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Breast Cancer Screening

RESEARCH ARTICLE

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Breast Cancer Awareness Related to Screening in a General Population of Turkish Women

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Abstract

Background: This study aimed to investigate the existing knowledge, health beliefs, and practices related to breast cancer screening in a general population of Turkish women. **Methods:** A total of 1514 women (mean±SD age: 32.5±13.6 years) were included voluntarily in this questionnaire-based survey. The questionnaire involved items on participant characteristics, knowledge on breast cancer, knowledge and practice on breast self-examination (BSE), clinical breast examination (CBE) and mammography, and the items on the Champion's Health Belief Model (CHBM). **Results:** Overall, 23.8%, 32.7%, and 22.1% of women reported the monthly BSE practice, the previous CBE, and the previous mammography, respectively. On average, 72.8%, 74.0%, and 66.3% of participants responded correctly to the items related to risk factors, first symptoms, and early diagnosis of breast cancer, respectively. Overall, 38.0%, 52.7% and 44.0 % of participants had a good level of knowledge about the BSE, CBE, and mammography, respectively, while only 32.1% of women reported that they knew exactly how to perform BSE. The CHBM scores were moderate overall (median 159.0). **Conclusion:** Our findings in a group of Turkish women revealed insufficient knowledge about breast cancer and screening strategies and low rates of breast screening practice along with low scores on the perceived susceptibility and seriousness of breast cancer. There is a need for effective awareness campaigns and public health education and promotion interventions on breast cancer to improve the health-seeking behavior of women and thereby enable early reporting of symptoms and increase uptake of breast screening.

Keywords: Breast cancer- knowledge- health beliefs- screening practices- Champion' s Health Belief Model

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Introduction

Breast cancer is the most common cancer and the leading cause of cancer mortality in women worldwide [1]. Given the considerable risk of advanced and incurable stages of disease at the time of diagnosis, early detection of breast cancer is of utmost importance to maximize the potential for good health outcomes [2, 3].

Breast self-examination (BSE), clinical breast examination (CBE), and mammography are commonly recommended screening methods for the early detection of breast cancer [4, 5]. BSE is particularly important in terms of adopting protective health behaviors, as a simple and effective technique that allows women to become familiar with the appearance and sense of their breasts and to seek early medical care in case of detecting any changes in their breasts [3, 6, 7].

Besides the improved screening practice, awareness about breast cancer symptoms and risk factors is also considered essential for motivating health-seeking behaviors among women, enabling early detection and management of the disease with better chances of survival [3, 7, 8]. However, both insufficient disease awareness and low adoption of breast screening behaviors by women have been reported in different populations, which emphasizes the critical role of studies addressing the drivers and barriers through women's health beliefs as known to strongly impact the compliance with breast screening practice [4, 7, 9]. The Champion Health Belief Model (CHBM) is a universally accepted psychological model capable of predicting and optimizing prevention and health screening actions [9, 10]. CHBM proposes that preventive health behaviors and screening behaviors are influenced by perceived susceptibility and perceived seriousness of disease in addition to perceived benefits from or barriers to action [10]. In this regard, CHBM offers a useful theoretical framework for studying breast cancer screening behavior such as BSE, CBE and mammography

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[10].

This study aimed to investigate the existing knowledge, health beliefs, and practices related to breast cancer screening in a general population of Turkish women.

Materials and Methods

Study population

A total of 1514 women (mean±SD age: 32.5±13.6 years, range 18.0 to 84.0 years) were included voluntarily in this cross-sectional questionnaire-based survey conducted between May 2023 and January 2024. The participants were selected from a population of women visiting family health centers and community health centers in Istanbul province and those attending to women's health educational seminars organized by local municipalities, while social media announcements and academic e-mail lists were also used to reach the volunteers. Convenience sampling was used in selecting participants from a population of women of different ages and socioeconomic backgrounds, based on their accessibility and availability to the researcher providing a cost-effective and time-efficient method of data collection from a conveniently available pool of respondents, via face-to-face interview method or online forms.

