Al-Turath Journal of Nursing
Open Access Journal
ISSN Print: 3080-5759
Online : 3080-5767

Effectiveness of the health-belief model-based intervention in improving the knowledge, practices and awareness among females with breast lumps

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KEYWORDS
Breast cancer, Breast self-examination, Health education, Belief, Malaysia

Received: 12/10/2024
Accepted: 24/11/2024
Available online: 31/12/2024

ABSTRACT

Breast cancer is the most common cancer and the second principal cause of cancer deaths in women worldwide as well as in Iraq. Breast self-examination has a role in raising breast cancer awareness among women and educational programs play an important role in breast cancer preventive behaviour. The aim of this study is to develop, implement and evaluate the effectiveness of Breast Health Awareness program based on health belief model on knowledge of breast cancer and breast-self-examination and BSE practice among female students in Iraq. A single-blind randomized controlled trial was carried out among 162 female undergraduate students for three months in Al-Turath University in Iraq. Participants were randomized to either the intervention group or the control group. The educational program was delivered to the intervention group. The outcome measures were assessed at baseline, pre, and post one month after implementing the health educational program. Chi-square, independent samples t-test and two-way repeated measures ANOVA (GLM) were conducted in the course of the data analyses. Mean scores of knowledge on breast cancer ($p<0.003$), knowledge on breast self-examination ($p<0.001$), benefits of BSE ($p<0.00$), barrier of BSE (0.01) and confidence of BSE practice ($p<0.00$) in the intervention group had significant differences in comparison with those of the control group 6 and 12 months after the intervention. Also, among those who never practiced BSE at baseline, frequency of BSE practice increased pre and post one month after the intervention ($p<0.05$). The Breast Health Awareness program based on health the belief model had a positive effect on knowledge of breast cancer and breast self-examination and practice of BSE among females in Al-Turath University.

DOI: https://doi.org/10.63964/ATJN.2024.1.1

INTRODUCTION

Breast cancer is a significant health concern in Iraq, as in many other parts of the world. It is the most commonly diagnosed cancer among Iraqi women, accounting for approximately one-third of all reported cancer cases among females in the country. Many cases are diagnosed at advanced stages, which poses challenges for effective treatment and outcomes [1]. The incidence rate of breast cancer in Iraq has been rising, partially due to improved diagnostic facilities and greater awareness but also influenced by environmental and lifestyle factors. Challenges in cancer control in Iraq are compounded by limited healthcare infrastructure, economic hardships, and the aftermath of conflicts, which have strained the healthcare system. Efforts have been made to promote early detection and treatment through awareness campaigns and healthcare initiatives. However, substantial disparities remain in access to screening programs, particularly in rural areas compared to urban centres [2]. Educating women about the signs and symptoms of breast cancer empowers them to seek medical advice promptly, facilitating early diagnosis and treatment. Early detection examinations for breast cancer (BC) play a crucial role in saving thousands of lives annually and significantly enhance the likelihood of early diagnosis and successful treatment. Various methods for breast cancer screening (BCS) have been evaluated, including breast self-examination (BSE), clinical breast examination (CBE), and mammography. Epidemiological studies conducted on diverse community samples have consistently indicated that the rate of BCS practice remains low in many countries [3, 4]. Theoretically, various models and frameworks have been employed to understand the early detection of breast cancer (BC). One widely used model is the Health Belief Model (HBM), which serves as the foundation for numerous educational interventions. The HBM has demonstrated effectiveness in improving factors that influence breast cancer screening (BCS) behaviors [5, 6]. This model highlights that health-related threats can negatively impact women's health behaviors. For example, women who perceive themselves as vulnerable to BC are more likely to engage in breast self-examination (BSE). Additionally, women who possess strong health motivation, recognize the benefits of screening, and face fewer barriers to exams are more likely to perform BSE [7]. Furthermore, the model suggests that increased knowledge of BCS practices is positively associated with the likelihood of engaging in these behaviors [8]. Many studies on BCS performance have been implemented among women worldwide. Such studies have incorporated certain women groups such as female university students, female workers, women attending health care centers, or female residents [9,10].

Nevertheless, only a few studies have been conducted on female teachers regarding breast cancer screening (BCS) practice in Iraq. For example, although some studies have examined BCS practices among teachers in other countries, there is limited research on this topic among Iraqi female school teachers. As teachers, they are considered role models and key figures in education. They could play a crucial role in offering health education and promoting healthy behaviors related to BCS practices, influencing future generations. Additionally, many of these teachers may return to their communities in the future, allowing them to spread the knowledge they have gained in this area. Therefore, developing and implementing a breast cancer education program among Iraqi female teachers could be an effective way to reduce breast cancer mortality rates within this group and create educational programs for broader communities [11, 12,13]. This study aims to examine the effectiveness of the HBM-based intervention module among female university students with a positive lump at Al-Turath University in increasing their awareness, knowledge, and practices toward breast abnormalities. It is hypothesized that starting from baseline until the three months assessment, women in the experimental group will gain the following:

i. An increase in the proportion of their BCS uptake
ii. An increase in their BC knowledge scores
iii. An improvement in their BC health beliefs (perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers, health motivation, confidence).

