Impact of Health Literacy Interventions on Breast Cancer Knowledge and Health Literacy

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ABSTRACT

Background and Objectives: For women, health literacy level is an important factor directly affecting their health protection and development behaviors. The aim of this study was to evaluate the effect of health literacy interventions on breast cancer knowledge and health literacy breast cancer screening beliefs and behaviors.

Materials and Methods: This randomized controlled experimental study was conducted with women working in two different municipalities in Istanbul/Turkey. The study was completed with a total of 86 participants, 43 in the training group and 43 in the control group. The participants in the training group were given a comprehensive training program by the researchers in groups of 10-12 people in 3-hour sessions per day for 3 consecutive days.

Results: In the first and second measurements after the intervention, it was observed that the training group's Health Literacy Scale Total Score means increased compared to those of control group (training and control group post-test-1 scores, respectively; 98.395 ± 21.388 vs. 86.372 ± 24.752, p=0.018, increased by 13.95%; training and control group post-test-2 scores, respectively; 112.904 ± 10.178 vs. 87.581 ± 26.531, p<0.001, increased by 28.73%. Also, in the first and second measurements after the intervention, it was observed that the control group's Breast Cancer Screening Beliefs Scale Total Score means increased compared to those of the control group (training and control group post-test-1 scores, respectively; 77.862 ± 14.767 vs. 58.604 ± 16.001, p<0.001, increased by 32.75%; training and control group post-test-2 scores, respectively; 81.574 ± 12.478 vs. 58.917 ± 15.860, p<0.001, increased by 39.65%.

Conclusion: The comprehensive training program given to women, including what breast cancer is, its risk factors, etiology, early screening methods, treatment and breast self-examination, has positively changed their breast cancer screening beliefs, health literacy levels, and beliefs and practices regarding early diagnosis.

Paper Type: Research Article

Keywords: Breast Cancer, Training, Health Literacy, Cancer Screening Beliefs, Behavior.

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Introduction

According to GLOBOCAN 2022 data, female breast cancer accounted for 11.6% of all cancer types in the world and is the second most common cancer type after lung cancer, making it the leading cause of global cancer incidence. Breast cancer ranked fourth in cancer-related deaths worldwide, with an estimated 665,684 deaths in 2022. Breast cancer ranked first in women with a mortality incidence of 15.4% (1).

Diagnosing breast cancer in the early stages is critical to preserving and improving quality of life of patients. Several studies reveal that early diagnosis has a significant impact on breast cancer treatment success and prognosis (2–4). Especially in high-risk individuals, early diagnosis and treatment strategies are vital to prevent and reduce cancer-related deaths. Screening programs are widely used approaches worldwide for the early diagnosis of breast cancer (5). Core elements of these programs include clinical breast examination (CBE), breast self-examination (BSE), and mammography. These methods allow breast cancer to be detected and treated in the early stages, thus they increase chance of treatment success of patients and improve health outcomes (6, 7).

Although health level has generally improved thanks to medical and technological advances, global health inequalities persist (8). Increasing health literacy level is extremely important to eliminate these inequalities and improve health services (9, 10). Individuals having low or limited health literacy cannot accurately express their health status and cannot effectively cope with chronic diseases, leading to unnecessary emergency room visits, prolonged hospital stays, increasing healthcare costs (11, 12).

For women, health literacy level is an important factor directly affecting their health protection and development behaviors. As access to necessary information on health issues and the ability to use this information increase, the tendency to prevent diseases and provide early diagnosis also increases (13–15). In particular, low health literacy levels can lead to deficiencies in the use of preventive health services and limit screening programs for conditions such as cancer, which require critical early diagnosis. Individuals with low health literacy levels tend to prefer treatment-oriented health services rather than preventive health services (16). This can limit access to preventive medical interventions and lead to diseases being diagnosed at advanced stages. Therefore, increasing health literacy plays a critical role in improving health outcomes by strengthening women's health awareness and their ability to properly utilize health services (16, 17).

In a study on health literacy in Turkey, it was found that 24.5% of the population was in the ‘inadequate’ and 40.1% in the ‘problematic’ health literacy categories (18). In different countries, it has been reported that between 2% and 27% of the countries have inadequate health literacy level. In the USA, 66% of Hispanics, 58% of blacks, and 48% of Alaska natives were found to have limited health literacy (19). In a meta-analysis of 92 studies, a total of 84% of women were informed about breast cancer; however, only 51% of women were aware of breast cancer symptoms and 40% were aware of breast cancer risk factors (20).

It should be kept in mind that women, in particular, have a wide area of influence as a result of their roles as both mothers and wives when it comes to increasing health literacy level in a society. Therefore, to increase knowledge and awareness of women about health literacy, trainings should be organized. Approaches such as interactive workshops, peer education programs and digital health literacy training are health literacy interventions (17, 21, 22).

These trainings can provide positive developments in health in families, societies, and at the national level. Since knowledge also increases belief, increasing health literacy levels of women can strengthen their belief in healthy living. The beliefs and importance given to breast cancer and breast cancer screening of women whose health literacy levels are determined can also be evaluated in this context (21, 22).

There is no study result evaluating the effect of breast cancer screening education given to women on health literacy, breast cancer screening beliefs and behaviours. It is important to fill this gap in this field. This study conducted in the light of this information aimed to evaluate the effect of health literacy interventions on breast cancer knowledge and health literacy breast cancer screening beliefs and behaviors.

Materials and Methods

Study design and setting

This randomized controlled experimental study was conducted with women working in two different municipalities in Istanbul/Türkiye. The study was carried out in accordance with the "Consolidated Standards of Reporting of Trials (CONSORT)" Checklist. The clinical trial number for this study is "NCT05723237".

Sample and Participants

The study was carried out between March 2023 and June 2024 with the participation of women working in two different municipalities in Istanbul/Türkiye. The study was completed with a total of 86 participants, 43 in the training group and 43 in the control group. The women aged 18 and over, volunteering to participate in the study, and having no communication problems were included in the study. The women diagnosed with any cancer during or before the data collection dates were excluded from the study.