Written informed consent was obtained from each participant. The study was conducted following the ethical principles stated in the "Declaration of Helsinki" and approved by institutional ethics committee (Date of Approval: 05/05/2023, Protocol no: 09.2023.699).

The questionnaire

The study questionnaire involved four parts including Part 1– items on participant characteristics (sociodemographic and clinical characteristics, obstetric history, menopausal status, and breast cancer-related factors), Part II– items on breast cancer knowledge (risk factors, first symptoms, and early diagnosis), Part III – items on breast cancer screening knowledge and practice (BSE, CBE, and mammography), and Part IV– items on the CHBM subscales. Knowledge on breast cancer (risk factors, first symptoms and early diagnosis) was evaluated based on rate of correct and wrong answers given for each item and the average score (%) for all items, while the breast cancer screening knowledge and practice was evaluated in categories of level of knowledge (good, moderate and poor) reported for each item and the average score (%).

The CHBM

This CHBM was developed by Champion in 1984 and revised in 1993, 1997, and lastly in 1999 for the health beliefs concerning breast cancer screening methods [10]. In this study, the Turkish version of CHBM was used, of which the validity and reliability analysis was performed by Gozum and Aydin in 2004 [11]. The Turkish version of CHBM consisted of 52 items scored via a 5-point Likert scale (ranges from 1 [strongly disagree] to 5 [strongly agree]), including the subscales of susceptibility (3 items, scored 3 to 15), seriousness (6 items, scored 8 to 30), motivation (5 items, scores 5 to 25), benefits of BSE (4 items, scored 4 to 20), barriers to BSE (8 items, scored 8 to 40), confidence/self-efficacy of BSE (10 items, scored 10 to 50), benefits of mammography (5 items, scored 5 to 25) and barriers to mammography (11 items, scored 11 to 55). The total scores range from 54 to 260 with higher scores indicating more agreement with health beliefs except for the subscales of barriers [11].

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows, version 27.0 (IBM Corp., Armonk, NY). Descriptive statistics were reported including mean± standard deviation (SD) and median (min-max) for continuous variables and percentages for categorical variables.

Results

Sociodemographic and clinical characteristics of participants

The mean±SD age of participants was 32.5±13.6 years (range, 18 to 84 years). Overall, 37.3% of women were high school graduates and 23.8% had primary education (Table 1). Majority of the study population was composed of housewives (49.9%) and students (41.0%) with moderate income levels (82.8%) (Table 1).

Obstetric history, menopausal status, and breast cancer-related factors

The mean±SD age of menarche was 13.3±1.3 years, and 75.9% of participants reported having regular menstrual cycles. Overall, 44.8% of women had children and the mean±SD age at first birth was 22.9±4.5 years, while breastfeeding was performed by the majority of them and for >12 months by 43.7% (Table 2). Postmenopausal status was evident in 15.4% of participants (due to natural causes in 13.8%) for at least 6 years in 7.9%, and the mean±SD age at menopause was 39.9±12.4 years (Table 2).

Family history for breast cancer was evident in 8.5% of the study population, while 1.8% of women had a breast cancer diagnosis. Overall, 23.8%, 32.7%, and 22.1% of women reported monthly BSE practice, previous CBE, and previous mammography screening, respectively (Table 2). Printed and visual media (36.0%), school/workplace (27.0%), and healthcare professionals (16.8%) were the leading sources of knowledge on breast cancer and BSE (Table 2).

Knowledge of breast cancer (risk factors, first symptoms and early diagnosis)

On average, 72.8%, 74.0% and 66.3% of participants responded correctly to the items related to risk factors, first symptoms, and early diagnosis of breast cancer, respectively (Table 2).

For the risk factors section, items on the obstetrics risk factors (late age at first birth absence or short-term breastfeeding, oral contraceptive usage, early onset of menarche) were the least correctly answered items (by 36.7% to 60.6% of participants) (Table 3).