2. MATERIALS AND METHODS

2.1. STUDY DESIGN

Females' university students with positive lumps at Al-Turath University participated in this single-blinded randomized control experiment. Three intervals were used to perform the study (baseline, 1- months intervention and 1-month follow-up). The participants were randomized into either the intervention group, which received the HBM-based intervention module on knowledge and practice toward BSE or the control group which was on the

waiting list. The CONSORT Statement guided the design of this study [14].

2.2 ELIGIBILITY CRITERIA

The inclusion criteria for Females' university students into consideration the following requirements: (1) such participants must only be Iraqi female at Al-Turath University; (2) participants are aged 18 years old or older; (3) they signa consent form to take part in the study. The exclusion criteria for Females' university students include (1) female with a history of breast surgery, (2) females who are lactating or pregnant.

RECRUITMENT AND RANDOMIZATION

The eligible participants were assigned randomly into control and intervention groups from the sampling frame by using the random number table. Matriculation numbers were used to identify the participants in our sampling frame and unique code numbers were given to each participant in both groups and used by them in the questionnaire in order to maintain confidentiality. Figure 1 shows the flow diagram of the study participants in the control and intervention groups.

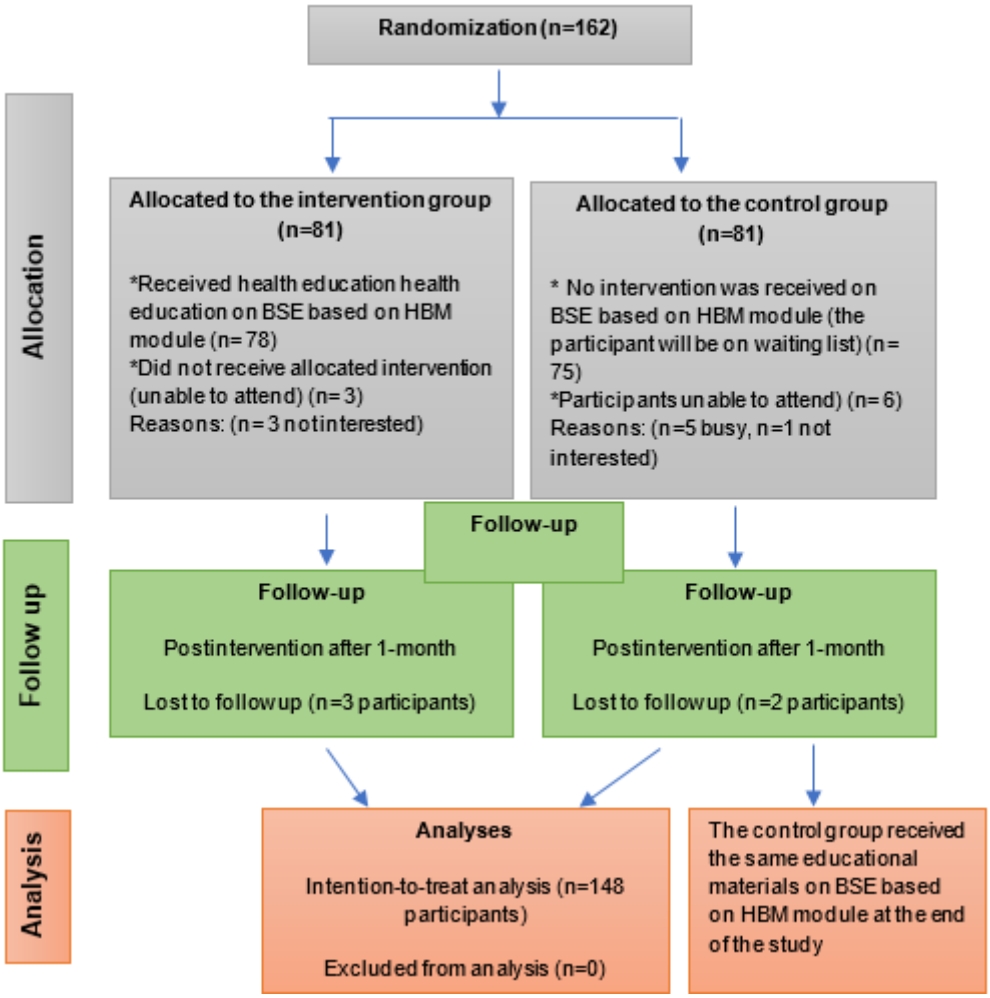

Figure 1: CONSORT Flow Chart of the Intervention and Control Groups

DEVELOPMENT OF INTERVENTION

A customized questionnaire made up of questions taken from Victoria L. Champion (1999) modified with the author's permission was used to assess participants' knowledge of BC and BCS procedures. The content of the education module includes the normal breast, breast health awareness, breast cancer, and other screening methods. In addition to this information, participants were trained on how to practice BSE on a silicon breast model with multiple implanted lumps. The module was developed based on the objective of this study and peer reviewed through a series of meetings with members of the project team. The final content of the educational module and steps of the BSE practice on a silicon breast model were tested among the 30 female

students other than the actual study participants for acceptability and comprehension. Table 1 summarises the topics covered in the educational module on breast health awareness.

2.3. INTERVENTION

The intervention group will be introduced to an educational intervention on BCS. This intervention is grounded in the HBM and developed based on the American Cancer Society [15], American Congress of Obstetricians and Gynecologists [16], and the International Agency for Research on Cancer (IARC) [17]. Many educational interventions, being grounded in the HBM, have shown improvement in the practice of BCS behaviors on the part of relevant participants. The educational intervention module uses six constructs of the HBM: perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers, health motivation, confidence. This intervention was prepared and designed to bridge the gap of BC knowledge and to modify beliefs related to BC. Table 1 gives an outline of the educational intervention on BCS along with the application of the HBM concepts in the educational intervention. Six HBM constructs perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers, confidence, and motivation are used in the educational intervention module. To close the information gap regarding BC and alter BC-related perceptions, this intervention was developed and created. A summary of the E-educational intervention on BCS and how the HBM ideas were used in the educational intervention is provided in Table 1.

