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Impact of a Breast Cancer Educational Program on Female University Students' Knowledge, Attitudes, and Practices

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Abstract
Breast cancer (BC) is a worldwide fatal cancer among females. Efforts fighting against this disease should start with females at younger ages. This study evaluated the effectiveness a BC educational program in promoting female university students' knowledge and attitudes towards BC and practices of breast self-examination (BSE). A pre- and post-test design was used in two phases; pre- and post-intervention phase. A 1-day educational program was conducted with theoretical and practical educational sessions. Participants were evaluated twice (before and 2 weeks after the intervention) for the following variables: knowledge regarding BC warning signs, BC risk factors and knowledge in regard to BSE, in addition to their attitudes and practices of BSE. A total of 110 participants were randomized into either intervention ($n = 64$, 58.2%) or control group ($n = 46$, 41.8%). Analysis revealed that participants in both groups had relatively low level of knowledge, negative attitudes, and poor practice towards BC and BSE before attending the intervention. Analysis of the post test revealed that participants in the interventional group had significant improvement in knowledge, positive attitudes, and more practice of BSE compared to participants in the control group. The implementation of a BC awareness program had positive effects on the female university students' knowledge, attitudes, and practices regarding BC and BSE. Findings from this study strengthen and reinforce the importance of conducting such awareness programs for this young age group.

Keywords Breast cancer · Breast self examination · Knowledge · Practice · Educational intervention · Jordan

Introduction

According to the World Health Organization [35], breast cancer (BC) is considered the most common worldwide fatal cancer among females causing a global public health problem. In Jordan, BC was ranked on top of the three most common cancers among Jordanian females. As reported by Jordan Cancer Registry [17], BC constituted nearly 20% of all incident cancer cases and 37.3% of female cancer cases followed by colorectal cancer (10.7%) and thyroid cancer (5.9%). The same report classified BC cases according to age groups, where the highest incidence (30.9%) was among women aged 40–49 years, followed by women aged 50–59 years (26%), and most noticeably, women under 40 years had a rate of 14.7%. Such figures should alarm the health policy-makers and authorities to focus on promoting awareness of early detection and prevention of BC to fight this alarming disease.

In comparison with other countries, the incidence rate of BC in Jordan and in Asian countries is lower than international rates. For example, the incidence of BC varied between 19.3 per 100,000 women in Eastern Africa to 89.7 per 100,000 women in Western Europe, whereas in most of the developing regions the incidence rates are below 40 per 100,000 [36]. The annual United States Surveillance, Epidemiology and End Results rates were noticeably higher than those observed in Middle Eastern women [30]. The differences in incidence rates could be related to different risk factors of BC such as lifestyle and genetics, along with differences in screening practices between the countries.

During the period from 2005 to 2010, the 5-year survival rate of BC in Jordan was 93, and had increased throughout the past decade because of earlier diagnosis, advanced diagnostic

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tests, the introduction of adjuvant therapy, and availability of more treatment option [17].

In Jordan, all Jordanian female citizens are offered free BC care and treatment. The government tolerates the cost of treating BC patients through Ministry of Health, Royal Medical Services, university hospitals, and King Hussein Cancer Center (KHCC). Further, the KHCC was the first specialized hospital in Jordan and Middle East, founded by royal decree in 1997 as a non-governmental, not-for-profit institution to fight cancer in Jordan. The KHCC is the only specialized tertiary hospital that offers all treatment modalities and services for cancer care in the country and in the region. Another initiative for fighting against BC was the establishment of a national program called the Jordan Breast Cancer Program (JBCP), which aimed to improve the public awareness about BC through developing of infrastructure for early detection of BC through educational campaigns and outreach to different screening services on the way to enhance cure and survival rates and to decrease treatment cost [3].

