to 1.37)	.930	0.95 (0.78 to 1.15)	.600	1.04 (0.88 to 1.22)	.680	1.04 (0.88 to 1.23)	.640
Retired	0.33 (0.04 to 2.63)	.290	0.34 (0.07 to 1.60)	.170	1.33 (0.29 to 6.11)	.720	1.61 (0.44 to 5.97)	.470	0.57 (0.19 to 1.72)	.320
Student	0.83 (0.56 to 1.24)	.360	0.91 (0.62 to 1.33)	.610	1.35 (1.03 to 1.76)	.028	1.28 (1.02 to 1.61)	.034	1.02 (0.81 to 1.27)	.890
Monthly income										
< 1,450 NIS	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
≥ 1,450 NIS	1.14 (0.84 to 1.54)	.410	1.16 (0.88 to 1.52)	.300	1.10 (0.92 to 1.32)	.290	0.93 (0.80 to 1.08)	.330	0.99 (0.85 to 1.15)	.860
Marital status										
Single	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Married	2.38 (1.76 to 3.21)	< .001	1.19 (0.88 to 1.60)	.250	1.33 (1.10 to 1.61)	.004	1.12 (0.95 to 1.33)	.170	1.16 (0.99 to 1.37)	.070
Divorced/widowed	1.86 (1.06 to 3.25)	.029	0.82 (0.51 to 1.33)	.430	1.25 (0.90 to 1.74)	.180	1.09 (0.82 to 1.46)	.550	1.11 (0.83 to 1.48)	.480
Residency										
Gaza strip	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
WBJ	0.66 (0.49 to 0.89)	.006	0.76 (0.58 to 0.99)	.040	0.88 (0.74 to 1.05)	.150	1.00 (0.86 to 1.15)	.980	0.93 (0.80 to 1.07)	.310
Having a chronic disease										
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	0.83 (0.59 to 1.16)	.280	0.90 (0.67 to 1.21)	.490	1.09 (0.90 to 1.31)	.380	1.06 (0.90 to 1.25)	.470	1.08 (0.92 to 1.28)	.320
Knowing someone with cancer										
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref

(Continued on following page)

TABLE 6. Multivariable Logistic Regression Analyzing the Association Between Recognizing the Modifiable Risk Factors for Breast Cancer and Participant Characteristics (Continued)

Characteristic	Not Breastfeeding		Not Doing 30 Minutes of Moderate Physical Activity Five Times a Week		Smoking		Passive Smoking		Consumption of Fatty Foods	
	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P
Yes	1.21 (0.95 to 1.53)	.120	1.14 (0.93 to 1.41)	.210	0.98 (0.85 to 1.12)	.760	0.95 (0.85 to 1.06)	.370	1.09 (0.97 to 1.23)	.130
Site of data collection										
Public spaces	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Hospitals	1.29 (0.97 to 1.72)	.080	1.46 (1.13 to 1.88)	.004	1.41 (1.20 to 1.66)	< .001	1.29 (1.12 to 1.48)	< .001	1.30 (1.13 to 1.49)	< .001
Primary health care centers	1.02 (0.75 to 1.40)	.900	1.12 (0.85 to 1.47)	.420	1.97 (1.63 to 2.39)	< .001	1.77 (1.51 to 2.08)	< .001	1.63 (1.39 to 1.91)	< .001

Characteristic	Long-Term Use of Contraceptive Pill		Using Hormone Replacement Therapy		Being Overweight		Having Children Later on in Life or Not at all	
	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P
Age group, years								
18-39	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
40 or older	1.26 (1.09 to 1.45)	.002	1.25 (1.08 to 1.44)	.002	1.08 (0.94 to 1.25)	.270	0.99 (0.85 to 1.15)	.880
Menarche								
Normal (11-15 years)	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Early (≤ 10 years)	1.20 (0.74 to 1.93)	.470	1.54 (0.94 to 2.53)	.070	1.14 (0.71 to 1.83)	.580	1.43 (0.88 to 2.33)	.140
Late (≥ 16 years)	0.80 (0.67 to 0.96)	.015	0.83 (0.70 to 0.99)	.037	1.05 (0.88 to 1.25)	.620	0.88 (0.73 to 1.07)	.200
Educational level								
Secondary or below	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Postsecondary	1.19 (1.05 to 1.36)	.009	1.40 (1.23 to 1.60)	< .001	1.06 (0.93 to 1.21)	.420	0.98 (0.85 to 1.13)	.790
Occupation								
Unemployed/housewife	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Employed	1.02 (0.86 to 1.19)	.850	1.18 (1.00 to 1.39)	.041	1.06 (0.90 to 1.25)	.460	1.03 (0.87 to 1.23)	.710
Retired	1.19 (0.36 to 3.93)	.770	1.64 (0.45 to 6.05)	.460	0.62 (0.20 to 1.95)	.420	0.92 (0.28 to 3.07)	.890
Student	1.10 (0.89 to 1.38)	.380	1.18 (0.94 to 1.47)	.150	0.99 (0.79 to 1.24)	.930	1.18 (0.93 to 1.49)	.170
Monthly income								
< 1,450 NIS	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
≥ 1,450 NIS	1.11 (0.96 to 1.29)	.160	1.21 (1.04 to 1.40)	.012	1.03 (0.89 to 1.19)	.720	0.94 (0.81 to 1.10)	.440
Marital status								
Single	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Married	1.11 (0.94 to 1.31)	.220	1.04 (0.89 to 1.23)	.610	0.84 (0.71 to 0.99)	.042	0.81 (0.68 to 0.96)	.015
Divorced/widowed	1.05 (0.79 to 1.40)	.720	1.02 (0.77 to 1.36)	.870	1.13 (0.85 to 1.49)	.400	1.17 (0.87 to 1.57)	.290

(Continued on following page)

TABLE 6. Multivariable Logistic Regression Analyzing the Association Between Recognizing the Modifiable Risk Factors for Breast Cancer and Participant Characteristics (Continued)