Table 1: Tabular illustration of the educational intervention materials by constructed and contents

Sessions	Topics	HBM Constructs	Area of Target	Intervention
1. The normal breast	- Structure of the breast - Breast development	Perceived susceptibility	Knowledge on BC	Video
2. Knowledge of BC	- What is BC - Symptoms of BC - BC stages - BC risk factors	Perceived susceptibility Perceived seriousness	Knowledge on BC	Video
3. BCS	- MMG - CBE - U/S	Perceived benefits Perceived barriers Health motivation (Cue to Action)	Knowledge & Beliefs on BCS	Video
4. Breast health awareness	- Breast health awareness - BSE performance	Perceived benefits Perceived barriers Health motivation (Cue to Action) Confidence	- Knowledge & Beliefs on breast health awareness -Practice of BSE	-BSE film
5. Practice	Practice of BSE	Perceived benefits Perceived barriers Health motivation (Cue to Action) Confidence	Practice of BSE	Practice on a silicon model -BSE film

The 20-minute sessions for one day comprise the E-educational intervention. Although five sessions were planned. The duration of the intervention was the same for everyone, even if the date of implementation varied depending on the participants. The procedures that must be carried out are broken down as follows:

a. Women employed in our research were offered the choice to participate in our E-education intervention. After sending

participants a video over WhatsApp, we posed a question and asked them to respond. Then, each participant received a personal upload of the brief videos. after watching each of the short videos and responding to the questions. We instructed everyone to do BSE and complete the performance form.

b. Messages were sent out a month after the E-education intervention session ended, reminding the group to do self-examination one more each week. One month after the post-test, messages were discontinued
c. A three-minute short film regarding BSE performance from Bahagian Pembangunan Kesihatan Keluarga's YouTube channel, along with a second, three-minute testimonial from a BC survivor who discussed the value of BCS and early identification while sharing her personal experience with BC. The overall anatomy and physiology of a healthy breast, BC knowledge, learning about several BCS methods, and the significance of breast health awareness were all topics covered in these materials.
d. Within 10 minutes, a training session was completed, which included practicing BSE on a silicone breast model with many lumps implanted. Participants have learned search strategy, palpation technique, and indicators of BC that should be recognized while examining the breast during this segment.
e. A softcopy of a brief film on BSE performance was delivered via WhatsApp at the conclusion of the online educational session. These resources were thought to reinforce the lessons and serve as a reminder to participants of the value of BCS practice and monthly BSE performance.
f. Participants were given a booklet comprising all the program-related material and a BC bottom badge at the baseline.

Additionally, participants in the control group were only instructed to complete the BSE self-practice form for one month throughout the study period; no teaching was provided to them. They, however, obtain similar BCS education materials at the end of the trial and completed the same baseline and intervention-related questionnaires.