Early recognition and detection of BC can play a significant role in reducing cancer morbidity and mortality as it gives more treatment options and increases survival rate if diagnosed early [11]. Early detection of BC can be achieved by one of the following screening methods: breast self-examination (BSE), clinical breast examination (CBE), and mammography [28]. Although BSE alone is inadequate for early detection of BC, it is recommended by the American Cancer Society [2] as an option for women starting from the early 20s of age as a method for breast awareness and early recognition and detection of BC. Unlike mammography and CBE, BSE does not require hospital visit and expertise, and it is cheap, simple, and non-invasive method that can performed by women themselves at home. According to ACS recommendations, women should be aware how their breasts usually feel and report any breast changes without delay to their healthcare providers.

Several previous studies have shown that female students had poor knowledge and negative attitudes concerning BC and BSE [9, 10, 25, 31]. Such negative indicators continue to be present as a recent descriptive study among female university students [9] found that those students to have inadequate knowledge regarding BC and BSE (45.5%), fairly positive attitudes (56.3%), and low frequent practice of BSE (37.5%).

Worldwide, many interventional studies have been conducted to increase awareness of BC and practice of BSE among women. For instance, ([5] evaluated the effectiveness of a breast health awareness program on knowledge of BC and BSE practice among female students in Malaysia based on the health belief model. The study revealed that the educational intervention had a positive impact on increasing BC knowledge among the participants. Similar findings were revealed among Nigerian female school students [4] and Saudi female university students [23]. Therefore, all recommendations were to increase the level of the women's knowledge about BC and emphasize the importance of increasing BC awareness and promoting the practice of BSE for early detection of breast abnormalities.

Literature on the effectiveness of BC education programs for female university students is limited in Jordan. Up to the researchers' knowledge, there is only one Jordanian study that assessed the effectiveness of a BC education intervention campaign, which was conducted in five governorates in the northern and middle regions of Jordan [32]. The education was held by the JBCP to increase Jordanian women knowledge about BC. About 2554 women voluntarily participated and responded to advertisements about educational lectures, and pre-post education questionnaires were utilized in the study. The study concluded that knowledge scores were improved after the intervention by comparing the pre-test score with the posttest score. However, none of the found studies assessed the effectiveness of educational programs on female university students' knowledge and attitudes towards BC and practices of BSE. Further, none was held at the southern region of Jordan.

Jordan Department of Statistics [18] estimated Jordanian population to be 9.8 million, where females constituted 45% (4.41 million). Further, there are 142,908 female students registered at different Jordanian universities constituting 51.6% of the total university students in Jordan [19]. This population was targeted in this study as no published studies were found concerning effectiveness of BC education sessions or programs among university them. Also, nearly all female university students are at a point where it is significant that they should have adequate knowledge and awareness in regard to BC, in addition, female university students are the most important group of population to start with to enhance their knowledge and to support health promotion among young females who are expected to influence their relatives and communities in future. Therefore, this study aimed to evaluate the effectiveness a BC educational program in promoting female university students' knowledge and attitudes towards BC and practices of BSE in the southern region of Jordan. A timely provision of educational program regarding breast health and breast screening measures to female university students can promote female students' knowledge regarding BC, change their attitudes towards BC, and increase their practice of BSE.

Research Hypothesis

Hypothesis (1): Female university students who completed a BC awareness educational program will show increased knowledge of BC awareness compared with the control group.

Hypothesis (2): Female university students who completed a BC awareness educational program will show better attitudes of BC awareness compared with the control group.

Hypothesis (3): Female university students who complete a BC awareness educational program will show increased compliance with BSE compared with the control group.

Methods

Design

A true experimental design was used to evaluate the effectiveness of the educational program among female university students regarding BC awareness. This study involved random assignment of subjects to either experimental or control group. A pre- and post-test were conducted among both groups separated by a period of 2 weeks. The experimental group attended the BC awareness program while the control group received no training.

Setting

This study was conducted at the largest public university in the southern region of Jordan located in Al-karak governorate.

Sampling

The target population of this study included all female university students in the southern region of Jordan. The accessible population included all female university students registered at the participating university, excluding those registered at health faculties (medicine, nursing, and pharmacy). Eligibility criteria included being a female student, registered at a faculty other than health faculties and willing to participate. On the other hand, exclusion criteria include students who were pregnant or breast feeding. The statistical software G*Power V.3 [13] was utilized to estimate the required sample size applying the following parameters: a power of 0.80, medium effect size 0.35, statistical significance 0.05, and independent sample *t* test. Thus, the minimum required sample size was revealed to be 70 participants divided between both the experimental and control groups. Previous studies with similar approach supports the adequacy of this sample size [1, 33]. A larger sample was targeted to compensate for attrition and incomplete questionnaires.