Characteristic	Long-Term Use of Contraceptive Pill		Using Hormone Replacement Therapy		Being Overweight		Having Children Later on in Life or Not at all	
	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P
Residency								
Gaza strip	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
WBJ	0.71 (0.62 to 0.82)	< .001	0.84 (0.73 to 0.96)	.014	0.81 (0.70 to .93)	.003	0.72 (0.62 to 0.84)	< .001
Having a chronic disease								
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1.18 (1.00 to 1.38)	.044	1.23 (1.05 to 1.43)	.011	1.23 (1.06 to 1.44)	.008	0.98 (0.83 to 1.16)	.800
Knowing someone with cancer								
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1.07 (0.96 to 1.20)	.230	1.03 (0.92 to 1.16)	.550	0.84 (0.75 to 0.94)	.003	0.90 (0.80 to 1.02)	.090
Site of data collection								
Public spaces	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Hospitals	1.29 (1.12 to 1.47)	< .001	1.50 (1.31 to 1.72)	< .001	1.47 (1.28 to 1.69)	< .001	1.84 (1.58 to 2.13)	< .001
Primary health care centers	1.48 (1.27 to 1.72)	< .001	1.66 (1.43 to 1.94)	< .001	2.07 (1.77 to 2.41)	< .001	1.85 (1.57 to 2.18)	< .001

Abbreviations: AOR, adjusted odds ratio; NIS, New Israeli Shekel; WBJ, West Bank and Jerusalem.

[a]Adjusted for age group, menarche, educational level, occupation, monthly income, marital status, residency, having a chronic disease, knowing someone with cancer, and site of data collection.

TABLE 7. Multivariable Logistic Regression Analyzing the Association Between Recognizing the Nonmodifiable Risk Factors for Breast Cancer and Participant Characteristics

Characteristic	Radiation Exposure		Having a History of BC		Having a Close Relative With BC		Having a Late Menopause		Starting the Periods at an Early Age	
	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P	AOR (95% CI)[a]	P
Age group, years										
18-39	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
40 or older	1.08 (0.88 to 1.34)	.450	1.01 (0.84 to 1.20)	.940	1.13 (0.97 to 1.32)	.120	0.78 (0.66 to 0.92)	.003	1.31 (1.09 to 1.56)	.003
Menarche										
Normal (11-15 years)	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Early (≤ 10 years)	1.12 (0.53 to 2.38)	.760	0.96 (0.54 to 1.73)	.900	1.37 (0.79 to 2.40)	.260	0.86 (0.49 to 1.51)	.590	1.89 (1.13 to 3.16)	.016
Late (≥ 16 years)	0.76 (0.59 to 0.96)	.024	0.78 (0.63 to 0.97)	.023	0.80 (0.66 to 0.96)	.017	1.00 (0.82 to 1.23)	.970	0.84 (0.67 to 1.06)	.140
Educational level										
Secondary or below	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Postsecondary	2.12 (1.72 to 2.60)	< .001	1.62 (1.37 to 1.92)	< .001	1.60 (1.39 to 1.86)	< .001	1.07 (0.92 to 1.24)	.400	1.11 (0.94 to 1.31)	.220
Occupation										
Unemployed/housewife	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Employed	1.00 (0.78 to 1.29)	.990	1.02 (0.82 to 1.25)	.890	1.15 (0.96 to 1.38)	.140	1.05 (0.87 to 1.26)	.610	1.25 (1.02 to 1.53)	.029
Retired	0.74 (0.09 to 5.84)	.770	1.87 (0.24 to 14.7)	.550	2.91 (0.37 to 22.67)	.310	3.71 (1.22 to 1.27)	.021	0.28 (0.04 to 2.15)	.220
Student	1.18 (0.84 to 1.66)	.330	1.13 (0.85 to 1.49)	.410	0.93 (0.73 to 1.18)	.560	1.07 (0.83 to 1.37)	.600	1.30 (0.99 to 1.71)	.060
Monthly income										
< 1,450 NIS	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
≥ 1,450 NIS	1.68 (1.35 to 2.09)	< .001	1.39 (1.15 to 1.67)	.001	1.44 (1.23 to 1.69)	< .001	1.07 (0.91 to 1.27)	.410	0.98 (0.82 to 1.18)	.850
Marital status										
Single	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Married	1.17 (0.92 to 1.50)	.200	1.18 (0.96 to 1.45)	.110	1.07 (0.89 to 1.28)	.460	0.84 (0.70 to 1.01)	.060	0.72 (0.58 to 0.88)	.001
Divorced/widowed	0.98 (0.66 to 1.46)	.930	1.07 (0.76 to 1.51)	.690	0.83 (0.62 to 1.12)	.230	0.74 (0.53 to 1.03)	.070	0.81 (0.57 to 1.15)	.250
Residency										
Gaza strip	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
WBJ	1.05 (0.84 to 1.30)	.670	0.63 (0.52 to 0.75)	< .001	0.94 (0.80 to 1.10)	.420	0.94 (0.80 to 1.10)	.420	0.75 (0.63 to 0.89)	.001
Having a chronic disease										
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1.31 (1.03 to 1.66)	.027	0.88 (0.72 to 1.07)	.190	1.06 (0.89 to 1.25)	.540	1.15 (0.96 to 1.37)	.130	1.09 (0.90 to 1.33)	.360
Knowing someone with cancer										
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1.13 (0.95 to 1.34)	.160	1.46 (1.27 to 1.69)	< .001	1.27 (1.12 to 1.43)	< .001	1.02 (0.90 to 1.16)	.730	0.85 (0.74 to 0.98)	.027
Site of data collection										
Public spaces	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Hospitals	1.30 (1.07 to 1.59)	.010	1.73 (1.45 to 2.06)	< .001	1.26 (1.09 to 1.46)	.002	1.49 (1.27 to 1.75)	< .001	2.10 (1.75 to 2.52)	< .001
Primary health care centers	1.35 (1.07 to 1.69)	.010	1.02 (0.85 to 1.23)	.830	1.70 (1.44 to 2.02)	< .001	1.77 (1.49 to 2.11)	< .001	2.08 (1.71 to 2.54)	< .001

Abbreviations: AOR, adjusted odds ratio; BC, breast cancer; NIS, New Israeli Shekel; WBJ, West Bank and Jerusalem.