For the first symptoms section, particularly the pain and nipple retraction were known by 65.3% and 64.5% of

Table 1. Sociodemographic and Clinical Characteristics of Participants (n=1,514)

Age (year)	
mean±SD	32.5±13.6
median (min-max)	27.0 (18.0-84.0)
Educational status, n(%)	
Illiterate	54 (3.6)
Primary education	361 (23.8)
High school	564 (37.3)
Associate degree	280 (18.5)
Bachelor's degree	229 (15.1)
Master's degree	19 (1.3)
Doctorate degree	7 (0.5)
Employment status, n(%)	
Unemployed	989 (65.3)
Employed	525 (34.7)
Occupation, n(%)	
Student	620 (41.0)
Officer	73 (4.8)
Academic staff	5 (0.3)
Teacher	61 (4.0)
Housewife	755 (49.9)
Income level, n(%)	
Low	226 (14.9)
Moderate	1253 (82.8)
High	35 (2.3)
Marital status, n(%)	
Married	627 (41.4)
Divorced/widow	101 (6.7)
Single	786 (51.9)
Active smoking, n(%)	391 (25.8)
Regular alcohol consumption, n(%)	229 (15.1)
Regular exercise, n(%)	354 (23.4)
Body weight, n(%)	
Underweight	160 (10.6)
Normal weight	1002 (66.2)
Overweight	337 (22.3)
Obese	8 (0.5)
Markedly obese	7 (0.5)
Bra band size, n(%)	
70-75	392 (25.9)
80-85	738 (48.7)
90-95	325 (21.5)
100-110	52 (3.4)
>110	7 (0.5)
Chronic disease, n(%)	259 (17.1)
Chronic medication, n(%)	336 (22.2)

Table 2. Obstetric History, Menopausal Status and Breast Cancer-Related factors

Obstetric history	
Age of menarche (year), mean±SD	13.3±1.3
Regular menstrual period, n(%)	1149 (75.9)
Age at first birth (year), mean±SD	22.9±4.5
Number of children, n(%)	
None	835 (55.2)
1-2	430 (28.4)
3-4	202 (13.3)
≥5	47 (3.1)
Breastfeeding (n=679), n(%)	
None	10 (1.5)
0-3 months	32 (4.7)
3-6 months	76 (11.2)
6-9 months	125 (18.4)
9-12 months	139 (20.5)
> 12 months	297 (43.7)
Menopausal status	
Postmenopausal status, n(%)	233 (15.4)
Age at menopause (year) (n=233), mean±SD	39.9±12.4
Causes of menopause, n(%)	
Natural	209 (13.8)
Surgically-induced	13 (0.9)
Chemotherapy-induced	11 (0.7)
Duration of menopause, n(%)	
1 year	77 (5.1)
2-5 years	36 (2.4)
6-10 years	46 (3.0)
≥10 years	74 (4.9)
Breast cancer-related factors	
Family history for breast cancer, n(%)	129 (8.5)
Mother	18 (1.2)
Sibling	13 (0.9)
Aunt	98 (6.5)
Regular performance of breast self-exam (on a monthly basis)	361 (23.8)
Previous clinical breast exam, n(%)	495 (32.7)
Previous mammography, n(%)	334 (22.1)
Mass detection on breast self-exam, n(%)	106 (7.0)
Fibroadenoma	64 (4.2)
Fibrocystic	42 (2.8)
Previous breast cancer diagnosis, n(%)	27 (1.8)
Source of knowledge on breast cancer and breast self-exam, n(%)	
Printed and visual media	545 (36.0)
School/workplace	409 (27.0)
Healthcare professionals	255 (16.8)
Academic sources	142 (9.4)
Brochure/poster	80 (5.3)
Conference	83 (5.5)

participants respectively (Table 3). The relation of early diagnosis to prolonged survival and improved treatment success was correctly identified only by 67.2% and 65.3%