Instruments

The instrument package utilized for measuring the variables of this study had many sections, where the first section contained the socio-demographic data sheet developed by the researchers. The collected demographics included age, place of living, marital status, faculty name and program (bachelor vs. master) and academic year, and family history of BC.

The second section measured participants' knowledge of BC with different categories including (1) knowledge of BC warning signs and symptoms that contains 11 yes/no questions adopted from the Breast Cancer Awareness Measure (Breast CAM-version 2) [21] which was validated with the support of Breast Cancer Care and Breakthrough Breast Cancer [22]; (2) knowledge of BC risk factors that contains nine yes/no questions adopted from the BCAM; and (3) knowledge of BSE that contains four yes/no questions adopted from the work of [27]. For the 24 questions, one mark awarded for each correct answer, while incorrect or I do not know answers awarded zero. Scores summed for the total score and for the category score. Higher scores indicate that participant has more knowledge of BC. Thus, the Arabic translated version of the (BCAM-A) was used, which was developed and validated by College of Nursing-Sultan Qaboos University, Oman [7]. Also, [27] has successfully used Breast CAM in a study among the Saudi females and reported Cronbach's alpha as 0.81 [27].

The third section of the study package assessed participants' attitudes towards BSE, which was adopted from the previous work of [28]. This section consists of 13 5-point Likert scale items ranging from 0 (strongly disagree) to 4 (strongly agree), with a total score ranges from 0 to 52, and higher scores indicate better attitudes towards BC. The last section of the study package evaluated participants' practice of BSE using seven questions adopted from a previous work of [28]. This section uses a 5-point Likert scale ranging from 4 (always) to 0 (rare), with a range between 0 and 28 and higher scores indicate more practicing of BSE.

Ethical Considerations

Ethical approval was obtained from the Research Ethics Committee at the Faculty of Nursing-Mutah University. Further, permission to conduct this study was obtained from the university presidency. Also, an informed consent form was obtained from participants after explanation of the purpose and the nature of the study. Participants were notified that participation in the study is voluntary, and that they had the right to decline participation and withdraw from the study at any time with no penalties. There were also notified that the study contained no direct benefits or compensation for participation, but they may benefit from the study by becoming more aware of the knowledge and practices related to BC. Questionnaires were anonymous without any personal identifier. Rather, they were coded using numbers on both pre- and post-test for comparison purposes.

Procedure of Data Collection and the Educational Program

After gaining the ethical approval, participants were recruited through posters and announcements posted at the university

campus. The flyers and the announcements notified students regarding the purpose of the study and ask those who are interested to show up at an office in the faculty of nursing allocated for the purpose of the study. Those who came to the office were given details of the study and invited to participate. Those who agreed were asked to sign the study consent form. Then, a list of the students was made and students were randomly assigned to experimental and control groups. Both intervention and control groups were asked to fill out the pre-test questionnaire. Participants selected to be in the experimental group were notified regarding the educational program date, time, and location. Both groups were contacted 2 weeks after the program to fill out the post test.

On the day of the program, the researcher and trained research assistants first explained the purpose of the study. After that, the principle investigator started the 1-day educational program that was over 120 min of theoretical and practical educational sessions. The theoretical content of the educational session included basic information about breast anatomy and an introduction to BC definition, epidemiology, risk factors, sign and symptom, stages and diagnosis, screening, and treatment. The content of the educational session were given in Arabic language. The educational module was developed based on the American Cancer Society module [2] and was peer reviewed by maternal experts in this field. Various teaching methods such as power point presentation, videos, group discussion and interaction, and pamphlets and printed materials were utilized. After the educational session, an organized practical session for doing manual breast exam on a silicon breast model implemented in small groups of 10 students under the supervision of the researcher. At the end of the educational session, the principal investigator summarized and reviewed the important points, and participants were encouraged to ask questions, each participant was given a copy of the educational module.