[a]Adjusted for age group, menarche, educational level, occupation, monthly income, marital status, residency, having a chronic disease, knowing someone with cancer, and site of data collection.

factors retain the greatest impact on BC prevalence and mortality, the control of modifiable risk factors, such as obesity, smoking, and lack of regular exercise, can also reduce prevalence and, thus, BC mortality. It has been estimated that with the control of all modifiable risk factors, a reduction of at most 30% in BC risk could be achieved.[52-54] In the absence of organized screening programs, delayed BC diagnosis, and lack of access to effective treatment options, as in Palestine, risk factor reduction might be one way of reducing BC mortality.[55-57] Therefore, good BC risk factor awareness may still play a significant role in reducing BC prevalence and mortality, particularly in low- and middle-income countries like Palestine. This study showed low awareness with only 38.4% of participants displaying good BC risk factor awareness, which is consistent with data from other low- and middle-income countries (such as India[47] and Nigeria[58]) and high-income countries (such as Iran[59] and Saudi Arabia[60]). The greatest risk factor, advanced age, was only recognized by 3.3% in this study, compared with 14.0% in the United Kingdom and up to 38.0% in Sweden.[61] In concordance with a previous study,[43] older women and those with higher education were more likely to have good BC risk factor awareness. Furthermore, the BC risk factor awareness was significantly greater among women visiting hospitals and primary health care centers, highlighting the important role of health care practitioners in forming patients' health literacy.

Women living in the Gaza Strip were more likely than those living in the WBJ to have good BC risk factor awareness (42.0% v 35.2%). This difference might be compounded by the fact that the WBJ has checkpoints and restrictions on internal mobility, even between cities, making it difficult to reach health care facilities.[57] Another explanation could be the number of women living in rural regions, where the WBJ has a higher proportion, who might have limited access to health care facilities.[62] Health care staff serves as a direct source of medical information to the public.[63] Therefore, it might be more difficult to gain this knowledge for women who are not exposed to health care staff.[64] Furthermore, the higher rate of unemployment among women from the Gaza Strip versus the WBJ (63.7% v 25.8%) could also contribute to the knowledge difference.[65] This may give more opportunities for women from the Gaza Strip to search and read the internet and other sources to enrich their knowledge about different health-related issues including BC.

The low level of awareness of BC risk factors in the Palestinian society provides new opportunities to introduce collaborations among different national and international BC awareness campaigns. Such health education programs may improve the utilization of screening services across Palestine. This could be facilitated by incorporating BC symptom awareness in these programs. Women eligible for BC screening were found to be more likely to recognize BC symptoms.[19] This may drive these women to undergo BC screening, which will eventually lead to an increase in the rates of BC early detection. Our group has also found a significant association between higher recognition of BC symptoms and an earlier seeking for medical advice for a possible BC symptom (unpublished data). All this highlights the importance of establishing these integrated educational programs. Targeting communities with less educational opportunities and remote areas with little access to health care services should also be considered. Furthermore, extending the use of opportunistic health education delivered by health care professionals could improve awareness in the general population. Exploration of possible knowledge gaps and beliefs toward BC risk factors and screening among health care staff could be the basis for facility-based staff training and, thus, effective delivery of health education.

The main strength of this study is the community-based approach covering a wide geographical area of Palestine and reaching various communities. In addition, the large sample size and the high response rate facilitated a broad representation of the Palestinian population. This might have mitigated the limitation of using convenience sampling but does not guarantee the generalizability of the study findings to all women in Palestine. Another limitation could be the exclusion of patients or visitors to the oncology departments and those with medical backgrounds, which might have possibly reduced the number of participants with a presumably good awareness. However, their exclusion was meant to make this study more relevant as an assessment of the public awareness of BC.

In conclusion, the overall awareness of BC risk factors in the current study was suboptimal, with only 38.4% of the participants having good knowledge. In addition, only 3.3% of participants were aware of the age-related risk of getting BC, and about one quarter was aware of the lifetime risk of BC. These findings reinforce the continuing need for more BC risk factor awareness through conducting health education programs. Furthermore, effective programs for improving the health literacy of Palestinian women could include the equipment of health care professionals with knowledge and tools to inform women as contact with health care professionals appeared to have a positive impact on women's BC awareness.

AFFILIATIONS
[1]Division of Surgical Oncology, Department of Surgery, University Hospitals Cleveland Medical Center, Cleveland, OH
[2]Ministry of Health, Gaza, Palestine
[3]Department of Medical Laboratory Sciences, Faculty of Health Sciences, Islamic University of Gaza, Gaza City, Palestine
[4]Almakassed Hospital, Jerusalem, Palestine
[5]Al-Shifa Hospital, Gaza, Palestine
[6]Faculty of Medicine, Al-Quds University, Palestine

[7]Faculty of Medicine, Al Azhar University-Gaza, Gaza, Palestine
[8]Faculty of Medicine, Islamic University of Gaza, Gaza, Palestine
[9]Department of Medical Laboratory Sciences, Hebron University, Hebron, Palestine
[10]Tulkarem Governmental Hospital, Tulkarem, Palestine
[11]Caritas Baby Hospital, Bethlehem, Palestine
[12]Department of Pharmacy, An-Najah National University, Nablus, Palestine
[13]Faculty of Dentistry, Al-Quds University, Jerusalem, Palestine
[14]Faculty of Medicine and Health Sciences, Palestine Polytechnic University, Hebron, Palestine
[15]Faculty of Nursing, Islamic University of Gaza, Gaza, Palestine

CORRESPONDING AUTHOR

Mohamedraed Elshami, MD, MMSc, Division of Surgical Oncology, Department of Surgery, University Hospitals Cleveland Medical Center, 11100 Euclid Ave, Cleveland, OH 44106; Twitter: @MElshamiMD; e-mail: mohamedraed.elshami@gmail.com.

EQUAL CONTRIBUTION

M.E. and F.D.U. contributed equally as first coauthors to this work. N.A.-E.-N. and B.B. contributed equally as senior coauthors to this work.