Table 3. Knowledge on Breast Cancer (Risk Factors, First Symptoms and Early Diagnosis)

	Yes	No
Breast cancer risk factors		
Family history for breast cancer increases the breast cancer risk	1395 (92.1)	119 (7.9)
Smoking increases the breast cancer risk	1347 (89.0)	167 (11.0)
Presence of unilateral breast cancer increases the breast cancer risk on the other side	1337 (88.3)	177(11.7)
Breast self-exam reduces the risk of delayed breast cancer diagnosis	1304 (86.1)	210 (13.9)
Alcohol consumption increases the breast cancer risk	1254 (82.8)	260 (17.2)
Radiation therapy increases the breast cancer risk	1250 (82.6)	264 (17.4)
Obesity and fatty diet increase the breast cancer risk	1171 (77.3)	343 (22.7)
Hormone therapy increases the breast cancer risk	1057 (69.8)	457 (30.2)
Previous history for benign breast disease increases the breast cancer risk	968 (63.9)	546 (36.1)
Late age at first birth increases the breast cancer risk	917 (60.6)	597 (39.4)
Absence or short-term breastfeeding increases the breast cancer risk	908 (60.0)	606 (40.0)
Oral contraceptive usage increases the breast cancer risk	863 (57.0)	651 (43.0)
Early onset of menarche increases the breast cancer risk	555 (36.7)	959 (63.3)
Average score (%)	72.8	27.2
First symptoms of breast cancer		
First symptom of breast cancer is palpable mass in the breast	1290 (85.2)	224 (14.8)
First symptom of breast cancer is palpable mass in the axilla	1224 (80.8)	290 (19.2)
First symptom of breast cancer is pain in the breast	989 (65.3)	525 (34.7)
First symptom of breast cancer is nipple retraction.	976 (64.5)	538 (35.5)
Average score (%)	74	26
Early diagnosis of breast cancer		
Prolongs survival	1018 (67.2)	496 (32.8)
Increases the chance of treatment success	989 (65.3)	525 (34.7)
Average score (%)	66.3	33.7

of participants (Table 3).

Knowledge of breast cancer screening (BSE, CBE, and mammography)

Overall, 38.0%, 52.7%, and 44.0 % of participants had a good level of knowledge about the BSE, CBE, and mammography, respectively (Table 4). Only 32.1% of women reported that they know exactly how to perform BSE, while those with a good knowledge of frequency (once a month starting from 20 years of age) and timing (5-7 days after the onset of menstrual period) of BSE comprised only the 33.9% and 28.5% of the study population, respectively (Table 4). The CBE was performed yearly after 40 years of age by 61.4% of participants and every 2 years between 20-39 years of age by 36.7% (Table 4). Annual screening mammography was performed after 40 years of age by 28.5% of participants, after 50 years of age by 37.6%, and 7-10 days after the menstrual period by 36.5% of participants (Table 4).

BSE knowledge and practice according to educational level and source of knowledge

Educational level had no significant impact on participants' knowledge on how to perform BSE (Table 5).

Healthcare professionals (18.8 vs. 14.8%, p=0.038), and academic sources (11.2 vs. 7.5%, p=0.013) were reported as more common sources of knowledge on breast cancer and BSE by participants with regular monthly performance of BSE compared to those without regular BSE performance (Table 5).

CHBM scores

The CHBM scores were moderate overall (median 159.0, ranged 54.0 to 260.0), including the subscale scores of breast cancer susceptibility (median 7.0, ranged 3.0 to 15.0), breast cancer seriousness (median 20.0, ranged 8.0 to 30.0), health motivation (median 20.0, ranged 5.0 to 25.0), benefits of BSE (median 16.0, ranged 4.0 to 20.0), barriers to BSE (median 20.0, ranged 8.0 to 40.0), confidence/self-efficacy in BSE (median 33.0, ranged 10.0 to 50.0), benefits of mammography (median 18.0, ranged 5.0 to 25.0) and barriers to mammography (28.0, ranged 11.0 to 55.0).