Sample size and randomization

The sample size was calculated using the G* Power 3.1.9.7 program (23). In the calculation, for the two-way mixed pattern variance analysis, the number of measurements was determined as 3 for a medium effect level (f = 0.25), 5% margin of error (α = 0.05), a correlation value of 0.5 between measurements, and 80% power (1-β), making a total of 44 people for each group of 22.

One hundred volunteer participants who met the inclusion criteria were assigned to groups using an online random number generator. We used computer-generated random numbers to assign participants to either the education or the control group (24). Seven participants from each group withdrew from the study for various reasons. The study was concluded with 43 participants in each group (Figure 1).

Data Collection Tools

To collect the study data, the Participant Information Form, Breast Cancer Screening

Beliefs Scale, and Health Literacy Scale were used.

Participant Information Form

The form consists of two parts. The first part includes age, gender, marital status, educational status, diagnosis, and treatment type of the participants. The second part includes questions assessing their status of receiving information about breast cancer, having a family member or relative diagnosed with breast cancer, and performing BSE. This form was developed by the researchers in line with the literature.

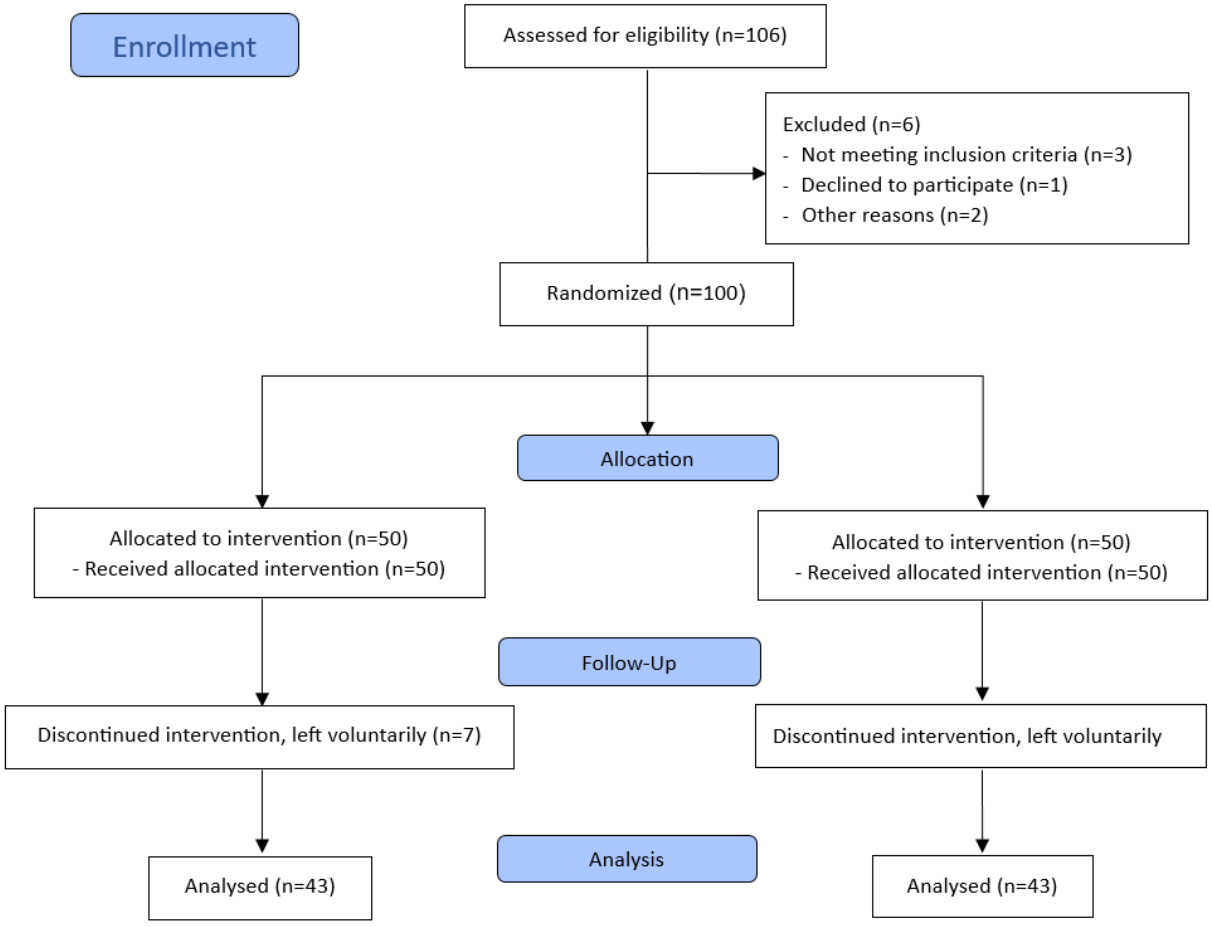

Fig. 1: Consort flow diagram

Breast Cancer Screening Beliefs Scale

The scale was developed by Kwok et al. in 2010 (25) to determine breast cancer screening beliefs of women. The validity and reliability study of the scale was conducted by Turkoğlu and Ssi Çelik (19). The scale consists of 13 items. Each item in the original scale was rated on a 5-point Likert-type scale ranging from “strongly agree” (1 point) to “strongly disagree” (5 points). The scale consists of three subscales: attitudes towards health screenings, knowledge and perceptions of breast cancer, and barriers to mammography screenings. The internal consistency coefficients (Cronbach's alpha) determined for the subscales of the original scale are between 0.76 and 0.87. The lowest score obtained from the scale is 0 while the highest score is 100.

The mean scores of the scale subscales being 65 and above indicates that screening beliefs have increased positively, knowledge levels have increased, and barriers to mammography screening have decreased (26). Cronbach's alpha coefficient for this study was determined as 0.835.

Health Literacy Scale

The scale was developed by Toçi et al. (2014) (27), and its Turkish validity and reliability studies were completed by Aras and Bayık Temel (2017) (28).