AUTHOR CONTRIBUTIONS

Conception and design: Mohamedraed Elshami, Mohammed Alser, Ibrahim Al-Slaibi, Nasser Abu-El-Noor, Bettina Bottcher
Administrative support: Mohamedraed Elshami, Mohammed Alser, Ibrahim Al-Slaibi
Provision of study materials or patients: Mohamedraed Elshami, Mohammed Alser, Ibrahim Al-Slaibi
Collection and assembly of data: Mohamedraed Elshami, Faten Darwish Usrof, Mohammed Alser, Ibrahim Al-Slaibi, Heba Mahmoud Okshiya, Roba Jamal Ghithan, Nouran Ramzi Shaban Shurrab, Islam Osama

Ismail, Ibtisam Ismail Mahfouz, Aseel AbdulQader Fannon, Malak Ayman Mousa Qawasmi, Mona Radi Mohammad Hawa, Narmeen Giacaman, Manar Ahmaro, Rula Khader Zaatreh, Wafa Aqel AbuKhalil, Noor Khairi Melhim, Ruba Jamal Madbouh, Hala Jamal Abu Hziema, Raghad Abed-Allateef Lahlooh, Sara Nawaf Ubaiat, Nour Ali Jaffal, Reem Khaled Alawna, Salsabeel Naeem Abed, Bessan Nimer Ali Abuzahra, Aya Jawad Abu Kwaik, Mays Hafez Dodin, Raghad Othman Taha, Dina Mohammed Alashqar, Roaa Abd-al-Fattah Mobarak, Tasneem Smerat
Data analysis and interpretation: Mohamedraed Elshami, Faten Darwish Usrof, Nasser Abu-El-Noor, Bettina Bottcher
Manuscript writing: All authors
Final approval of manuscript: All authors
Accountable for all aspects of the work: All authors

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

The following represents disclosure information provided by authors of this manuscript. All relationships are considered compensated unless otherwise noted. Relationships are self-held unless noted. I = Immediate Family Member, Inst = My Institution. Relationships may not relate to the subject matter of this manuscript. For more information about ASCO's conflict of interest policy, please refer to www.asco.org/rwc or ascopubs.org/go/authors/author-center.

Open Payments is a public database containing information reported by companies about payments made to US-licensed physicians (Open Payments).

No potential conflicts of interest were reported.

ACKNOWLEDGMENT

The authors would like to express their gratitude to all participants who took part in the survey.

REFERENCES

1. Sung H, Ferlay J, Siegel RL, et al: Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 71:209-249, 2021

2. Taha Z, Eltom SE: The role of diet and lifestyle in women with breast cancer: An update review of related research in the Middle East. Biores Open Access 7:73-80, 2018

3. United Nation Population Fund: For One Breast Cancer Survivor in Gaza Strip, a Journey of Hardship and Hope—UNFPA Press Release. 2020. https://www.un.org/unispal/document/for-one-breast-cancer-survivor-in-gaza-strip-a-journey-of-hardship-and-hope-unfpa-press-release

4. AlWaheidi S: Breast cancer in Gaza—A public health priority in search of reliable data. Ecancermedicalscience 13:964, 2019

5. Kerlikowske K, Bissell MCS, Sprague BL, et al: Advanced breast cancer definitions by staging system examined in the Breast Cancer Surveillance Consortium. J Natl Cancer Inst 113:909-916, 2021

6. Waller J, McCaffery K, Wardle J: Beliefs about the risk factors for cervical cancer in a British population sample. Prev Med 38:745-753, 2004

7. Fraser GE, Shavlik D: Risk factors, lifetime risk, and age at onset of breast cancer. Ann Epidemiol 7:375-382, 1997

8. Amadou A, Torres-Mejía G, Hainaut P, et al: Breast cancer in Latin America: Global burden, patterns, and risk factors. Salud Publica Mex 56:547-554, 2014

9. García-Estévez L, Cortés J, Pérez S, et al: Obesity and breast cancer: A paradoxical and controversial relationship influenced by menopausal status. Front Oncol 11:705911, 2021

10. Chlebowski RT: Nutrition and physical activity influence on breast cancer incidence and outcome. Breast 22:S30-S37, 2013

11. Youn HJ, Han W: A review of the epidemiology of breast cancer in Asia: Focus on risk factors. Asian Pac J Cancer Prev 21:867-880, 2020

12. Hamajima N, Hirose K, Tajima K, et al: Collaborative Group on Hormonal Factors in Breast Cancer Alcohol, tobacco and breast cancer–collaborative reanalysis of individual data from 53 epidemiological studies, including 58,515 women with breast cancer and 95,067 women without the disease. Br J Cancer 87:1234-1245, 2002

13. Daly AA, Rolph R, Cutress RI, et al: A review of modifiable risk factors in young women for the prevention of breast cancer. Breast Cancer (Dove Med Press) 13:241-257, 2021

14. Liu L-Y, Wang F, Yu L-X, et al: Breast cancer awareness among women in Eastern China: A cross-sectional study. BMC Public Health 14:1-8, 2014

15. Morse EP, Maegga B, Joseph G, et al: Breast cancer knowledge, beliefs, and screening practices among women seeking care at district hospitals in Dar es Salaam, Tanzania. Breast Cancer (Auckl) 8:73-79, 2014

16. Inumaru LE, Irineu Gomes Duarte Quintanilha M, Aparecida da Silveira É, et al: Risk and protective factors for breast cancer in Midwest of Brazil. J Environ Public Health 2012:356851, 2012

17. El Haidari R, Abbas LA, Nerich V, et al: Factors associated with health-related quality of life in women with breast cancer in the Middle East: A systematic review. Cancers (Basel) 12:696, 2020

18. Elshami M, Abu Kmeil H, Abu-Jazar M, et al: Breast cancer awareness and barriers to early presentation in the Gaza-strip: A cross-sectional study. J Glob Oncol 4:1-13, 2018

19. Elshami M, Al-Slaibi I, Ghithan RJ, et al: Women's awareness of breast cancer symptoms: A national cross-sectional study from Palestine. BMC Public Health 22:1-13, 2022

20. Elshami M, Yaseen A, Alser M, et al: Knowledge of ovarian cancer symptoms among women in Palestine: A national cross-sectional study. BMC Public Health 21:1-10, 2021

21. Elshami M, Al-Slaibi I, Abukmail H, et al: Knowledge of Palestinian women about cervical cancer warning signs: A national cross-sectional study. BMC Public Health 21:1-15, 2021

22. Elshami M, Abukmail H, Aqel W, et al: Awareness of Palestinians about lung cancer symptoms: A national cross-sectional study. BMC Pulm Med 22:1-14, 2022