Table 6 summarizes the percentage of participants who agreed/strongly agreed on items related to perceived susceptibility to breast cancer (ranged 4.5-10.1%), the seriousness of breast cancer (ranged 25.0-67.4%), health motivation (43.8-81.2%), benefits of BSE (74.8-79.8%), barriers to BSE (10.5-23.2%), confidence/self-efficacy in BSE (33.4-61.4%), benefits of mammography (37.9-79.8%) and barriers to mammography (12.4-33.0%).

Correlation between age and CHBM scores

CHBM scores for breast cancer susceptibility

Table 4. Knowledge on Breast Cancer Screening (Breast Self-Exam, Clinical Breast Exam and Mammography)

Breast self-exam	Knowledge level		
	Good	Moderate	Poor
Breast anatomy	475 (31.4)	627 (41.4)	412 (27.2)
How to perform breast self-exam	486 (32.1)	665 (43.9)	363 (24.0)
BSE enables detection of mass in the breast tissue	718 (47.4)	613 (40.5)	183 (12.1)
BSE enables breast awareness and becoming familiar with the normal look and feel of the breasts	767 (50.7)	528 (34.9)	219 (14.5)
BSE should be performed once a month starting from 20 years of age	514 (33.9)	666 (44.0)	334 (22.1)
BSE should be performed 5-7 days after the onset of menstrual period	432 (28.5)	600 (39.6)	482 (31.8)
BSE technique involves using pads of the 3 middle fingers	770 (50.9)	590 (39.0)	154 (10.2)
BSE technique involves pressing all parts of the breast tissue without raising the fingers	684 (45.2)	594 (39.2)	236 (15.6)
BSE technique involves squeezing the nipple to check for discharge.	327 (21.6)	563 (37.2)	624 (41.2)
Average score (%)	38	40	22
Clinical breast exam	Knowledge level		
	Good	Moderate	Poor
Should be performed by a physician	907 (59.9)	347 (22.9)	260 (17.2)
Should be performed yearly after 40 years of age	929 (61.4)	284 (18.8)	301 (19.9)
Should be performed every 2 years between 20-39 years of age	556 (36.7)	583 (38.5)	375 (24.8)
Average score (%)	52.7	26.7	20.6
Mammography	Knowledge level		
	Good	Moderate	Poor
Is a breast imaging performed via placing the between two plates	960 (63.4)	266 (17.6)	288 (19.0)
Annual screening mammography should be performed in every woman after 40 years of age	432 (28.5)	549 (36.3)	533 (35.2)
Annual screening mammography should be performed in every woman after 50 years of age	569 (37.6)	417 (27.5)	528 (34.9)
No deodorant, talcum powder or lotion used on the day of examination	820 (54.2)	440 (29.1)	254 (16.8)
Should be performed 7-10 days after the menstrual period	553 (36.5)	528 (34.9)	433 (28.6)
Average score (%)	44	29.1	26.9

(r=0.058, p=0.023) and BSE barriers (r=0.067, p=0.009) were positively correlated with age. CHBM scores for health motivation (r=-0.050, p=0.050), BSE benefits (r=-0.053, p=0.041) and BSE confidence/self-efficacy (r=-0.052, p=0.042) were negatively correlated with age (Table 7).

Discussion

In our cohort, the regular BSE practice, CBE, and mammography rates were low comprising less than one-third of participants, whereas at least half of the participants had moderate-to-poor knowledge regarding the breast screening tools. Besides, almost one-third of

Table 5. BSE Knowledge and Practice According to Educational Levels and Source of Knowledge