The scale consists of 25 items and four sub-factors: accessing information (five items), understanding (seven items), evaluating (eight items), and applying/using (five items). The lowest score that can be received from the scale is 25 while the highest score is 125. Low scores indicate that the health literacy status is inadequate, problematic and poor, while high scores indicate that it is adequate and very good. As the score increases, the health literacy level of the individual increases. The scale items are in a Likert structure as evaluated by the participants as "5: I have no difficulty, 4: I have little difficulty, 3: I have some difficulty, 2: I have a lot of difficulty, 1: I cannot do it/I have no ability/it is impossible". All items of the scale are positive. There is no reverse item in the scale. Cronbach alpha coefficient for this study was determined as 0.961.

Procedures

Before participating in the study, the patients who met the inclusion criteria were randomized into either the training or control group. Before being assigned to the groups, the participants were interviewed and informed about the study and their consent was obtained. At the beginning of the study, without any intervention, breast cancer screening beliefs were assessed with the Participant Information Form and Breast Cancer Screening Beliefs Scale, and health literacy levels were assessed with the Health Literacy Scale (Pre-test).

In order to be able to convey the information clearly to the participants in the training group and to be understandable to the participants, the participants were divided into 4 groups of 10-12 people to conduct the sessions. Following the pre-test session, a short break was given to allow the participants to split into groups and prepare for the training session. The participants in the training group were given a comprehensive training program by the researchers in groups of 10-12 people, including what breast cancer is, its risk factors, etiology, early screening methods, treatment and BSE, in 3-hour sessions per day for 3 consecutive days. Each session took 45-60 minutes. While preparing the content of the training presentation, presentations of the Ministry of Health and the Turkish Cancer Association were used. To ensure that the participants were able to understand the training materials, one or two participants from each group were encouraged to demonstrate and share what they had learned during each session. These individuals were randomly selected among the participants who were willing to perform the task. In the study, health literacy interventions were provided in sessions.

Interventions for Health Literacy Improvement

Session I Topic: Introduction, incidence of breast cancer, risk factors, signs and symptoms, early detection methods,

screening programme and prevention, treatment. Interactive workshops engaged participants in hands-on activities involving the interpretation and application of health information to real-life scenarios, using case studies specifically related to breast cancer.

Session II Topic: The importance of BSE and demonstration of the implementation of BSE on the model, BSE implementation techniques, and BSE implementation time were included. Discussions and role-playing to develop skills to understand and practice breast cancer.

Session III Topic: Women's practice of BSE on the model and on their own breasts. To be able to detect breast cancer findings on the model. In the groups receiving the training, questions were answered and participants' BSE experiences were listened to. Participants participated in BSE training interactively. The digital health literacy training taught participants how to navigate trusted online resources, assess their credibility and apply the information to personal health decisions. At the end of each session, a discussion environment was created and questions from the participants were answered. After the health literacy training was completed, written training materials were also given to the participants. While creating the written training materials, opinions of three experts were obtained and suggested corrections were made.

Immediately after the completion of the training (at the end of the 3rd training day), the participants were asked to fill out the Breast Cancer Screening Beliefs Scale and the Health Literacy Scale again (Post-test-1). The Breast Cancer Screening Beliefs Scale and the Health Literacy Scale were re-administered to the women in the training group at the end of the first month (on the 30th day) (Post-test-2). The participants in the control group were given only the training booklet; no explanation or training was given verbally. Alternative intervention was applied to the control group that mimicked the training experience without training content. However, after the data collection process was completed, the participants in the control group were also trained using the same method. Training in the study was provided by the researchers. The results were analysed by blinded evaluators and bias was tried to be minimised.

Data Analysis

Statistical Package for Social Science (SPSS) statistical package program was used to evaluate the study data. The conformity of the data to normal distribution was determined by the Kollmogorov Smirnov test and the Shapiro Wilk test, data were found to be normally distributed and the t-Test and chi-square analysis were used to evaluate the mean, standard deviation, and the difference between the independent groups. To determine within-group differences in measurements, the t-test was used for the dependent groups. All results were considered significant at $p<.05$ and a confidence interval of 95%. ANOVAs test in repeated measures were used for the between-group breast cancer screening beliefs scale and health literacy measurements. All measurement results were obtained by another researcher blinded to group allocation.

Ethical Considerations

In order to conduct the study, the approval was obtained from Istanbul Aydin University

Ethics Committee (Number 2022/20, 24.11.2022). Additionally, informed consent of the participants included in the study was obtained in writing form. The study was conducted in accordance with the Declaration of Helsinki.

Results

The post hoc power analysis of the study was calculated using the G* Power 3.1.9.7 programme (29). As a result of the calculation performed using the study data with a total sample size of 86, the power of the study was calculated as %82 power (1- β), with a 5% margin of error (α = 0.05).

The sociodemographic characteristics of the participants are presented in Table 1. When the mean age of the participants in the education (35.907±10.914) and control (36.069±10.522) groups was examined, it was seen that there was no significant difference between the groups (p>0.05). When the distribution of marital status, economic status, educational level, living place, and employment status of the participants was examined by the groups, no significant difference was found between the groups (p>0.05, Table 1). It was determined that the groups showed similar/homogeneous distribution in terms of all these characteristics (Table 1).

Table 1. Sociodemographic Characteristics of Participants

Variable	Training Group (n=43)		Control Group (n=43)		Test	p
Characteristics	Min.-Max.	$\bar{x}$ ± SD	Min.-Max.	$\bar{x}$ ±SD		
Age (years)	18–57	35.907±10.914	20-57	36.069±10.522	t:-.070	.944
-	n	%	n	%	$\chi 2$	p
Living place						
District	20	46.5	25	58.1	1.165	.388
Province	23	53.5	18	41.9		
Marital Status						
Single	27	62.8	22	51.2	.997	.384
Married	16	37.2	21	48.8		
Education Status						
Primary school dropout	1	2.3	1	2.3	.355	.986
Primary school	1	2.3	1	2.3		
Secondary school	2	4.7	1	2.3		
High School	16	37.2	16	37.2		
University and postgraduate	23	53.5	24	55.8		
Working status						
I work	31	72.1	33	76.7	.244	.805
I do not work	12	27.9	10	23.3		
Economic level						
Good	8	18.6	9	20.9	0.321	.852
Moderate	33	76.7	31	72.1		
Low	2	4.7	3	7.0		

When the distribution of the participants' status of receiving breast cancer information, the person from whom they received the information, the presence of a breast cancer diagnosis in close and distant relatives, performing BSE, performing it regularly and the frequency of performing it were examined by the groups, no significant

difference was detected between the groups (p>0.05, Table 2). It was determined that the groups showed similar/homogeneous distribution in terms of all these characteristics (Table 2).