23. Elshami M, Tuffaha A, Yaseen A, et al: Awareness of ovarian cancer risk and protective factors: A national cross-sectional study from Palestine. PLoS One 17:e0265452, 2022

24. Elshami M, Ayyad MM, Alser M, et al: Awareness of colorectal cancer signs and symptoms: A national cross-sectional study from Palestine. BMC Public Health 22:866, 2022

25. Linsell L, Forbes LJ, Burgess C, et al: Validation of a measurement tool to assess awareness of breast cancer. Eur J Cancer 46:1374-1381, 2010

26. Halahleh K, Gale RP: Cancer care in the Palestinian territories. Lancet Oncol 19:e359-e364, 2018

27. Husseini A, Abu-Rmeileh NM, Mikki N, et al: Cardiovascular diseases, diabetes mellitus, and cancer in the occupied Palestinian territory. Lancet 373:1041-1049, 2009

28. Böttcher B, Abu-El-Noor M, Abu-El-Noor N: Choices and services related to contraception in the Gaza strip, Palestine: Perceptions of service users and providers. BMC Womens Health 19:1-8, 2019

29. Ali MM, Helou M, Ahmad MA-S, et al: Risk of tobacco smoking and consumption of energy drinks on obesity and central obesity among male university students. Cureus 14:e21842, 2022

30. Nakkash R, Khader Y, Chalak A, et al: Prevalence of cigarette and waterpipe tobacco smoking among adults in three Eastern Mediterranean countries: A cross-sectional household survey. BMJ Open 12:e055201, 2022

31. Harvard Humanitarian Initiative: KoBoToolbox. https://www.kobotoolbox.org

32. AlWaheidi S, McPherson K, Chalmers I, et al: Mammographic screening in the occupied Palestinian territory: A critical analysis of its promotion, claimed benefits, and safety in Palestinian health research. JCO Glob Oncol 6:1772-1790, 2020

33. Gaudineau A, Ehlinger V, Vayssiere C, et al: Factors associated with early menarche: Results from the French Health Behaviour in School-aged Children (HBSC) study. BMC Public Health 10:1-7, 2010

34. Palestinian Central Bureau of Statistics: On the occasion of the International Workers' Day, H.E. Dr. Ola Awad, President of PCBS, presents the current status of the Palestinian labour force. https://www.pcbs.gov.ps/postar.aspx?lang=ar&ItemID=3729

35. Elshami M, Elshami A, Alshorbassi N, et al: Knowledge level of cancer symptoms and risk factors in the Gaza Strip: A cross-sectional study. BMC Public Health 20:1-11, 2020

36. Ullah Z, Khan MN, Din ZU, et al: Breast cancer awareness and associated factors amongst women in Peshawar, Pakistan: A cross-sectional study. Breast Cancer (Auckl) 15:11782234211025346, 2021

37. Kharaba Z, Buabeid MA, Ramadan A, et al: Knowledge, attitudes, and practices concerning breast cancer and self examination among females in UAE. J Community Health 46:942-950, 2021

38. Biswas S, Syiemlieh J, Nongrum R, et al: Impact of educational level and family income on breast cancer awareness among college-going girls in Shillong (Meghalaya), India. Asian Pac J Cancer Prev 21:3639-3646, 2020

39. Al-Ismaili Z, Al-Nasri K, Al-Yaqoobi A, et al: Awareness of breast cancer risk factors, symptoms and breast self-examination among Omani female teachers: A cross-sectional study. Sultan Qaboos Univ Med J 20:e194-e201, 2020

40. Alshareef B, Yaseen W, Jawa W, et al: Breast cancer awareness among female school teachers in Saudi Arabia: A population based survey. Asian Pac J Cancer Prev 21:337-342, 2020

41. Al-Mousa DS, Alakhras M, Hossain SZ, et al: Knowledge, attitude and practice around breast cancer and mammography screening among Jordanian women. Breast Cancer (Dove Med Press) 12:231-242, 2020

42. Linsell L, Burgess C, Ramirez A: Breast cancer awareness among older women. Br J Cancer 99:1221-1225, 2008

43. Moser K, Patnick J, Beral V: Do women know that the risk of breast cancer increases with age? Br J Gen Pract 57:404-406, 2007

44. Mardela AP, Maneewat K, Sangchan H: Breast cancer awareness among Indonesian women at moderate-to-high risk. Nurs Health Sci 19:301-306, 2017

45. Kunneman M, Marijnen CA, Rozema T, et al: Decision consultations on preoperative radiotherapy for rectal cancer: Large variation in benefits and harms that are addressed. Br J Cancer 112:39-43, 2015

46. Webster P, Austoker J: Women's knowledge about breast cancer risk and their views of the purpose and implications of breast screening—A questionnaire survey. J Public Health 28:197-202, 2006

47. Prusty RK, Begum S, Patil A, et al: Knowledge of symptoms and risk factors of breast cancer among women: A community based study in a low socio-economic area of Mumbai, India. BMC Womens Health 20:106, 2020

48. Bernardo H, Cesar V; World Health Organization: Long-term effects of breastfeeding: A systematic review. 2013. https://apps.who.int/iris/handle/10665/79198

49. Anastasi N, Lusher J: The impact of breast cancer awareness interventions on breast screening uptake among women in the United Kingdom: A systematic review. J Health Psychol 24:113-124, 2019

50. Lahart IM, Reichl C, Metsios GS, et al: Physical activity and awareness in breast screening attendees in Black Country, UK. Health Promot Int 31:13-22, 2016

51. Amansia: Worldwide Prevalence of Obesity. 2020. https://www.a-mansia.com/obesity-and-diabetes-in-the-world/

52. Sun Y-S, Zhao Z, Yang Z-N, et al: Risk factors and preventions of breast cancer. Int J Biol Sci 13:1387-1397, 2017

53. Gaudet MM, Carter BD, Patel AV, et al: Waist circumference, body mass index, and postmenopausal breast cancer incidence in the Cancer Prevention Study-II Nutrition Cohort. Cancer Causes Control 25:737-745, 2014