OUTCOME MEASURE

The primary outcome of this study was the BSE practice. The secondary outcomes were knowledge of BSE and breast cancer as well as the health belief model scales. To evaluate these outcomes, data were collected via a self-administrative Arabic-language questionnaire which was developed by the researchers based on the previous research publications [8, 9, 10]. The content validity was evaluated by three experts from the Department of Radiology at Al Turath University to examine each item for congruence by estimating the Content Validity Index (CVI) as being over 0.80 (acceptable), while face validity was verified by discussing the items individually with 10 students. The reliability of the questionnaire was determined by using the test-retest reliability conducted among 30 female undergraduate students at Al Turath University that were not included in the main study. Data were collected using the following questionnaires: (1) Socio-demographic data form: Socio-demographic data consisted of age, religious, marital status, and family cancer history. (2) Knowledge data form: Participants' breast cancer knowledge was assessed using 35 items concerning their knowledge of BSE (10 items) and breast cancer (25 items). The 25 items on the knowledge of breast cancer included general facts of breast cancer (5 items), knowledge of symptoms of breast cancer (6 items), risk factors (10 items), as well as CBE and mammography (4 items). The items were derived from the literature [25, 29, 20]. Responses were measured using the nominal scale of "True", "False" and "I do not know". Respondents were given one point for each correct answer and zero for each wrong or unsure response. For the current study, the kappa value for categorical data was ranged between general facts of breast cancer (0.70–0.80), risk factors in breast cancer (0.52–0.97), symptom of breast cancer (0.70–0.97), CBE and mammography (0.80–0.90) and knowledge of BSE (0.70–0.87). (3) Champion's Health Belief Model Scale: The third part evaluated health beliefs of the participants by using the Champion's Health Belief Model Scale [8]. It consists of 40 questions related to the seriousness and susceptibility of breast cancer, barrier-BSE, benefit-BSE, the confidence of doing BSE and health motivation using a five-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5) responses. Acceptable intra-class correlation coefficient (ICC) values were

recorded for seriousness (0.89–0.96), susceptibility (0.79– 0.86), benefit (0.85–0.98), barrier (0.70–0.80), confidence (0.88–0.97) and motivation (0.92–0.98). These values were consistent with the previous studies in Malaysia [8]. (4) BSE practice and frequency: The last part of the questionnaire assessed the BSE practice by self-reported responses to two questions which included whether they had ever carried out BSE (yes/no) and the frequency of doing BSE ("once a month", "occasionally", "others" and "never"). A woman who performed BSE once a month was categorized as practicing "regular BSE" while a woman who performed occasionally or others was categorized as practicing "irregular BSE". The Kappa value for the current study ranged from 0.82–0.85 [BSE practice (K = 0.82) and frequency of BSE (K = 0.85)].

SAMPLE SIZE ESTIMATION

Using the two proportions formula, the minimal sample size needed to test the study's hypotheses was determined [18]. $$n = \frac{Z_{1-\alpha/2}\sqrt{2\bar{P}(1-\bar{P})} + Z_{1-\beta}\sqrt{P1(1-P1) + P2(1-P2)}}{(P1-P2)}^2$$

In order to achieve 80 % power to detect a group difference of 13 % with a two-sided 5 % significance level, 81 female students in each arm were required. On the basis of a predicted attrition rate of 20 %, the goal was to randomly assign 100 female students in each intervention and control groups. Of those who initially agreed to participate in the study, 26 dropped out for variety of reasons (e.g. medical illness, unwillingness to participate, moving and schedule conflict). As a result, 81 female students in the intervention group and 81 female students in the control group completed the study in 3 months (Fig. 1).

STATISTICAL ANALYSIS

The data were analysed using the Statistical Package for Social Science (SPSS) version 25.0. The outcome of interest was the BSE practice, and knowledge of breast cancer, BSE and health beliefs. The Socio-demographic characteristics of the intervention and control groups were described by using frequency, percentage, mean and standard deviation. The comparison at baseline between the intervention and control groups was made by using the appropriate inferential tests such as the Chi-square and independent samples t-test. The two-way repeated measures ANOVA (GLM) was used to evaluate the changes in the mean score of breast cancer and BSE knowledge and belief between the control and intervention groups at baseline, as well as 1 and 1 months after the intervention. The cut-off level for alpha was set at 0.05.

RESULTS

The sociodemographic details of the study's respondents were shown in Table 2. In this study, the respondents' ages ranged from 19 to 59 years old, with a mean age of 31.80± 9.44years old and a mean menarche age of 12.35 ±1.24 years old. Additionally, this study discovered that 39 (24.2%) respondents had a history of breast cancer in their families. Out of the 19, the majority of respondents (48.7%) said that they had other family members who had breast cancer, followed by their mother 43.6%.