Data Analysis

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 21.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were utilized to describe frequencies, means, and standard deviations of the sample characteristics and study variables. Inferential statistics was utilized to test the study hypotheses regarding the differences between participants who attended the BC awareness educational program and those who did not. They include a series of independent sample t tests to test the differences between study group (the experimental and the control group). Also, a series of paired t tests to test the differences between two related groups means (pre- and post-test scores for both groups). All tests considered two-sided significance level of $P \leq 0.05$.

Results

The study sample consisted of sample of 110 participants, which was drawn from the population of female university students who met the eligibility criteria. Participants were divided into either intervention ($n = 64$, 58.2%) or control group ($n = 46$, 41.8%). As seen in Table 1, no statistically significant differences were noted based on their demographics.

Using a series of independent sample t tests, participants were evaluated twice (before and 2 weeks after the intervention) for the following variables: knowledge regarding BC warning signs, BC risk factors, BSE, and total knowledge in addition to their attitudes and practices of BSE. Table 2 provides a description of the pre-test results for the study variables, where participants in both groups had relatively low level of knowledge, negative attitudes, and poor practice. However, comparing the pre-test scores between groups revealed no statistically significant differences.

Analysis of the post-test results (Table 3) revealed that participants in the interventional group, after the educational program, showed an extreme overall improvement in all study variables. For example, participants in the interventional group had significantly higher total knowledge ($M = 21.63$, SD = 2.03), more positive attitudes ($M = 2.95$, SD = 0.33), and more frequent practice of BSE ($M = 2.59$, SD = 0.54) than participants in the control group ($M = 11.74$, SD = 4.7), ($M = 2.41$, SD = 0.58), ($M = 1.27$, SD = 0.61), respectively. These results suggest the usefulness of implementing BC awareness program to improve the female university students' knowledge, attitudes, and practices regarding BC and BSE.

Table 1 Comparison of study variables based on categorical demographics ($n = 110$)

Variable	Interventional group ($n = 64$)	Control group ($n = 46$)	P
Marital status			
Single	59	45	.199
Married	5	1	
Program			.336
Bachelor	62	46	
Master	2	0	
College			
Scientific	26	20	.465
Humanitarian	38	26	
Family history of BC	60	40	.187
No	4	6	
Yes			
Previous BC knowledge			.320
No	22	13	
Yes	44	33	

Table 2 Comparison of between groups' pre-test scores of study variables ($n = 110$)

	Mean (SD)	*P*
Knowledge of BC warning signs (overall)	6.26/11 (2.97)	.107
Control group	6.9/11 (3.37)	
Interventional group	5.7/11 (2.54)	
Knowledge of BC risk factors (overall)	2.2/9 (1.49)	.095
Control group	2.6/9 (1.82)	
Interventional group	1.9/9 (1.12)	
Knowledge of BSE (overall)	1.84/4 (0.97)	.917
Control group	1.9/4 (1.15)	
Interventional group	1.8/4 (0.83)	
Total knowledge (overall)	10.3/24 (4.17)	.106
Control group	11.5/24 (4.78)	
Interventional group	9.4/24 (3.46)	
Attitudes towards BSE (overall)	2.43/4 (0.47)	.356
Control group	2.4/4 (0.46)	
Interventional group	2.5/4 (0.47)	
Practice of BSE (overall)	1.48/4 (0.69)	.067
Control group	1.2/4 (0.61)	
Interventional group	1.7/4 (0.68)	

BSE breast self-examination

To evaluate the improvement in study variables among participants in the interventional group, a series of paired *t* tests were run (Table 4), where their post-test scores were significantly higher than their pre-test scores in all study variables. For example, participants had higher pre-test total knowledge ($M = 21.63$, SD = 2.03), more positive attitudes ($M = 2.95$, SD = 0.33), and more frequent practice of BSE ($M = 2.59$, SD = 0.54) than their scores in the pre-test ($M = 9.44$, SD = 3.46), ($M = 2.46$, SD = 0.47), ($M = 1.68$, SD = 0.68), respectively. Again, these results suggest the usefulness of implementing such programs to improve the female university students' knowledge, attitudes, and practices regarding BC and BSE.