	Educational level		
	Up to high school (n=979)	Higher education (n=535)	p value
Knowledge on how to perform breast self-exam, n(%)			
Good	317 (32.4)	169 (31.6)	0.834
Moderate	432 (44.1)	233 (43.6)	
Poor	230 (23.5)	133 (24.9)	
	Regular monthly performance of breast self-exam		
	No (n=1153)	Yes (n=361)	p value
Source of knowledge on breast cancer and breast self-exam, n(%)			
Printed and visual media	281 (38.1)	264 (34.0)	0.093
School/workplace	195 (26.5)	214 (27.5)	0.635
Healthcare professionals	109 (14.8)	146 (18.8)	0.038
Academic sources	55 (7.5)	87 (11.2)	0.013
Brochure/poster	54 (7.3)	26 (3.3)	0.001
Conference	43 (5.8)	40 (5.1)	0.558

Chi-square test

Table 6. The Champion's Health Belief Model Scale (CHBMS) subscales

The Champion's Health Belief Model Scale (CHBMS) subscales		Agree/strongly agree, n(%)
Susceptibility		
1	It is likely that I will get breast cancer	153 (10.1)
2	My chances of getting breast cancer in the next few years are great	68 (4.5)
3	I feel I will get breast cancer sometime during my life	82 (5.4)
Seriousness		
1	The thought of breast cancer scares me	859 (56.8)
2	When I think about breast cancer, my heart beats faster	554 (36.6)
3	I am afraid to think about breast cancer	818 (54.0)
4	Problems I would experience with breast cancer would last a long time	739 (48.8)
5	Breast cancer would threaten a relationship with my boyfriend, husband, or partner	378 (25.0)
6	If I had breast cancer my whole life would change	1021 (67.4)
Health motivation		
1	I want to discover health problems early	1230 (81.2)
2	Maintaining good health is extremely important to me	1207 (79.7)
3	I search for new information to improve my health	1135 (74.9)
4	I feel it is important to carry out activities that will improve my health	1153 (76.2)
5	I eat well-balanced meals	663 (43.8)
Benefits (breast self-exam)		
1	When I do BSE, I am doing something to take care of myself	1158 (76.5)
2	Completing BSE each month may help me find breast lumps early	1208 (79.8)
3	Completing BSE each month may decrease my chances of dying from	1138 (75.2)
4	If I find a lump early through BSE, my treatment for breast cancer may not be as bad	1132 (74.8)
Barriers (breast self-exam)		
1	BSE is embarrassing to me	284 (18.8)
2	BSE takes too much time	195 (12.9)
3	It is hard to remember to do breast examination	344 (22.7)
4	I don’t have enough privacy to do breast examination	218 (14.4)
5	BSE is not necessary if you have a breast exam by a healthcare provider	199 (13.1)
6	BSE is not necessary if you have a routine mammogram	352 (23.2)
7	My breast too large for me to complete breast self-examination	208 (13.8)
8	I have other problems more important than doing breast self-examination	158 (10.5)
Confidence/Self-efficacy (breast self-exam)		
1	I know how to perform BSE	563 (37.2)
2	I can perform BSE correctly	505 (33.4)
3	I could find a breast lump by performing BSE	759 (50.1)
4	I am able to find a breast lump that is the size of a walnut	930 (61.4)
5	I am able to find a breast lump that is the size of a hazelnut	750 (49.5)
6	I am able to find a breast lump that is the size of a pea	530 (35.0)
7	I am sure of the steps to follow for doing BSE	530 (35.0)
8	I am able to tell something is wrong with my breast when doing breast self-examination	766 (50.6)
9	I am able to tell something is wrong with my breast when I look in the mirror	517 (34.1)
10	I can use the correct part of my fingers when examining my breasts	637 (42.1)
Benefits (mammography)		
1	Having a mammogram will help me find breast lumps early.	1208 (79.8)
2	Having a mammogram is the best way for me to find a very small lump.	1033 (68.3)

