

Effect of Booklet-Based Education versus Mobile-Based Education on Women's Arm Lymphedema and their Knowledge and Practices regarding PostMastectomy Exercise

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Abstract

Background: Post-mastectomy exercise is an important part of female breast cancer patients' recovery after mastectomy as well as after radiotherapy to maintain their shoulder movement and to prevent side effects as radiation-induced fibrosis. These exercises can increase shoulder and arm motion and usually be started in a few days. **Aim:** To evaluate the effect of booklet-based education versus mobile-based education on women's arm lymphedema and their knowledge and practice regarding post mastectomy exercise. **Design:** A quasi- experimental research design was used with a pre-and post-test. **Setting:** The research was conducted at the inpatient and outpatient clinic of Fayoum Oncology Center, Fayoum governorate, Egypt. **Subjects:** A purposive sample of 200 post-mastectomy women was included (100 were taught using a mobile Whats app application and 100 were taught using a booklet). **Tools:** **Tool I:** women' structured interviewing questionnaire, it included three parts: (a) demographic characteristics; (b) women' medical data, (c) clinical manifestations of lymphedema include swelling, induration, skin changes, and decreased functionality of the affected limb, **Tool II:** women' knowledge regarding post mastectomy exercise, and **Tool III:** women' practices regarding post mastectomy exercise (pre/post). **Results:** The study results indicated that the main source of knowledge among post-mastectomy women was doctors. The results revealed that the knowledge and practices of both groups were improved post- education. The mobile-based education group showed more improvement in their knowledge compared to the booklet -based education group. There were statistically significant correlations between total knowledge and practice scores of the studied women. A significant improvement was detected between the two groups regarding improving degree of arm lymphedema post education **Conclusion:** Mobile-based education was more effective in improving post-mastectomy women's knowledge and practices regarding post mastectomy exercise than those who taught by booklet-based education. **Recommendations:** Mobile- based educational methods can be used for post mastectomy women regarding post mastectomy exercise to improve their knowledge and practices.

Keywords: Booklet, Mobile-based education, Post mastectomy exercise, Woman's arm lymphedema and their knowledge and practice; and post mastectomy arm lymphedema.

Introduction:

Breast cancer is a severe health issue that ranks second among the most frequent diseases in many nations

throughout the world. Breast cancer is the second largest cause of death in women after lung cancer, accounting for around 45.1 percent of all cancers in women.

Breast cancer is the most frequent invasive malignancy in women worldwide. It affects roughly 12% of all women on the planet. Women who have had breast cancer are more likely to develop cancer in other breasts (**Khuwaja & Abu-Rezq, 2019**).

Lymphedema refers to tissue swelling caused by an accumulation of protein-rich fluid that's usually drained through the body's lymphatic system. It most commonly affects the arms or legs, but can also occur in the chest wall, abdomen, neck and genitals. Lymph nodes are an important part of your lymphatic system. Lymphedema can be caused by cancer treatments that remove or damage your lymph nodes. Any type of problem that blocks the drainage of lymph fluid can cause lymphedema. Severe cases of lymphedema can affect the ability to move the affected limb, increase the risks of skin infections and sepsis, and can lead to skin changes and breakdown. Treatment may include compression bandages, massage, compression stockings, sequential pneumatic pumping, careful skin care and, rarely, surgery to remove swollen tissue or to create new drainage routes (**Mayo Clinic, 2021**).

Although adjuvant treatment, particularly chemotherapy, is necessary to prevent tumor cell development, it has a systemic cytotoxic impact that can harm both tumor and healthy cells, resulting in toxicity and side effects such as pain, nausea, and changes in taste and smell. These factors may cause changes in food intake and nutritional status in patients, thereby worsening prognoses and raising the chance of illness recurrence (**Ferreira et al., 2016 & and Drareni et al., 2019**).

Therefore, breast cancer is frequently treated with a mastectomy. The surgical removal of one or both

breasts, partially or totally, is known as a mastectomy. A mastectomy is commonly performed to treat breast cancer and prevent infection spread (**World Health Organization, 2020**).

Women who have had a mastectomy for breast cancer must deal with two significant issues: the fact that they have cancer and the loss of their physical attractiveness. As a result, post-mastectomy rehabilitation is critical to women's overall health (**Chan, Lui, & So, 2010**).

Women's who have had a mastectomy or surgical removal of one or both breasts engage in post-mastectomy exercise. Soon after a mastectomy, women can begin exercising. Post-mastectomy exercises can help them improve their shoulder and arm motion and can usually be done in a few days. Post-mastectomy exercises can also, help to strengthen the arm. Post-mastectomy exercise can help cancer women's recover from therapy by managing or rehabilitating them. The length of the follow-up period is critical in determining whether a reduction in breast cancer-related shoulder discomfort in women getting exercise therapy is short-term or long-term. Early shoulder mobilization has been demonstrated to help with the prevention of shoulder pain, dysfunction after total mastectomy (**Eskandari, Alipoor, & Ramezankhani, 2019**).

Books and traditional media are increasingly being displaced by mobile media, and health education is adjusting to this change. According to polls, Android-powered smartphones are used by the majority of people globally (**Sarabadani, Dehghani Tafti, Labafchi, & Javan Rashid, 2019**). Mobile-based interventions are effective in improving health outcomes because they offer programming flexibility and variety (i.e.,

they are multifunctional), and they can provide high-quality information and personal support 24 hours a day at a low cost to both the user and the health care provider (Eskandari, Alipoor, & Ramezankhani, 2019).