Pre-test Breast Cancer Screening Beliefs Scale Total Score means of the training and control groups were similar (p>0.05).

Table 2. Comparison of Baseline Breast Cancer Knowledge and Practice of the Training and Control Groups

Characteristics	Training Group (n=43)		Control Group(n=43)		$\chi 2$	p
	n	%	n	%		
Have you received information about Breast Cancer?						
Yes	21	48.8	23	53.5	.186	.829
No	22	51.2	20	46.5		
Who did you get information from?						
Healthcare personnel	7	16.3	3	7.0	2.475	.480
Books, magazines, brochures	5	11.6	7	16.3		
Social media, TV	5	11.6	6	14.0		
Other	4	9.3	2	4.7		
Have any of your distant relatives been diagnosed with breast cancer?						
No	35	81.4	40	93.0	2/606	.195
Yes	8	18.6	3	7.0		
Have any of your first-degree relatives been diagnosed with breast cancer?						
No	36	83.7	38	88.4	.387	.757
Yes	7	16.3	5	11.6		
Have you ever heard of breast self-examination?						
Yes	33	76.7	37	86.0	2.019	.155
No	10	23.3	6	14.0		
Do you know how to do breast self-examination?						
Yes	30	69.8	38	88.4	4.497	.062
No	13	30.2	5	11.6		
How often should breast self-examination be practiced?						
One a week	11	25.6	8	18.6	4.126	.389
Once a month	23	53.5	31	72.1		
Every few months	4	9.3	1	2.3		
Once a year	4	9.3	2	4.7		
No need	1	2.3	1	2.3		
Do You Practice BSE regularly?						
Yes	18	41.9	20	46.5	.425	.522
No	25	58.1	23	53.5		
When do you practice a breast self-examination?						
5-7 days after menstruation	2	4.7	2	4.7	4.873	.301
During menstrual period	3	7.0	3	7.0		
Any day of the month	4	9.3	7	16.3		
When it comes to my mind	13	30.2	22	51.2		
Other	3	7.0	0	0		

χ^2: Pearson's Chi-Square test, Scores were significant at a 0.05 level

In the first and second measurements after the health literacy interventions, it was observed that the control group's Breast Cancer Screening Beliefs Scale Total Score

means increased compared to those of the control group (training and control group post-test-1 scores, respectively; 77.862 ± 14.767 vs. 58.604 ± 16.001; training and control group post-test-2 scores, respectively; 81.574 ± 12.478 vs. 58.917 ± 15.860) ($p<0.05$).

Additionally, in the first and second measurements after the health literacy interventions, it was observed that the training group's mean scores of the subscales of attitude towards health screenings, breast cancer knowledge and perceptions, and barriers to mammography screenings increased statistically significantly in the training group compared to those of the control group ($p<0.05$), (Table 3). Moreover, when the training group's Breast Cancer Screening Beliefs Scale Total Score means and all subscales score means were compared, it was determined that there was a statistically significant increase in the first and second measurements after the intervention compared to before the intervention ($p<0.05$). However, there was no statistically significant difference between the intra-group measurements in the control group ($p>0.05$), (Table 3).

When the mean Health Literacy Scale Scores of the groups were compared, the pre-test Health Literacy Scale Total Score means of the training and control groups were similar ($p>0.05$). In the first and second measurements after the intervention, it was observed that the training group's Health Literacy Scale Total Score means increased compared to those of control group (training and control group post-test-1 scores, respectively; 98.395 ± 21.388 vs. 86.372 ± 24.752; training and control group post-test-2 scores, respectively; 112.904 ± 10.178 vs. 87.581 ± 26.531) ($p<0.05$). Additionally, in the first and second measurements after the intervention, it was found that the training group's mean scores of the Access to Information, Understanding Information, and Evaluating Information subscales increased statistically significantly compared to those of the control group ($p<0.05$). While in the first measurement after the intervention the training group's mean scores of the Applying/Using subscale compared to those of the control group were similar ($p>0.05$), it was observed that there was a statistically significant increase in the second measurement after the intervention ($p<0.05$) (Table 4). Moreover, when the training group's intra-group Health Literacy Scale Total Score means and all subscale score means were compared, it was determined that there was a statistically significant increase in the first and second measurements after the intervention compared to before the health literacy interventions ($p<0.05$). However, there was no statistically significant difference between the intra-group measurements in the control group ($p>0.05$).

Discussion

The aim of this study was to evaluate the effect of health literacy interventions on breast cancer knowledge and health literacy breast cancer screening beliefs and behaviors. The breast cancer health literacy interventions given to women has positively changed their breast cancer screening beliefs, health literacy levels, and beliefs and practices regarding early diagnosis. In our study, it was observed that, in the first and second measurements after the health

literacy intervention, the training group's Breast Cancer Screening Beliefs Scale, attitude towards health screenings, Breast cancer knowledge and perceptions, and barriers to Mammography screening subscales total score means increased statistically significantly compared to those of the control group.