Table 1 : Characteristics of socio-demographic and other factors at baseline (N=162)

Variables	Mean±SD	Frequency (N)	Percentage %
Age (years)	31.80±9.44		
(min-max)	(19-59)		
Marital status			
Single		101	62.3
Married		52	32.1
Divorced/Separated		6	3.7
Widowed		3	1.9
Family History of BC			
Yes		39	24.1
No		123	75.9
Family Members			
Mother		17	43.6
Sister		3	7.7
Others		19	48.7
Period Age(years)	12.35±1.24		
(Min-max)	(8-16)		

The baseline screening uptake levels across the study groups were compared using an independent t-test for continuous variables and a Chi-square test for categorical data. According to Table 3's findings, the only significant difference between the research groups was how well BSE was performed P<0.014. Pre-intervention BSE uptake is compared between the study groups in Table 4 using a t-test for continuous variables and a Chi-square test for categorical variables. This table clearly shows that there was a significant difference between the two groups in terms of BSE frequency and BSE performing time, P<0.01 and P<0.02, respectively. Only 25.3% in the control group reported performing breast self-examination, compared to 43.6% in the intervention group. In the intervention group, nearly all of those who conducted BSE 68.4% compared to 71.0% in the control group reported doing so at different frequencies. Only 14.0% in the control group reported the best time to practice BSE was 1-2 days after starting menstruation, while 35.0 % in the intervention group reported the same. However, there was no significant difference between the two groups. P>0.05.

The Mann-Whitney U test for not normally distributed data was used to see if there were differences between the research groups' pre-intervention knowledge and beliefs about BC and BSE. According to Table 5's findings, there was no statistical difference in the study groups' knowledge scores or the findings of any of the belief subscales on the BC or BSE. The awareness of BC risk factors and confidence in BSE significantly differed between the two groups P<0.05.

Table 3: Comparison of participants' BSE performance uptake in the intervention and control groups at baseline

Variables	**Intervention group**	**Control group**	**Test Statistic**	**P value**
Performing BSE	**(N=81) N(%)**	**(N=81) N(%)**		
Yes	14(17.9)	26(32.10)	χ^2 = 12.506	0.01*
No	42(50.0)	29(35.80)		
Sometimes	25(32.1)	23(28.40)		
BSE frequency	**(N=64) N(%)**	**(N=49) N(%)**		
At least once a week	2(3.13)	1(2.04)	χ^2=5.878	0.92
At least once a month	7(10.94)	14(28.57)		
Once in 2-3 months	1(1.56)	9(18.37)		
Occasionally	21(32.81)	18(36.73)		
None	33(51.56)	7(14.29)		
BSE Best time	**(N=41) N(%)**	**(N=49) N(%)**	χ^2=4.708	0.58
Before menstruation period	4(9.76)	1(2.04)		
1-2 days after starting menstruation	4(9.76)	9(18.37)		
1-2 days after finished menstruation	-	5(10.20)		
One fixed day every month	-	2(4.08)		
None	33(80.49)	32(65.31)		
How many times do BSE?	**(N=40)**	**(N=49)**	t = -0.841	0.41
Mean (SD)	3.50(3.15)	4.00(3.20)		

*Significant result (P<0.05)

Table 4: Comparison of participants' BSE uptake in the intervention and control groups at pre-intervention (153)

Variables	Intervention group	Control group	Test Statistic	P value
Performing BSE	**(N=78) N(%)**	**(N=75) N(%)**		
Yes	34(43.6)	19(25.3)	$\chi^2 = 1.627$	0.80
No	18(23.1)	35(46.7)		
Sometimes	26(33.3)	21(28.0)		
BSE frequency	**(N=60) N(%)**	**(N=43) N(%)**		
At least once a week	4(6.7)	4(9.3)	χ^2=30.353	0.01*
At least once a month	12(20.0)	3(7.0)		
Once in 2-3 months	1(1.7)	4(9.3)		
Occasionally	24(40.0)	20(46.5)		
None	19(31.7)	12(27.9)		
BSE Best time	**(N=60) N (%)**	**(N=43) N(%)**	χ^2=0.425	0.80
Before menstruation period	2(3.3)	-		
1-2 days after starting menstruation	21(35.0)	6(14.0)		
1-2 days after finished menstruation	-	-		
One fixed day every month	-	-		
None	37(61.7)	37(86.0)		
How many times do BSE?	**(N=40)**	**(N=49)**	t = -1.41935	0.02*
Mean (SD)	3.36(3.29)	2.23(2.23)		

*Significant result (P<0.05)

Table 5: Comparison of participants' knowledge and beliefs on BC and BCS between intervention and control groups at pre-intervention (N=148)