Table 3 Comparison of between groups' post-test scores of study variables

	Mean (SD)	*t*	*df*	*P*
Knowledge of BC warning signs		− 7.40	108	.000
Control group	6.96/11 (3.17)			
Interventional group	10.16/11 (1.19)			
Knowledge of BC risk factors		− 17.35	108	.000
Control group	2.74/9 (1.90)			
Interventional group	7.59/9 (1.03)			
Knowledge of BSE		− 12.62	108	.000
Control group	2.04/4 (1.01)			
Interventional group	3.88/4 (0.49)			
Total knowledge		− 15.03	108	.000
Control group	11.74/24 (4.69)			
Interventional group	21.63/24 (2.03)			
Attitudes towards BSE		− 6.12	108	.000
Control group	2.41/4 (0.58)			
Interventional group	2.95/4 (0.33)			
Practice of BSE		− 11.94	108	.000
Control group	1.27/4 (0.61)			
Interventional group	2.59/4 (0.54)			

BSE breast self-examination

Table 4 Comparing pre- and post-test scores of study variables within the interventional group

	Mean (SD)	*t*	*Df*	*P*
Knowledge of BC warning signs		− 13.52	63	.000
Pre-test	5.73/11 (2.54)			
Post-test	10.16/11 (1.19)			
Knowledge of BC risk factors		− 30.81	63	.000
Pre-test	1.88/9 (1.12)			
Post-test	7.59/9 (1.03)			
Knowledge of BSE		− 17.88	63	.000
Pre-test	1.83/4 (0.83)			
Post-test	3.88/4 (0.49)			
Total knowledge		−26.42	63	.000
Pre-test	9.44/24 (3.46)			
Post-test	21.63/24 (2.03)			
Attitudes towards BSE		− 8.25	63	.000
Pre-test	2.46/4 (0.47)			
Post-test	2.95/4 (0.33)			
Practice of BSE		− 11.24	63	.000
Pre-test	1.68/4 (0.69)			
Post-test	2.59/4 (0.54)			

BSE breast self-examination

To assess changes in the control group in terms of study variables, a series of paired *t* tests were run to compare participants' pre-test scores with their post-test scores. Results (Table 5) revealed that none of the study variables were significantly different, and no improvement was noticed in any of them, which reflects that improvement in the interventional group was merely due to receiving the educational program and indicates its effectiveness.

Discussion

This study sought to assess the effectiveness of a BC educational program in promoting the female university students' knowledge and attitudes towards BC and practice of BSE in the southern region of Jordan. The results of this study imply that participants in both groups had relatively poor knowledge, negative attitudes, and poor practice towards BC and

Table 5 Comparing pre- and post-test scores of study variables within the control group

	Mean (SD)	*t*	*df*	*P*
Knowledge of BC warning signs		0.13	45	.896
Pre-test	6.9/11 (0.50)			
Post-test	6.96/11 (0.48)			
Knowledge of BC risk factors		− 0.66	45	.514
Pre-test	2.63/9 (1.82)			
Post-test	7.74/9 (1.90)			
Knowledge of BSE		− 1.93	45	.060
Pre-test	1.85/4 (1.15)			
Post-test	2.04/4 (1.01)			
Total knowledge		− .70	45	.486
Pre-test	11.48/24 (4.78)			
Post-test	11.74/24 (4.68)			
Attitudes towards BSE		− 0.52	45	.608
Pre-test	238/4 (0.47)			
Post-test	2.41/4 (0.58)			
Practice of BSE		− 0.53	45	.601
Pre-test	1.23/4 (0.61)			
Post-test	1.27/4 (0.61)			

BSE breast self-examination

BSE before attending the intervention, which comes in line with local and international literature [9, 10, 31]. Also, this result confirms what was found by many previous Jordanian literature regarding the low compliance of Jordanian women to the healthy practices of different diseases [12, 20, 24]. Furthermore, literature suggested that inadequate knowledge and the negative attitude about BC were found to be significant predictors of BSE practice [6, 14, 15]. Therefore, it is imperative to teach female students to be aware and have knowledge in regard to BC since it can positively affect their BSE practice, which indicates the importance of this study that comes within the local and international efforts fighting against this alarmingly dangerous disease.