Table 3. Comparison of Cancer Screening Beliefs Scale Measurements of Groups

Measurements		Training Group (n=43)	ControlGroup (n=43)	t	p	95% Confidence Interval	
		$\bar{x}$ ±Sd	$\bar{x}$ ±Sd				
Breast Cancer Screening Beliefs Scale Total Score	Pre-test	59.105 ± 16.032	58.336 ± 17.101	.215	.830	-6.339	7.877
	Post-test-1	77.862 ± 14.767	58.604 ± 16.001	5.800	<0.001	12.654	25.860
	Post-test-2	81.574 ± 12.478	58.917 ± 15.860	7.362	<0.001	16.536	28.776
	F	65.220	0.805				
	p	<0.001	0.385				
	Partial eta squared	.608	.019				
Attitudes towards health screenings subscale	Pre-test	53.720 ± 24.615	44.970 ± 22.228	1.730	.087	-1.307	18.807
	Post-test-1	76.598 ± 19.436	45.552 ± 21.463	7.031	<0.001	22.265	39.827
	Post-test-2	78.924 ± 15.611	45.843 ±20.997	8.291	<0.001	25.146	41.016
	F	35.256	2.049				
	p	<0.001	.157				
	Partial eta squared	.456	.047				
Breast cancer knowledge and perceptions subscale	Pre-test	59.883 ± 20.559	62.645 ± 24.869	-.561	.576	-12.546	7.023
	Post-test-1	77.616 ± 16.379	61.627 ± 22.558	3.761	<0.001	7.534	24.442
	Post-test-2	81.104 ± 15.459	61.918 ± 22.485	4.611	<0.001	10.910	27.461
	F	42.624	.305				
	p	<0.001	.588				
	Partial eta squared	.504	.007				
Barriers to mammography screening subscale	Pre-test	62.790 ± 20.653	65.581 ± 22.472	-.600	.550	-12.046	6.465
	Post-test-1	79.069 ± 21.248	66.627 ± 22.166	2.657	.009	3.130	21.753
	Post-test-2	84.069 ± 14.890	64.418 ± 21.525	4.923	<0.001	11.713	27.588
	F	25.475	1.381				
	p	<0.001	.250				
	Partial eta squared	.378	.032				

F = ANOVAs test in repeated measures; t = t test independent groups; Scores were significant at a 0.05 level

Similar to our study results, in a quasi-experimental study, women were given a training module (16 times, 2 hours in groups of 12-13 people) that included normal breast, breast health awareness, breast cancer, and other screening methods. It was stated that, 6 and 12 months after the training, the mean differences in perceived sensitivity, self-efficacy, and health motivation were statistically significantly higher and BSE barriers scores improved in the intervention group compared to those of the control group (30).

Wu and Lee conducted a study with 944 women in 2019 to raise breast cancer awareness and encourage screening

practices for early detection. As a result of this study, following breast health training and screening programs, the participants reported greater intention to adhere to recommended breast cancer screening guidelines (31).

Table 4. Comparison of Health Literacy Scale Measurements of Groups

Measurements		Training Group (n=43)	ControlGroup (n=43)	t	p	95% Confidence Interval	
		$\bar{x}$ ±Sd	$\bar{x}$ ±Sd				
Health Literacy Scale Total Score	Pre-test	85.001 ± 24.438	88.814 ± 25.434	-.709	.480	-14.510	6.882
	Post-test-1	98.395 ± 21.388	86.372 ± 24.752	2.410	.018	2.102	21.943
	Post-test-2	112.904±10.178	87.581± 26.531	5.783	<0.001	16.614	34.032
	F	23.580	.119				
	p	<0.001	.761				
	Partial eta squared	.365	.003				
Access to Information subscale	Pre-test	17.209 ± 5.642	18.209 ± 6.006	-.796	.428	-3.499	1.499
	Post-test-1	20.395 ± 3.671	18.001 ± 5.855	2.273	.026	.299	4.491
	Post-test-2	22.697 ± 2.659	18.069 ± 5.933	4.667	<0.001	2.655	6.599
	F	19.447	.021				
	p	<0.001	.890				
	Partial eta squared	.316	0.001				
Understanding Information subscale	Pre-test	25.465 ± 6.730	25.418 ± 6.203	.033	.973	-2.729	2.822
	Post-test-1	28.325 ± 4.892	24.720 ± 5.917	3.078	.003	1.276	5.933
	Post-test-2	31.604 ± 3.566	25.465 ± 6.430	5.475	<0.001	3.909	8.369
	F	18.558	.246				
	p	<0.001	.662				
	Partial eta squared	.306	.006				
Evaluating Information subscale	Pre-test	26.093 ± 8.662	27.232 ± 9.382	-.585	.560	-5.012	2.733
	Post-test-1	31.907 ± 7.002	26.25 ± 9.291	3.185	.002	2.122	9.179
	Post-test-2	36.093 ± 3.753	27.186 ± 9.993	5.471	<0.001	5.669	12.144
	F	30.262	.169				
	p	<0.001	.716				
	Partial eta squared	.419	.004				
Using/ Applying of knowledge subscale	Pre-test	16.232 ± 5.340	17.953 ± 6.183	-1.381	.171	-4.198	.756
	Post-test-1	17.767 ± 7.425	17.395 ± 6.230	.252	.802	-2.567	3.311
	Post-test-2	22.357 ± 3.058	16.860 ± 5.701	5.520	<0.001	3.516	7.477
	F	16.834	.414				
	p	<0.001	.545				
	Partial eta squared	.291	.010				

F = ANOVAs test in repeated measures; t* = t test independent groups; Scores were significant at a 0.05 level

In a study conducted by Rabbani et al. in 2019 with 250 women in order to increase awareness of breast cancer and screening methods and to encourage health behavior change through a community-based training initiative, it was reported that there was a statistically significant difference in women's knowledge about breast cancer and BSE after the training intervention. In the same study, it was stated that the community-based training intervention was effective in increasing the awareness of the study population (32). If perceived benefits are high and perceived barriers are low, the use of early detection interventions increases. It is important to increase perceived benefits and minimize barriers to the adoption and implementation of positive health behaviors (33). Before the training, women had a lack of knowledge about early detection behaviors, and gaining the necessary knowledge with the training increased the perceived benefits of mammography, breast cancer screening beliefs, and breast cancer knowledge, while reducing perceived barriers. This result of our study is thought to be related to the increase in women's knowledge about breast cancer, risk factors, etiology, early screening methods, treatment and BSE.