Characteristics	Intervention group (N=75)	Control group (N=73)	Mann-Whitney Test	P value
Knowledge of BC symptom	92.96	91.50	1794.000	0.071
Knowledge of BC risk factors	103.87	98.41	1255.000	0.042*
Knowledge of BC health awareness	93.95	90.17	1898.000	0.914
Knowledge of BC screening	86.41	82.94	2462.000	0.085
Knowledge of BSE procedure	90.33	90.98	1772.500	1.000
Susceptibility of BC	78.81	72.19	2564.500	0.346
Seriousness of BC	77.76	73.24	2643.000	0.522
Benefits of BSE	73.29	77.36	2673.000	0. 585
Barriers of BSE	73.29	77.71	2647.000	0. 530
Confidence of BSE	66.83	84.17	2162.500	0. 014*
Health Motivation	68.98	82.02	2323.500	0.064

*Significant result (P<0.05)

One month after the intervention, Table 6 compares the performance of BSE uptake between the study groups using a t-test for continuous factors and a Chi-square test for categorical variables. These results demonstrated that there was a significant difference in how well BSE performed between the two groups P<0.05. In the intervention group, 77.9% of respondents reported performing BSE compared to just 52.5% in the control group. In comparison to the control group's 37.7%, 80.0% of those who performed BSE in the intervention group reported doing so at various frequencies. In the intervention group, 50% of respondents reported the best time practicing BSE at 1-2 days after starting menstruation, while only 18.1 % in the control group, this difference between the two groups was statistically significant P<0.01. Moreover, on how many times BSE differed significantly between the two groups (P<0.00).

The Mann-Whitney U test for not normally distributed data was used to see whether there were

differences in the knowledge and beliefs about BC and BSE between the study groups one month after the intervention. According to Table 7's findings, all of the subscales of beliefs on BSE and BC were found, and there was significant knowledge score differences between the study groups. Between the two groups, there was no significant difference in their knowledge of BC screening, the seriousness of BC, or the barriers to BSE (P>0.05).

To determine if there were differences in the BSE performance uptake level between the study groups one month after the intervention, the t-test for continuous variables and the Chi-square test for categorical variables were utilized. Table 8's findings indicated that there were significant differences between the research groups P< 0.05.

The Chi-Square test was used to see if there were any differences in the intervention group's knowledge and beliefs about BC and BSE between the pre- and post-intervention program. According to Table 9's findings, all of the subscales of beliefs on BC and BSE were found, and there was significant knowledge score differences between the study groups. Between the two groups, there was no significant difference in either group's susceptibility to BC, the seriousness of BC, or the benefits of BSE (P>0.05).

Table 6: Comparison of participant's BSE Performance uptake in the intervention and control groups at One Month after Intervention

Variables	Intervention group	Control group	Test Statistic	P value
Performing BSE	**(N=75) N(%)**	**(N=61) N(%)**		
Yes	41(52.6)	14(23.0)	χ^2= 13.114	0.01*
No	15(20.0)	29(47.5)		
Sometimes	19(25.3)	18(29.5)		
BSE frequency	**(N=60) N(%)**	**(N=32) N(%)**		
At least once a week	16(26.7)	3(9.4)	χ^2= 12.316	0.01*
At least once a month	10(16.7)	3(9.4)		
Once in 2-3 months	-	4(12.5)		
Occasionally	19(31.7)	13(40.6)		
None	15(25.0)	9(28.1)		
BSE Best time	**(N=60) n (%)**	**(N=32) N(%)**	χ^2= 15.179	0.01*
Before menstruation period	1(1.7)	-		
1-2 days after starting menstruation	30(50.0)	6(18.8)		
1-2 days after finished menstruation	-	-		
One fixed day every month	-	-		
None	39(48.3)	26(81.3)		
How many times do BSE?	**(N=58)**	**(N=32)**	t = -3.181	0.00*
Mean (SD)	5.21(4.69)	2.50(2.48)		

*Significant result (P<0.05)

Table 7: Comparison of participants' knowledge and beliefs on BC and BCS between intervention and control groups at One Month after Intervention (N=148)

Characteristics	Intervention group (N=75)	Control group (N=73)	Mann-Whitney Test	P value
Knowledge of BC symptom	91.48	57.05	1464.000	0.00*
Knowledge of BC risk factors	95.56	52.86	1158.000	0.00*
Knowledge of BC health awareness	93.95	59.66	1654.000	0.00*
Knowledge of BC screening	77.75	71.16	2493.500	0.31
Knowledge of BSE procedure	91.96	56.56	1428.000	0.00*
Susceptibility of BC	86.04	62.64	1872.000	0.00*
Seriousness of BC	73.97	75.04	2698.000	0.87
Benefits of BSE	66.29	82.94	2121.500	0.01*
Barriers of BSE	79.83	69.02	2337.500	0.12
Confidence of BSE	61.73	87.62	1780.000	0.00*
Health Motivation	62.17	87.17	1812.500	0.00*