According to the findings of the current study, it was noteworthy that the program was effective in improving all aspects of participants' BC knowledge in the intervention group including BC warning signs, risk factors, and BSE in the follow-up measurement 2 weeks after completing the educational session. Similarly, participants in the intervention group had significantly higher scores that those in the control group. The differences in knowledge mean scores (both within and between groups) support the effectiveness of this well-structured intervention program. Similar findings were reported by previous studies among university students in different countries [8, 16, 23] indicating the effectiveness of such programs being conducted among such group at earlier age. Therefore, such strategy should be generalized among colleges and universities to adopt breast health topics in students' university curricula to benefit from the curiosity of and enthusiasm of this age group. Further, breast cancer awareness campaigns should target universities for the same purpose.

Participants' attitudes towards BC and BSE were also promoted 2 weeks after the educational intervention, indicating that female students care about themselves as represented by the vast majority of who agreed that "All women should do BSE". Such improvement represents another success for our intervention that could improve not only participants' knowledge but also their attitudes. This finding is consistent with [23] who reported the effectiveness of such programs in improving the female university students' attitudes towards BC and BSE. The ultimate success for our educational program is the effectiveness in promoting participants' frequency of BSE practice after exposure to the program. Previous studies with educational programs support our finding [26, 29]. Such conclusion sends message to all efforts fighting against BC to invest in this age group that can gain valuable knowledge and behavioral changes and can serve as a mean to convey messages to their communities.

In addition, the result revealed that improving students' knowledge about BC by such structured educational program will contribute to improve their practices of BSE. On the same line, [23, 32, 34] reported that women who were knowledgeable about BC were expected to more frequently practice BSE. This result highlights the significance of health education programs not only in increasing the level of knowledge about BC and BSE but also in improving the participants' attitudes and BSE practice. This indicates that any future program should focus on the three items as the relationship among them is well established.

Indeed, our educational program was provided through lecture model, distributing pamphlet and group discussion. [34] used an online education model in teaching BSE and found it to be effective in increasing women's knowledge, motivation to practice BSE and in developing a positive health attitude. Future studies using are invited to use various strategies of health education (e.g., online education, social media, and e-learning) making sure they are attractive enough to gain the attention of the students, and trying not to make it look like a regular class.

Limitations

Using a convenience sample from only one university constitutes the major limitation of this study, which limits the generalizability of its results among all female students in Jordan. A multicenter study is highly recommended to overcome this limitation. Another limitation is the use of a self-reported scale to assess participants' BSE practice, which may lead to recall bias. Using a more objective method for evaluating this important variable such as diaries is highly recommended. Finally, this study conducted the post-test 2 weeks after the

education, which makes it difficult to evaluate the sustainability of changes acquired in participants' knowledge, attitudes and practice reported. The authors suggest a long-term follow-up of the intervention to assess knowledge, attitude, and practice of participants more carefully over time. Further, producing brochures and videos that contain the educational program can be used to follow on the results of this study? Despite those limitations, the current study has many strength points. First, the current study is the first to investigate the impact of an educational intervention on BC knowledge, attitude, and practice of BSE among the female university students in the south region of Jordan. Second, an adequate sample size was recruited combined with a low attrition rate.

Conclusion

The implementation of a BC awareness program was effective in increasing the female university students' knowledge, attitudes, and practices regarding BC and BSE in the intervention group. These findings make an implication to faculties of health sciences to carry out more health education sessions by using various teaching approaches (interactive lecturing, online courses, e-learning), which can increase female student's knowledge and awareness in regard to BC and ultimately affect their BSE performance. In addition, university students have an important role regarding their relatives at higher risk, through influencing their attitudes and practice of all screening tests and following up with their care providers for early detection and recognition of the disease.

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Compliance with Ethical Standards

Conflict of Interest None.

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