Table 6. Continued

The Champion's Health Belief Model Scale (CHBMS) subscales		Agree/strongly agree, n(%)
Benefits (mammography)		
3	If I get screened for breast cancer and nothing is found, I don't need to worry as much about breast cancer.	575 (37.9)
4	Having a mammogram will decrease my chances of dying from breast cancer	1039 (68.6)
5	Having a mass on mammogram may increase the chance of treatment success	1021 (67.4)
Barriers (mammography)		
1	I am afraid to have a mammogram because I might find out something is wrong.	368 (24.3)
2	I am afraid to have a mammogram because I do not understand what will be done	474 (31.3)
3	People doing mammography screening are rough to women	188 (12.4)
4	Mammography exposes me to unnecessary radiation	256 (17.0)
5	I am not at the right age to need a routine mammography	499 (33.0)
6	I have other problems more important than having mammography	220 (14.6)
7	I cannot remember to go to the doctor to get mammography	277 (18.3)
8	Mammography is painful	396 (26.2)
9	Mammography takes too much time	220 (14.5)
10	I don't know how to go about getting mammography	399 (26.3)
11	Having mammography is too embarrassing	361 (23.8)

Table 7. Correlation between Age and CHBMS Scores

	Age (year)	
	r	p
The Champion's Health Belief Model Scale (CHBMS) scores		
Susceptibility	0.058	0.023
Seriousness	-0.024	0.358
Health motivation	-0.05	0.05
Benefits (breast self-exam)	-0.053	0.041
Barriers (breast self-exam)	0.067	0.009
Confidence/Self-efficacy (breast self-exam)	-0.052	0.042
Benefits (mammography)	-0.009	0.725
Barriers (mammography)	0.014	0.583
Total	-0.019	0.467

Spearman correlation analysis; r, correlation coefficient

women had poor knowledge about the risk factors, first symptoms, and early diagnosis of breast cancer. Our findings indicate that there is a need for public health education and promotion interventions to raise awareness and knowledge about breast cancer and thereby improve the health-seeking behavior of women with early reporting of symptoms and increase uptake of breast screening to achieve the ultimate goal of early diagnosis and reduced breast cancer mortality [4,7-9].

Despite the guideline recommendations on breast cancer screening measures, the utilization of screening tools in routine practice remains below the desired level [9]. Our findings are consistent with previously reported poor adherence to BSE, CBE, and mammography in Turkey [12-14], while similarly low rates of breast cancer screening utilization have also been reported in many countries [8, 9, 15, 16].

The poor knowledge on steps of BSE technique and low rates of regular BSE practice in our cohort are in line with the previous reports indicated the insufficient knowledge on technical aspects of BSE and the low BSE practice rates (range, 17% to 33.0%) among women, despite they were aware of the role of BSE in early diagnosis of breast cancer [6, 9, 17]. Adequate knowledge about the steps of practicing BSE is considered a significant predictor of BSE practice, emphasizing the likelihood of improved acceptability and adoption of BSE by women by training programs on the BSE technique [6, 17].

Majority of our study population comprised students and housewives, which is notable since more educated groups (i.e., urban women, and academic and healthcare professionals) are considered to have higher breast cancer knowledge levels [6, 18]. In a previous study from Turkey, the frequency of BSE, CBE, and mammography was found higher in schoolteachers than in housewives [19]. In this regard, awareness campaigns and training programs are

suggested to be reoriented toward targeting vulnerable women with lower educational attainments [6, 18].

One-third of women in our cohort had poor knowledge about the risk factors (particularly obstetric and lifestyle-related factors) and first symptoms (particularly the pain and nipple retraction) of breast cancer. Many cross-sectional studies targeting the general population have reported inadequate knowledge regarding the specific symptoms and the breast cancer risk factors, particularly the reproductive risk factors (i.e., lack of breastfeeding, early menarche and late menopause) rather than risk factors with sufficient evidence (i.e. family history, smoking, alcohol) [3, 6, 20-23]. Hence, the educational interventions are suggested to be planned to improve not only the knowledge of BSE but also the knowledge of the breast cancer risk factors and healthy lifestyles given their importance for health-seeking behaviors [20, 22, 24-27].