*Significant result (P<0.05)

Table 8: Comparison of participant's BSE performance uptake within Intervention Group Pre and Post-Intervention Program

Variables	Pre-Intervention	Post Intervention	Test Statistic	P value
Performing BSE	**(N=78) N(%)**	**(N=75) N(%)**		
Yes	34(43.6)	41(52.6)	χ^2 = 80.684	0.000*
No	18(23.1)	15(20.0)		
Sometimes	26(33.3)	19(25.3)		
BSE frequency	**(N=60) N(%)**	**(N=60) N(%)**		
At least once a week	4(6.7)	16(26.7)	χ^2= 96.661	0.000*
At least once a month	12(20.0)	10(16.7)		
Once in 2-3 months	1(1.7)	-		
Occasionally	24(40.0)	19(31.7)		
None	19(31.7)	15(25.0)		
BSE Best time	**(N=60) n (%)**	**(N=60) n (%)**	χ^2= 52.207	0.000*
Before menstruation period	2(3.3)	1(1.7)		
1-2 days after starting menstruation	21(35.0)	30(50.0)		
1-2 days after finished menstruation	-	-		
One fixed day every month	-	-		
None	37(61.7)	39(48.3)		
How many times do BSE?	**(N=40)**	**(N=58)**	t = -3.190	0.002*
Mean (SD)	3.36(3.29)	5.21(4.69)		

*Significant result (P<0.05)

Table 9 : Comparison of participants' knowledge and beliefs on BC and BSE within Intervention Group Pre and Post-Intervention Program

Characteristics	Pre-Intervention	Post Intervention	Chi-Square Test	P value
Knowledge of BC symptom	92.96	123.02	11.557	0.003*
Knowledge of BC risk factors	130.87	142.18	60.726	0.000*
Knowledge of BC health awareness	122.95	130.13	22.270	0.000*
Knowledge of BC screening	121.71	130.41	21.569	0.000*
Knowledge of BSE procedure	123.33	132.67	25.484	0.000*
Susceptibility of BC	108.48	125.45	4.292	0.117
Seriousness of BC	115.07	124.33	5.579	0.061
Benefits of BSE	105.65	117.93	1.575	0. 455
Barriers of BSE	108.67	128.68	7.056	0. 029*
Confidence of BSE	91.23	108.69	21.082	0. 000*
Health Motivation	97.99	109.35	10.539	0.005*

*Significant result (P<0.05)

DISCUSSION

One of the important challenges and investments in the health of future generations of women is educating and informing youth about breast cancer [35]. Based on the Health Belief Model (HBM), this study assessed the effect of breast health education intervention on BSE practice, knowledge of breast cancer and BSE as well as health beliefs of female undergraduate students in the Baghdad, Iraq. Our results highlighted the importance of health education in increasing the level of knowledge among women about BSE and breast cancer, beliefs related to breast cancer and BSE, as well as BSE practice.

The results of the study showed that teaching BSE practice increases its rate and the frequency of doing BSE among those who did not practice BSE before the health education program. This shows that the Breast Health Awareness program successfully motivated the women towards BSE practice. The results are in line with those of several earlier studies reporting that BSE training increases the frequency of BSE practice and performing of BSE [9, 10,19,20,21]. Secginli et al. [22] similarly reported that those learning BSE practice on breast silicon models comprising lumps displayed more frequent BSE practice than those who learned BSE practice through film or pamphlets. Therefore, the Breast Health Awareness program may be appropriate to increase both BSE practice and frequency of doing BSE for further samples with similar demographic characteristics.

One of the hypotheses of this study was that there is a significant difference in the level of BSE knowledge among women in the intervention and control groups at 1 month post-intervention. Our results highlight the importance of health education in increasing women's level of BSE knowledge. In accordance with the present study, other two studies carried out in Turkey [23] and Iran [24] showed that educational intervention had a positive impact on increasing the level of knowledge of BSE. The findings of this and previous studies demonstrate that health promotion education teaches young women to increase their knowledge and awareness on BSE, which is the first important step in breast cancer screening [25].

After education, the breast cancer knowledge of participants in the intervention group significantly differed from that of the control group at all post-tests. This significant difference showed that educational intervention had a positive impact on increasing breast cancer knowledge among the participants. This finding is consistent with those of the previous studies in Iran [24], Egypt [26], India [27], Taiwan [28] which showed that educational intervention significantly increased awareness regarding breast cancer as well as the frequency of performing breast self-examination. Therefore, a community-oriented educational intervention which emphasizes proper techniques can bring a desirable change among women.