54. World Health Organization: https://www.who.int/news-room/fact-sheets/detail/breast-cancer

55. Barrios CH: Global challenges in breast cancer detection and treatment. Breast 62:S3-S6, 2022 (suppl 1)

56. Jubran J, Shaar A, Jarrar K, et al: Pathway to Survival—The Story of Breast Cancer in Palestine. 2018. https://palestine.unfpa.org/en/publications/pathway-survival-story-breast-cancer-palestine

57. World Health Organization: Overcoming Barriers to Health Care Access in the West Bank with Mobile Clinics. 2019. http://www.emro.who.int/opt/news/overcoming-barriers-to-health-care-access-in-the-west-bank-with-mobile-clinics.html

58. Oluwatosin OA, Oladepo O: Knowledge of breast cancer and its early detection measures among rural women in Akinyele Local Government Area, Ibadan, Nigeria. BMC Cancer 6:1-6, 2006

59. Tazhibi M, Feizi A: Awareness levels about breast cancer risk factors, early warning signs, and screening and therapeutic approaches among Iranian adult women: A large population based study using latent class analysis. Biomed Res Int 2014:306352, 2014

60. Amin T, Mulhim A, Almaqhawi A: Breast cancer knowledge, risk factors and screening among adult Saudi women in a primary health care setting. Asian Pac J Cancer Prev 10:133-138, 2009

61. Forbes L, Simon AE, Warburton F, et al: Differences in cancer awareness and beliefs between Australia, Canada, Denmark, Norway, Sweden and the UK (the International Cancer Benchmarking Partnership): Do they contribute to differences in cancer survival? Br J Cancer 108:292-300, 2013

62. Devi S: Health in the West Bank. Lancet 370:1405-1406, 2007

63. Hing JJX, Lee WP, Chua YNS, et al: Impact of health talks on knowledge, attitudes and perception of breast cancer screening and treatment amongst healthcare staff by a breast surgical unit in a public healthcare institution: A cross-sectional study. BMC Womens Health 21:1-12, 2021

64. Lim SK, Teo XL, Ng JL, et al: A Survey on Singaporean Women's Knowledge, perception and practices of mammogram screening. Ann Acad Med Singapore 44:317-325, 2015

65. Palestinian Central Bureau of Statistics: https://pcbs.gov.ps/Portals/_Rainbow/Documents/unemployment-2020-02a.html

---

APPENDIX

TABLE A1. Bivariable Logistic Regression Analyzing the Association Between Recognizing Each of the Age-Related and Lifetime Risks of Breast Cancer and Participant Characteristics

Characteristic	Age-Related Risk[a]		Lifetime Risk[b]	
	COR (95% CI)	*P*	COR (95% CI)	*P*
Age group, years				
18-39	Ref	Ref	Ref	Ref
40 or older	1.11 (0.81 to 1.54)	.510	0.88 (0.77 to 1.00)	.060
Menarche				
Normal (11-15 years)	Ref	Ref	Ref	Ref
Early (≤ 10 years)	1.29 (0.40 to 4.15)	.670	0.98 (0.58 to 1.64)	.930
Late (≥ 16 years)	1.07 (0.66 to 1.72)	.790	0.83 (0.68 to 1.01)	.060
Educational level				
Secondary or below	Ref	Ref	Ref	Ref
Postsecondary	1.09 (0.81 to 1.48)	.560	1.64 (1.46 to 1.86)	< .001
Occupation				
Unemployed/housewife	Ref	Ref	Ref	Ref
Employed	1.47 (1.02 to 2.11)	.040	1.25 (1.08 to 1.46)	.003
Retired	1.29 (0.08 to 21.88)	.860	1.87 (0.64 to 5.49)	.250
Student	1.91 (1.28 to 2.87)	.002	1.64 (1.37 to 1.97)	< .001
Monthly income				
< 1,450 NIS	Ref	Ref	Ref	Ref
≥ 1,450 NIS	1.09 (0.80 to 1.48)	.590	1.04 (0.92 to 1.17)	.550
Marital status				
Single	Ref	Ref	Ref	Ref
Married	0.75 (0.54 to 1.05)	.100	0.78 (0.68 to 0.89)	< .001
Divorced/widowed	0.83 (0.42 to 1.66)	.610	0.54 (0.40 to 0.74)	< .001
Residency				
Gaza strip	Ref	Ref	Ref	Ref
WBJ	1.21 (0.89 to 1.64)	.220	0.67 (0.59 to 0.76)	< .001
Having a chronic disease				
No	Ref	Ref	Ref	Ref
Yes	1.04 (0.72 to 1.52)	.820	0.76 (0.65 to 0.88)	< .001
Knowing someone with cancer				
No	Ref	Ref	Ref	Ref
Yes	0.70 (0.51 to 0.95)	.022	1.23 (1.09 to 1.38)	.001
Site of data collection				
Public spaces	Ref	Ref	Ref	Ref
Hospitals	1.42 (0.99 to 2.02)	.054	0.97 (0.84 to 1.12)	.660
Primary health care centers	1.06 (0.69 to 1.61)	.800	1.19 (1.02 to 1.39)	.031

Abbreviations: COR, crude odds ratio; NIS, New Israeli Shekel; WBJ, West Bank and Jerusalem.

[a]The correct answer was "A 70-year-old woman," and all other answers were considered incorrect.

[b]The correct answer was "one in eight women," and all other answers were considered incorrect.

TABLE A2. Bivariable Logistic Regression Analyzing the Association Between Recognizing the Modifiable Risk Factors for Breast Cancer and Participant Characteristics