An important finding of our study was that, in the first and second measurements after the intervention, the training group’s health literacy total score, access to information, understanding of information and evaluating information subscales mean scores increased compared to those of the control group. Previous studies found that cancer awareness and cancer knowledge are likely to be very helpful in increasing participation in cancer screenings (34–37). However, another study found that increased knowledge about cancer screening was not sufficient to convey self-efficacy and did not necessarily turn into practice (38). Similar to our study results, a randomized controlled experimental study conducted to examine the effectiveness of the training program in improving the quality of life and health status of breast cancer patients reported that the training program increased health literacy (39). There are other studies suggesting that limited or inadequate levels of health literacy may affect participation in cancer screening. As a result, health literacy still plays a key role in participation (17, 34). Health literacy is crucial in helping individuals make informed decisions about cancer screening by providing insight into the potential benefits, risks, alternative options, and uncertainties associated with undergoing a recommended cancer screening test. It also helps individuals understand the importance of early diagnosis and prevention of diseases. Adequate levels of health literacy enable individuals to understand and participate in a shared decision-making process with their physician (40). Increasing health literacy can facilitate patients' ability to make informed choices about treatment processes, participate effectively in strategies to manage their health, and communicate effectively with health care providers. This may contribute to improved health outcomes, particularly by increasing compliance with early screening programmes for diseases such as breast cancer. Maintaining healthy living habits depends on patients' ability to understand their health status, treatment options and the benefits of lifestyle changes (41, 42). In our study, improving health literacy may have

enabled patients to obtain health-related information more quickly, analyse this information accurately and make informed decisions. In our study, it was observed that there was no difference in the Appling/Using subscale scores of the Health Literacy Scale in the first measurement made immediately after the training, but in the second measurement made one month after the training intervention, it was seen that the Applying/Using subscale scores of the training group increased compared to those of the control group. It can be said that this result is due to the fact that after health literacy awareness is achieved through training, a certain amount of time must pass before it can be put into practice and before women can use it in their own health behaviors.

It is of great importance to implement health literacy interventions in order to facilitate more effective management of individual health. Educational workshops and seminars led by health professionals provide vital information about the disease, its risk factors, early screening methods and treatment options, which are tailored to the specific needs of different populations. The utilisation of digital resources, including online tools, websites, mobile applications and video content, facilitates the acquisition of knowledge about breast cancer and encourages active participation in the treatment process. Furthermore, peer support programmes that facilitate interaction between patients and survivors assist patients in adapting to the process by providing emotional support and practical information. Individual counselling with health professionals ensures that patients have a comprehensive understanding of their diagnosis and treatment plans, thereby enabling them to make more informed decisions. Community-based health literacy initiatives raise awareness about breast cancer, emphasise the importance of early screening and support informed decision-making by reaching a wide audience. Such multifaceted initiatives significantly enhance health literacy and encourage individuals to take proactive steps to manage their health (41–44).

Study Limitations and Strengths: The fact that study participants were from two municipalities and relatively young may limit generalisability. The follow-up assessment one month after the intervention may not capture long-term behaviour change to assess the sustainability of the effects of the training on health literacy and screening behaviours. Further studies may consider including behavioural measures such as actual participation in breast cancer screening to complement self-reported belief and knowledge assessments. These are the limitations of this study. Considering these limitations for future studies, measures can be taken to reduce the risk of bias. Throughout the study period, the researchers independently delivered the training and control protocols to the training and control groups, respectively, and a different third researcher, blinded to group allocation, performed the pre- and post-assessment analyses to avoid potential performance and detection biases.

Conclusions

The comprehensive training program given to women, including what breast cancer is, its risk factors, etiology, early screening

methods, treatment and BSE, has positively changed their breast cancer screening beliefs, health literacy levels, and beliefs and practices regarding early diagnosis. Early detection reduces breast cancer mortality. Public environments provide opportunities to influence the development of positive health behaviors. Nurses can contribute to the development of positive health behaviors towards breast cancer through training programs they can organize in these environments. The results of this study may be useful in improving early screening beliefs and health literacy of women. Health systems can increase participation rates in breast cancer screening by implementing not only education but also other interventions aimed at improving health literacy, both at the community level and within health facilities.

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Consent for publication: Not applicable

Ethics approval and consent to participate: For conducting the study, written ethics board approval numbered 2022/20 (Date: 24.11.2022) was obtained from the Istanbul Aydin University Ethics Board. The study was registered in Clinical Trials with the registration number "NCT05723237". Additionally, after informing the participants about the objective and method of the study, their verbal and written consent was received. This study was conducted following the principles of the Declaration of Helsinki.

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References

1- Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2024 May 4; 74(3):229-63. https://doi.org/10.3322/caac.21834 PMid: 38572751.

2- Coleman C. Early Detection and Screening for Breast Cancer. Semin Oncol Nurs. 2017 May; 33(2):141-55. https://doi.org/10.1016/j.soncn.2017.02.009 PMid: 28365057.

3- Khrouf S, Letaief Ksontini F, Ayadi M, Belhaj Ali Rais H, Mezlini A. Breast cancer screening: a dividing controversy. Tunis Med. 2020 Jan; 98(1):22-34.

4- Nielsen S, Narayan AK. Breast Cancer Screening Modalities, Recommendations, and Novel Imaging Techniques. Surgical Clinics of North America. 2023 Feb; 103(1):63-82. https://doi.org/10.1016/j.suc.2022.08.004 PMid: 36410354.

5- Rahman WT, Helvie MA. Breast cancer screening in average and high-risk women. Best Pract Res Clin Obstet Gynaecol. 2022 Sep; 83:3-14. https://doi.org/10.1016/j.bpobgyn.2021.11.007 PMid: 34903436.