In the literature, it was reported that health education is effective in increasing the breast cancer knowledge and BSE practice. However, it is difficult and complex to achieve behavioral change. In this study, positive beliefs about benefits of BSE and confidence of doing BSE were increased after health

education while beliefs related to barriers of BSE decreased. This result shows that the health education intervention was effective in terms of increasing accurate perception, providing further support for the results of the previous literature [10, 25, 29]. However, the other components of health belief model such as perceived susceptibility to BC, seriousness of BC, and health motivation did not change over times, which is in line with studies done in Turkey [30] and Malaysia [31]. This may be because this study involved younger women, who believed that older women were more likely to get breast cancer; thus, they did not feel obliged to gain knowledge about breast cancer and BSE independently [32].

The participants' confidence level and frequency of doing BSE practice increased over time in the current study. According to Kevin et al., people with higher level of BSE knowledge have higher perceived confidence. Additionally, confidence in BSE is positively related to the frequency of BSE practice [33]. Consequently, promoting breast health awareness through educating women about breast cancer and teaching them how to practice BSE correctly is important. The health education methods which are used in this breast health awareness program, such as practice on breast silicon model and providing information about breast cancer via module may have fostered confidence of doing BSE and its benefit. The findings of this study are supported by Abasi et al., [34] who reported that women's confidence in performing proper BSE was improved by teaching breast awareness and BSE. The significant difference in mean scores of perceived benefits of BSE after training in the intervention group agrees with the results of the previous studies [35, 36]. Perceived benefits of a behavior are indicative of the person's understanding of benefits gained from conducting a behaviour [37]. The more people understand the benefits of a preventive behavior, the more they have that behaviour. Another studied psychological factor is perceived barriers, which points out the person's perception of intrinsic and extrinsic obstacles in performing a behaviour. Significant differences between groups were found in line with studies done in Turkey [38] and Iran [39].

The strengths of this study include the use of RCT, adequate sample size, low attrition rate, appropriate statistical tests and its generalizability to the college and university students in Iraq. To the best of our knowledge, before this study no previous research is available on RCT among young female students in Iraq; consequently, the result of this study can be used as the fundamental data for further study. Along with the numerous strengths, our study had some limitations. First of all, the result of this study cannot be generalized among all young women in Iraq, because it focused on young educated women and was only done in public universities. It is suggested that future intervention studies should be extended to different parts and workplaces in Malaysia and among low-literate rather than educated women. Another limitation of this study is that all collected data were self-reported with no objective measures to evaluate the women. In this study, researchers did not implement any education program for the control group until the end of study. Nonetheless, the control group may have been exposed to other information sources, such as media, printed material and any campaign for breast cancer provided by the Ministry of Health during the study period which could not be controlled. In this study, although BSE practice was significantly improved after the intervention, the change was in a small number, indicating future studies should find the barriers of BSE practice and use others methods of intervention, like social media, which is more attractive for this particular group of participants.

Although there is no evidence that BSE lowers mortality from breast cancer, it should not be promoted to detect breast cancer tumors in women effectively. Women are at risk of harm from BSE including unnecessary breast biopsies, imaging tests and emotional duress [9]. Breast self-examination (BSE) might still be an important tool to improve breast awareness. Women are encouraged to take responsibility for their own health by examining themselves during bathing or dressing and to become familiar with their breasts at different times of the month and with age, looking and feeling for any changes from normal, and reporting any obvious changes promptly. Therefore, appropriate educational interventions are needed to encourage women to engage in regular breast awareness as well as to practice BSE [40].

CONCLUSION

The current study demonstrates that the Breast Health Awareness program which comprised of health education materials and training of the BSE practice, was effective in increasing knowledge about breast cancer, BSE and BSE practice of the female students in the intervention group. Consequently, the Breast Health Awareness

program may be appropriate for future samples with similar demographic characteristics to improve BSE in the low resource area in Iraq. It is also important to provide information and raise awareness about breast cancer and BSE practice among Iraqi females by the health care providers. In order to make Breast Self-Examination a habit, education about breast self-examination should be started for girls at school age.

Abbreviations

CBE, clinical breast examination; BSE, breast self-examination; BC, breast cancer; HBM, health belief model; RCT, randomized control trial, CVI, content validity index; ICC, intra-class correlation coefficient

Acknowledgments

The authors would like to thank the participants of the study.

Funding

This research not funded

Availability of data and materials

A request for the data and material may be made to the corresponding author of the article.

Authors' contributions

Shahad and Sahar designed the study. Shahad collected the data. Shahad
data analysis. Shahad, Sahar and Thuria wrote the manuscript and critically edit it.
All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

There are no details on individual participants within the manuscript.

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