Characteristic	Not Breastfeeding COR (95% CI)	P	Not Doing 30 Minutes of Moderate Physical Activity Five Times a Week COR (95% CI)	P	Smoking COR (95% CI)	P	Passive Smoking COR (95% CI)	P	Consumption of Fatty Foods COR (95% CI)	P
Age group, years										
18-39	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
40 or older	1.61 (1.23 to 2.10)	.001	1.18 (0.94 to 1.47)	.150	0.91 (0.79 to 1.04)	.170	1.06 (0.94 to 1.20)	.350	1.23 (1.09 to 1.39)	.001
Menarche										
Normal (11-15 years)	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Early (≤ 10 years)	1.49 (0.47 to 4.78)	.500	0.55 (0.27 to 1.12)	.100	1.34 (0.72 to 2.50)	.360	2.01 (1.15 to 3.52)	.014	1.04 (0.64 to 1.69)	.870
Late (≥ 16 years)	0.98 (0.68 to 1.40)	.900	0.68 (0.51 to 0.91)	.009	0.97 (0.79 to 1.20)	.780	0.95 (0.80 to 1.14)	.600	0.86 (0.72 to 1.03)	.100
Educational level										
Secondary or below	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Postsecondary	0.95 (0.76 to 1.20)	.690	1.07 (0.87 to 1.31)	.530	1.06 (0.93 to 1.22)	.370	1.08 (0.96 to 1.21)	.200	0.87 (078 to 0.97)	.015
Occupation										
Unemployed/ housewife	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Employed	0.52 (0.40 to 0.68)	< .001	0.97 (0.75 to 1.26)	.820	0.83 (0.71 to 0.98)	.028	0.95 (0.82 to 1.09)	.450	0.89 (0.77 to 1.02)	.100
Retired	0.59 (0.08 to 4.56)	.610	0.44 (0.10 to 1.99)	.290	1.42 (0.31 to 6.42)	.650	1.90 (0.52 to 6.90)	.330	0.65 (0.22 to 1.95)	.450
Student	0.45 (0.33 to 0.62)	< .001	0.75 (0.56 to 1.01)	.060	0.99 (0.80 to 1.22)	.930	1.02 (0.86 to 1.22)	.800	0.73 (0.61 to 0.87)	< .001
Monthly income										
< 1,450 NIS	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
≥ 1,450 NIS	0.83 (0.66 to 1.05)	.130	1.01 (0.82 to 1.24)	.920	0.99 (0.86 to 1.13)	.850	0.93 (0.83 to 1.04)	.220	0.91 (0.81 to 1.02)	.110
Marital status										
Single	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Married	2.72 (2.15 to 3.44)	< .001	1.33 (1.06 to 1.67)	.013	1.29 (1.11 to 1.50)	.001	1.13 (1.00 to 1.29)	.060	1.37 (1.20 to 1.56)	< .001
Divorced/widowed	1.92 (1.16 to 3.19)	.012	0.90 (0.59 to 1.37)	.620	1.06 (0.79 to 1.43)	.680	1.09 (0.84 to 1.14)	.520	1.33 (1.02 to 1.72)	.034
Residency										
Gaza strip	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
WBJ	0.69 (0.55 to 0.87)	.002	0.84 (0.69 to 1.03)	.100	0.87 (0.76 to 0.99)	.039	0.92 (0.82 to 1.03)	.132	0.91 (0.81 to 1.01)	.090
Having a chronic disease										
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1.12 (0.84 to 1.50)	.440	0.98 (0.76 to 1.26)	.870	1.00 (0.85 to 1.18)	.990	1.06 (0.92 to 1.22)	.420	1.19 (1.04 to 1.38)	.014
Knowing someone with cancer										
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1.16 (0.93 to 1.46)	.190	1.12 (0.91 to 1.37)	.270	0.91 (0.80 to 1.04)	.160	0.90 (0.81 to 1.01)	.080	1.05 (0.94 to 1.18)	.380
Site of data collection										
Public spaces	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Hospitals	1.73 (1.33 to 2.24)	< .001	1.48 (1.17 to 1.88)	.001	1.40 (1.21 to 1.63)	< .001	1.26 (1.11 to 1.47)	< .001	1.37 (1.21 to 1.56)	< .001
Primary health care centers	1.46 (1.09 to 1.95)	.011	1.18 (0.91 to 1.52)	.200	2.04 (1.70 to 2.45)	< .001	1.75 (1.50 to 2.03)	< .001	1.69 (1.46 to 1.96)	< .001

Abbreviations: COR, crude odds ratio; NIS, New Israeli Shekel; WBJ, West Bank and Jerusalem.

TABLE A3. Bivariable Logistic Regression Analyzing the Association Between Recognizing the Modifiable Risk Factors for Breast Cancer and Participant Characteristics

Characteristic	Long-Term Use of Contraceptive Pill		Using Hormone Replacement Therapy		Being Overweight		Having Children Later on in Life or Not at All	
	COR (95% CI)	P	COR (95% CI)	P	COR (95% CI)	P	COR (95% CI)	P
Age group, years								
18-39	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
40 or older	1.28 (1.14 to 1.44)	< .001	1.24 (1.10 to 1.39)	< .001	1.12 (1.00 to 1.26)	.060	0.97 (0.86 to 1.10)	.610
Menarche								
Normal (11-15 years)	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Early (≤ 10 years)	1.16 (0.72 to 1.86)	.540	1.53 (0.94 to 2.50)	.090	1.12 (0.70 to 1.78)	.640	1.34 (0.83 to 2.15)	.230
Late (≥ 16 years)	0.80 (0.67 to 0.95)	.010	0.81 (0.68 to 0.97)	.020	1.04 (0.88 to 1.24)	.620	0.90 (0.75 to 1.08)	.260
Educational level								
Secondary or below	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Postsecondary	1.07 (0.95 to 1.19)	.260	1.30 (1.17 to 1.46)	< .001	0.978(0.88 to 1.09)	.690	0.95 (0.85 to 1.07)	.390
Occupation								
Unemployed/ housewife	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Employed	0.95 (0.83 to 1.09)	.490	1.22 (1.06 to 1.40)	.005	0.94 (0.82 to 1.08)	.380	0.87 (0.75 to 1.00)	.060
Retired	1.76 (0.54 to 5.72)	.350	2.89 (0 .79 to 10.51)	.110	0.71 (0.23 to 2.18)	.550	0.87 (0.27 to 2.81)	.810
Student	0.88 (0.74 to 1.04)	.130	1.00 (0.85 to 1.19)	.960	0.87 (0.73 to 1.03)	.110	1.03 (0.86 to 1.23)	.740
Monthly income								
< 1,450 NIS	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
≥ 1,450 NIS	0.92 (0.83 to 1.03)	.160	1.16 (1.04 to 1.30)	.007	0.86 (0.77 to 0.96)	.007	0.75 (0.67 to 0.84)	< .001
Marital status								
Single	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Married	1.21 (1.07 to 1.38)	.003	1.09 (0.96 to 1.24)	.190	1.04 (0.91 to 1.18)	.590	0.93 (0.82 to 1.07)	.310
Divorced/widowed	1.18 (0.91 to 1.52)	.200	1.10 (0.85 to 1.41)	.470	1.32 (1.03 to 1.70)	.030	1.21 (0.93 to 1.57)	.150
Residency								
Gaza strip	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
WBJ	0.77 (0.69 to 0.85)	< .001	0.96 (0.86 to 1.07)	.430	0.78 (0.70 to 0.87)	< .001	0.68 (0.61 to 0.76)	< .001
Having a chronic disease								
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1.24 (1.08 to 1.42)	.002	1.25 (1.09 to 1.43)	.002	1.21 (1.06 to 1.38)	.006	0.96 (0.83 to 1.10)	.550
Knowing someone with cancer								
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1.04 (0.93 to 1.15)	.530	1.03 (0.92 to 1.14)	.650	0.79 (0.71 to 0.88)	< .001	0.82 (0.73 to 0.92)	.001
Site of data collection								
Public spaces	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Hospitals	1.29 (1.14 to 1.46)	< .001	1.39 (1.22 to 1.57)	< .001	1.43 (1.26 to 1.63)	< .001	1.67 (1.46 to 1.92)	< .001
Primary health care centers	1.51 (1.31 to 1.74)	< .001	1.53 (1.33 to 1.77)	< .001	2.06 (1.78 to 2.38)	< .001	1.81 (1.55 to 2.11)	< .001