Printed and visual media were reported as the main source of knowledge on breast cancer and BSE by our participants. Likewise, social media, the internet, newspapers, and television are consistently reported to be the main sources of information about breast cancer in previous studies, even though these forms of media have primarily focused on the reduction and perils of tobacco use rather than the other important risk factors such as reproductive history and overweight/adiposity [9, 23, 28].

Higher scores on perceived susceptibility or seriousness of disease, health motivation, self-efficacy, and benefits of screening are associated with a higher probability of undertaking a screening test, while the differences can be observed depending on the target group risk factors [7, 10, 29, 30]. In our cohort, the benefits of BSE were acknowledged by the majority of our participants, who also did not consider barriers to screening tests as a major problem. In a previous study from Turkey among healthy women of screening age (40-69 years), age older than 50 was reported amongst the factors associated with increased likelihood of having a mammogram [31]. Our findings indicate increase in breast cancer susceptibility and barriers to BSE scores but decrease in health motivation, benefits of BSE and BSE self-efficacy scores with increasing age. Hence, the young age of our participants compared to the target risk group appears to be the principal factor responsible for the low scores on perceived susceptibility and seriousness of breast cancer, which might also have led to the low rates of actual BSE practice, CBE, and mammography in our study population. The low rate of BSE practice in our cohort is particularly important, given that CBE and mammography focus on women older than 40, while the sensitivity of mammography decreases with increased breast density, and thus BSE becomes the most favorable screening strategy among younger females [17, 32-34].

Reducing barriers can increase perceived benefits, while self-efficacy indirectly affects the perceived benefits and perceived barriers to screening [7, 12, 35]. Barriers to BSE were confirmed by nearly 20% of our participants, while nearly 70% reported a lack of confidence/self-efficacy in BSE, while healthcare professionals and academic sources were the common sources of knowledge on BSE in our participants with regular monthly performance of BSE. These findings seem to emphasize the likelihood of an educational intervention to improve the adoption of regular BSE practice [24, 25].

Major strength of our study sems to be its design that allows for a comprehensive assessment of knowledge, attitudes, and practices, providing a well-rounded perspective in a real-world setting along with use of validated psychological model capable of predicting and optimizing prevention and health screening actions. However, certain limitations to this study should be considered. First, the qualitative cross-sectional study design limits the ability to make causal inferences. Second, although the study population was composed of 1514 women who were selected via convenience sampling from a population of women of different ages and socioeconomic backgrounds living in Turkey's largest and most populous city, which enables external validity, our study sample may not be representative of the entire population indicating potential lack of generalizability. Third, there are also limitations inherent to convenience sampling, such as the possibility of sampling bias, self-report bias and social desirability bias and a lack of diversity leading to limited external validity.

In conclusion, our findings in a group of Turkish women revealed insufficient knowledge about breast cancer and screening strategies, particularly in terms of the obstetric risk factors and the technique, timing, and frequency of BSE, in addition to the low rates of breast screening practice, which seem to align with the low scores on the perceived susceptibility and seriousness of breast cancer. There is a need for effective awareness campaigns and public health education and promotion interventions on risk factors, prevention, screening, and management for breast cancer to improve the health-seeking behavior of women and thereby enable early reporting of symptoms and increase uptake of breast screening by improved ability to adopt protective health behaviors.

Author Contribution Statement

Conceptualization: NA. Methodology: NA. Data curation: NA, VO. Formal analysis: NA, SOG. Investigation: NA, BO. Project administration: NA, Writing-original draft preparation: NA, Writing- review & editing: EA, NC. Supervision: NA. All authors read and approved the final manuscript.

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Ethics statement

Written informed consent was obtained from each participant. The study was conducted following the ethical principles stated in the "Declaration of Helsinki" and approved by Marmara University Clinical Research Ethics Committee (Date of approval: 05/05/2023, Protocol no: 09.2023.699).

Data availability

The data supporting the findings of this study are available within the article, further inquiries can be directed to the corresponding author.

Conflict of interest

The authors declare that they have no conflict of interest.

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