6- Mann RM, Athanasiou A, Baltzer PAT, Camps-Herrero J, Clauser P, Fallenberg EM, et al. Breast cancer screening

in women with extremely dense breasts recommendations of the European Society of Breast Imaging (EUSOBI). Eur Radiol. 2022 Jun 8; 32(6):4036-45. https://doi.org/10.1007/s00330-022-08617-6 PMid: 35258677 PMCid: PMC9122856.

7- Sarker R, Islam MdS, Moonajilin MstS, Rahman M, Gesesew HA, Ward PR. Effectiveness of educational intervention on breast cancer knowledge and breast self-examination among female university students in Bangladesh: a pre-post quasi-experimental study. BMC Cancer. 2022 Dec 22; 22(1):199. https://doi.org/10.1186/s12885-022-09311-y PMid: 35193526 PMCid: PMC8862195.

8- Gkiouleka A, Wong G, Sowden S, Bambra C, Siersbaek R, Manji S, et al. Reducing health inequalities through general practice. Lancet Public Health. 2023 Jun; 8(6):e463-72. https://doi.org/10.1016/S2468-2667 (23) 00093-2 PMid: 37244675.

9- Batterham RW, Hawkins M, Collins PA, Buchbinder R, Osborne RH. Health literacy: applying current concepts to improve health services and reduce health inequalities. Public Health. 2016 Mar; 132:3-12. https://doi.org/10.1016/j.puhe.2016.01.001 PMid: 26872738.

10- Juvinyà-Canal D, Suñer-Soler R, Boixadós Porquet A, Vernay M, Blanchard H, Bertran-Noguer C. Health Literacy among Health and Social Care University Students. Int J Environ Res Public Health. 2020 Mar 27; 17(7):2273. https://doi.org/10.3390/ijerph17072273 PMid: 32230985 PMCid: PMC7177671.

11- Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low Health Literacy and Health Outcomes: An Updated Systematic Review. Ann Intern Med. 2011 Jul 19; 155(2):97. https://doi.org/10.7326/0003-4819-155-2-201107190-00005 PMid: 21768583.

12- Xie L, Zhang S, Xin M, Zhu M, Lu W, Mo PKH. Electronic health literacy and health-related outcomes among older adults: A systematic review. Prev Med (Baltim). 2022 Apr; 157:106997. https://doi.org/10.1016/j.ypmed.2022.106997 PMid: 35189203.

13- Kilfoyle KA, Vitko M, O'Conor R, Bailey SC. Health Literacy and Women's Reproductive Health: A Systematic Review. J Womens Health. 2016 Dec; 25(12):1237-55. https://doi.org/10.1089/jwh.2016.5810 PMid: 27564780 PMCid: PMC5175428.

14- Moore L, Hayes A. Cancer Health Literacy in Black Women with Breast Cancer: A Comprehensive Literature Review. Clin J Oncol Nurs. 2023 Oct 1.

15- Ayaz Alyaka S, Ozturk FO. Health Literacy Levels of Women and Related Factors in Turkey. Journal of Nursing Research. 2021 Dec; 29(6):e180. https://doi.org/10. 1097/JNR.0000000000000452 PMid: 34380974.

16- Huang CH, Lo YJ, Kuo KM, Lu IC, Wu H, Hsieh MT, et al. Health literacy and cancer screening behaviors among community-dwelling female adults in Taiwan. Women Health. 2021 May 28; 61(5):408-19. https://doi.org/10.1080/03630242.2021.1917477 PMid: 33902386.

17- Oldach BR, Katz ML. Health literacy and cancer screening: A systematic review. Patient Educ Couns. 2014 Feb; 94(2):149-57. https://doi.org/10.1016/j.pec.2013.10.001 PMid: 24207115 PMCid: PMC3946869.

18- Çelikkanat Ş, Akbaş M, Gökyıldız Sürücü Ş. Yetişkin Kadınların Sağlık Okuryazarlığı Düzeylerinin Belirlenmesi. Social Sciences Studies Journal. 2020 Jan 1; 6(54):19-27. https://doi.org/10.26449/sssj.2009.

19- Hersh L, Salzman B, Snyderman D. Health Literacy in Primary Care Practice. Am Fam Physician. 2015 Jul 15; 92(2):118-24.

20- Wang YJ, Wang F, Yu LX, Xiang YJ, Zhou F, Huang SY, et al. Worldwide review with meta-analysis of women's awareness about breast cancer. Patient Educ Couns. 2022 Jul; 105(7):1818-27. https://doi.org/10.1016/j.pec.2021.12.012 PMid: 34952749.

21- Luque JS, Logan A, Soulen G, Armeson KE, Garrett DM, Davila CB, et al. Systematic Review of Mammography Screening Educational Interventions for Hispanic Women in the United States. Journal of Cancer Education. 2019 Jun 12; 34(3):412-22. https://doi.org/10.1007/s13187-018-1321-0 PMid: 29330754 PMCid: PMC6043417.

22- Berger S, Huang CC, Rubin CL. The Role of Community Education in Increasing Knowledge of Breast Health and Cancer: Findings from the Asian Breast Cancer Project in Boston, Massachusetts. Journal of Cancer Education. 2017 Mar 15; 32(1):16-23. https://doi.org/10.1007/s13187-015-0911-3 PMid: 26373418 PMCid: PMC6528474.

23- Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods. 2007 May; 39(2):175-91. https://doi.org/10.3758/BF03193146 PMid: 17695343

24- Arifin WN. Random sampling and allocation using SPSS. Education in Medicine Journal. 2012 May 7; 4(1). https://doi.org/10.5959/eimj.v4i1.4.

25- Kwok C, Fethney J, White K. Chinese Breast Cancer Screening Beliefs Questionnaire: development and psychometric testing with Chinese-Australian women. J Adv Nurs. 2010 Jan 9; 66(1):191-200. https://doi.org/10.1111/j.1365-2648.2009.05177.x PMid: 20423444.

26- Türkoğlu N, Sis Çelik A. Validity and Reliability of the Turkish Version of the Breast Cancer Screening Beliefs Scale. Eur J Breast Health. 2021 Apr 1; 17(2):116-22. https://doi.org/10.4274/ejbh.galenos.2020.5565 PMid: 33870110 PMCid: PMC8025720.