Abbreviations: COR, crude odds ratio; NIS, New Israeli Shekel; WBJ, West Bank and Jerusalem.

TABLE A4. Bivariable Logistic Regression Analyzing the Association Between Recognizing the Nonmodifiable Risk Factors for BC and Participant Characteristics.

Characteristic	Radiation Exposure COR (95% CI)	P	Having a History of BC COR (95% CI)	P	Having a Close Relative With BC COR (95% CI)	P	Having a Late Menopause COR (95% CI)	P	Starting the Periods at an Early Age COR (95% CI)	P
Age group, years										
18-39	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
40 or older	1.01 (0.85 to 1.21)	.880	0.91 (0.79 to 1.05)	.200	1.04 (0.92 to 1.18)	.540	0.78 (0.68 to 0.90)	< .001	1.19 (1.03 to 1.38)	.016
Menarche										
Normal (11-15 years)	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Early (≤ 10 years)	1.14 (0.55 to 2.40)	.720	0.90 (0.51 to 1.59)	.710	1.35 (0.78 to 2.33)	.290	0.83 (0.47 to 1.45)	.510	1.79 (1.08 to 2.97)	.025
Late (≥ 16 years)	0.73 (0.58 to 0.93)	.011	0.78 (0.64 to 0.96)	.019	0.79 (0.66 to 0.95)	.012	1.02 (0.84 to 1.24)	.840	0.83 (0.66 to 1.05)	.110
Educational level										
Secondary or below	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Postsecondary	2.09 (1.75 to 2.50)	< .001	1.61 (1.40 to 1.86)	< .001	1.61 (1.42 to 1.82)	< .001	1.14 (1.01 to 1.29)	.036	1.06 (0.93 to 1.22)	.370
Occupation										
Unemployed/housewife	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Employed	1.45 (1.16 to 1.80)	.001	1.18 (0.99 to 1.41)	.070	1.41 (1.21 to 1.65)	< .001	1.01 (0.87 to 1.19)	.870	1.10 (0.92 to 1.30)	.300
Retired	1.96 (0.25 to 15.14)	.520	3.06 (0.40 to 23.61)	.280	5.45 (0.71 to 42.00)	.100	3.46 (1.16 to 10.32)	.026	0.35 (0.05 to 2.72)	.320
Student	1.34 (1.02 to 1.75)	.033	1.12 (0.90 to 1.39)	.310	0.98 (0.81 to 1.17)	.810	1.12 (0.92 to 1.36)	.250	1.14 (0.92 to 1.40)	.230
Monthly income										
< 1,450 NIS	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
≥ 1,450 NIS	1.98 (1.69 to 2.33)	< .001	1.20 (1.04 to 1.37)	.010	1.53 (1.36 to 1.73)	< .001	1.03 (0.91 to 1.17)	.620	0.86 (0.75 to 0.98)	.026
Marital status										
Single	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Married	0.97 (0.80 to 1.18)	.770	1.06 (0.90 to 1.24)	.470	1.07 (0.93 to 1.23)	.330	0.89 (0.77 to 1.02)	.100	0.85 (0.73 to 1.00)	.050
Divorced/widowed	0.78 (0.55 to 1.12)	.180	0.83 (0.62 to 1.13)	.230	0.80 (0.61 to 1.04)	.100	0.69 (0.51 to 0.94)	.017	0.99 (0.72 to 1.34)	.930
Residency										
Gaza strip	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
WBJ	1.45 (1.24 to 1.71)	< .001	0.82 (0.72 to 0.95)	.006	1.16 (1.03 to 1.30)	.016	0.93 (0.82 to 1.05)	.230	0.75 (0.66 to 0.86)	< .001
Having a chronic disease										
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1.17 (0.95 to 1.44)	.140	0.83 (0.70 to 0.98)	.026	1.01 (0.87 to 1.17)	.880	0.96 (0.83 to 1.13)	.640	1.12 (0.95 to 1.33)	.170
Knowing someone with cancer										
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1.19 (1.02 to 1.40)	.032	1.41 (1.23 to 1.62)	< .001	1.27 (1.13 to 1.43)	< .001	0.96 (0.85 to 1.09)	.520	0.79 (0.69 to 0.91)	.001
Site of data collection										
Public spaces	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Hospitals	1.13 (0.94 to 1.36)	.210	1.48 (1.26 to 1.74)	< .001	1.13 (0.99 to 1.30)	.070	1.34 (1.15 to 1.55)	< .001	1.81(1.53 to 2.14)	< .001
Primary health care centers	1.13 (0.91 to 1.39)	.270	0.96 (0.81 to 1.14)	.640	1.49 (1.27 to 1.75)	< .001	1.64 (1.39 to 1.93)	< .001	1.87(1.56 to 2.25)	< .001

Abbreviations: BC, breast cancer; COR, crude odds ratio; NIS, New Israeli Shekel; WBJ, West Bank and Jerusalem.