27- Toci E, Burazeri G, Sorensen K, Kamberi H, Brand H. Concurrent validation of two key health literacy instruments in a South Eastern European population. The European Journal of Public Health. 2015 Jun 1; 25(3):482-6. https://doi.org/10.1093/eurpub/cku190 PMid: 25395401.

28- Aras Z, Bayık Temel A. Sağlık Okuryazarlığı Ölçeğinin Türkçe Formunun Geçerlilik Ve Güvenirliğinin Değerlendirilmesi. Florence Nightingale Hemşirelik Dergisi. 2017 Jul 14; 25(2):85. https://doi.org/10.17672/fnhd.94626.

29- Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: A flexible statistical power analysis program for the social,

behavioral, and biomedical sciences. Behav Res Methods. 2007 May; 39(2):175-91. https://doi.org/10.3758/BF03193146 PMid: 17695343.

30- Akhtari-Zavare M, Juni MH, Said SM, Ismail IZ, Latiff LA, Ataollahi Eshkoor S. Result of randomized control trial to increase breast health awareness among young females in Malaysia. BMC Public Health. 2016 Dec 8; 16(1):738. https://doi.org/10.1186/s12889-016-3414-1 PMid: 27502284 PMCid: PMC4977616.

31- Wu TY, Lee J. Promoting Breast Cancer Awareness and Screening Practices for Early Detection in Low-Resource Settings. Eur J Breast Health. 2019 Jan 7; 15(1):18-25. https://doi.org/10.5152/ejbh.2018.4305 PMid: 30816360 PMCid: PMC6385717.

32- Rabbani SA, Salem Khalaf Al Marzooqi AM, Mousa Srouji AE, Hamad EA, Mahtab A. Impact of community-based educational intervention on breast cancer and its screening awareness among Arab women in the United Arab Emirates. Clin Epidemiol Glob Health. 2019 Dec; 7(4):600-5. https://doi.org/10.1016/j.cegh.2019.01.008.

33- Gözüm S, Karayurt Ö, Kav S, Platin N. Effectiveness of Peer Education for Breast Cancer Screening and Health Beliefs in Eastern Turkey. Cancer Nurs. 2010 May; 33(3):213-20. https://doi.org/10.1097/NCC.0b013e3181cb40a8 PMid: 20357655.

34- Baccolini V, Isonne C, Salerno C, Giffi M, Migliara G, Mazzalai E, et al. The association between adherence to cancer screening programs and health literacy: A systematic review and meta-analysis. Prev Med (Baltim). 2022 Feb; 155:106927. https://doi.org/10.1016/j.ypmed.2021.106927 PMid: 34954244.

35- Jung SM, Jo HS, Oh HW. Internal Motivation, Perceived Health Competency, and Health Literacy in Primary and Secondary Cancer Prevention. Asian Pac J Cancer Prev. 2016 Dec 1; 17(12):5127-32.

36- Pagán JA, Brown CJ, Asch DA, Armstrong K, Bastida E, Guerra C. Health Literacy and Breast Cancer Screening among Mexican American Women in South Texas. Journal of Cancer Education. 2012 Mar 15; 27(1):132-7. https://doi.org/10.1007/s13187-011-0239-6 PMid: 21573944.

37- Yılmazel G. Health Literacy, Mammogram Awareness and Screening among Tertiary Hospital Women Patients. Journal of Cancer Education. 2018 Feb 28; 33(1):89-94. https://doi.org/10.1007/s13187-016-1053-y PMid: 27236309.

38- Ooi C, Hanafi N, Liew S. Knowledge and practice of colorectal cancer screening in an urban setting: cross-sectional survey of primary care physicians in government clinics in Malaysia. Singapore Med J. 2019 Nov; 60(11):596-604. https://doi.org/10.11622/smedj.2019011 PMid: 30644527 PMCid: PMC6875808.

39- Huang SC, Kuo SF, Tsai PS, Tsai CY, Chen SS, Lin CY, et al. Effectiveness of Tailored Rehabilitation Education in Improving the Health Literacy and Health Status of Postoperative Patients With Breast Cancer. Cancer Nurs. 2020 Jan; 43(1):E38-46. https://doi.org/10.1097/NCC.0000000000000665 PMid: 31805025.

40- Damiani G, Federico B, Basso D, Ronconi A, Bianchi CBNA, Anzellotti GM, et al. Socioeconomic disparities in the uptake of breast and cervical cancer screening in Italy: a cross sectional study. BMC Public Health. 2012 Dec 3; 12(1):99. https://doi.org/10.1186/1471-2458-12-99 PMid: 22305108 PMCid: PMC3314546.

41- Karami M, Ashtarian H, Rajati M, Hamzeh B, Rajati F. The effect of health literacy intervention on adherence to medication of uncontrolled hypertensive patients using the M-health. BMC Med Inform Decis Mak. 2023 Dec 15; 23(1):289. https://doi.org/10.1186/s12911-023-02393-z PMid: 38102648 PMCid: PMC10724893.

42- Zanobini P, Bonaccorsi G, Giusti M, Minardi V, Possenti V, Masocco M, et al. Health literacy and breast cancer screening adherence: results from the population of Tuscany, Italy. Health Promot Int. 2023 Dec 1; 38(6). https://doi.org/10.1093/heapro/daad177 PMid: 38146742.

43- Meng K, Heß V, Schulte T, Faller H, Schuler M. Health literacy bei onkologischen Rehabilitanden und deren Relevanz für den subjektiven Rehabilitationsverlauf. Rehabilitation (Stuttg). 2021 Apr 15; 60(02):102-9. https://doi.org/10.1055/a-1361-4072 PMid: 33858019.

44- Keim-Malpass J, Doede A, Camacho F, Kennedy C, Showalter SL. Impact of patient health literacy on surgical treatment of breast cancer. Breast J. 2018 Jul; 24(4):633-6. https://doi.org/10.1111/tbj.13011 PMid: 29537708.