The basic role for nurses are keeping up modern forms of education and find methods to deal with lack of flexibility, mobility, and adaptation to learners' needs and education demands to be available at any time and in any place. Therefore capabilities of mobile education can help with some of the challenges. The study discusses the essential characteristics, benefits, and existing barriers to that and most flexible style of learning through integrating and collaborative learning qualities with mobile technologies functionalities are discussed ((Sagen, Kåresen, & Risberg, 2009).

Also, nursing must discuss strategic solutions for the development of learning types through integration of advanced technologies in various forms of education is presented and conducting more studies to compare the effect of booklet-based education versus mobile-based education on women's knowledge and practice regarding post- mastectomy exercise (W.H.O, 2020).

Significance of the study:

Exercises are important for preventing muscle shortening, joint rigidity, and improving lymph and blood circulation following mastectomy (Eskandari, Alipoor, & Ramezankhani, 2019). In Egypt, breast cancer is the most common malignancy in women, accounting for 38.8% of cancers in this population, with the estimated number of breast cancer cases nearly 22,700 in 2020 and forecasted to be approximately 46,000 in 2050 (A. Zeeneldin, et al., 2020).

It was revealed the effect of using of a most popular application for educating those patients and integrating it to achieve an innovative and collaborative learning. Also, this study was assessed the effect post mastectomy exercise on shoulder function, morbidity, and degree of arm lymphedema among post-mastectomy women. Hence this study was conducted to study the effect of booklet-based education versus mobile-based education on women's knowledge and practice regarding post- mastectomy exercise and also, to assess the effect of post mastectomy exercise on upper extremity range of motion, strength, lymphedema, pain and activities of daily living .

Aim of the study

To evaluate the effect of booklet-based education versus mobile-based education on women's arm lymphedema and their knowledge and practices regarding post mastectomy exercise through:

- Assessing women's knowledge regarding post mastectomy exercise.
- Assessing women's practices regarding post mastectomy exercise.
- Designing and implementing an educational program based on women's needs.
- Determine the effect of booklet-based education versus mobile-based education on women's arm lymphedema and their knowledge and practices regarding post mastectomy exercise.
- Assess the relation between post mastectomy exercise and breast cancer-related lymphedema in term of upper extremity range of motion, strength, lymphedema, pain and activities of daily living.

Research hypothesis:

H1: Women's knowledge and practices regarding post mastectomy

exercise will be improved in both mobile and booklet groups after implementing the educational program.

H 2: Education through the mobile-based method will be more effective in improving the Women's knowledge and practices regarding post mastectomy exercise than the booklet-based method.

H3: There will be a positive correlation between post mastectomy exercise and breast cancer-related lymphedema in term of upper extremity range of motion, strength, lymphedema, pain and activities of daily living

Subjects and Method:

Research design:

A quasi-experimental research design was used with a pre-and post-test to achieve the study's aim.

Setting:

The research study was conducted at the inpatient and outpatient clinic of Fayoum Oncology Center, Egypt; this setting was selected due to the high prevalence of patients.

Subjects:

Sample:

A purposive sample of 200 post-mastectomy women was representing 5% of the total attendees in the inpatient and outpatient clinic.

Inclusion criteria:

All women (200 post-mastectomy women) who had undergone a mastectomy within six months and were between the ages of 18 and 60 years old, educated women who were available at the time of the study in the previously mentioned setting, and who agreed to participate in the study. There was divided into two groups (100 were taught using a mobile Whats app application and 100 were taught using a booklet).

Exclusion criteria:

Women who had a mastectomy and don't match with inclusion criteria and were unwilling to participate in the study were excluded.

Sample size:

The sample size was calculated based on the following statistical formula $n = Z^2p(1-p)/d^2$, where z = level of confidence according to the standard normal distribution (for a level of confidence of 95%, $z = 1.96$). p = estimated proportion of the population that presents the characteristic (when unknown we use $p = 0.5$), d = (d is considered 0.05).

The sample size was calculated based on:

$$N = \frac{N \times p(1-p)}{\{N-1 \times (d^2 \div z^2)\} + p(1-P)}$$

- Type I error with significant level (α) = 0.5.
- Type II error by power test $(1-B) = 95\%$.

Data collection tools:

Three tools were used to collect the data of the study as the following:

Tool I: A structured interview questionnaire was developed by the researchers after reviewing the related literature and research studies (**Brown & Ligibel, 2018; Greenlee, et al., 2017**), it included three parts:

Part (1): It included demographic data of women such as age, educational level, occupation, and residence.

Part (2): It included medical data related items such as duration of disease, stages of the disease, treatment received, type of tumor, and family history.

Part (3): Clinical manifestations of lymphedema include swelling, induration, skin changes, and decreased functionality of the affected limb also included. Shoulder ROM. Degree of arm

lymphedema can be assessed by **Kissin's scale**. The scale was developed by **Kissin, Rover, Easton & Westburg (1986)** to assess the degree of arm lymphedema as measured by arm circumference measurement. The measurement was done by a tape measure 15 cm above the lateral epicondyle and 10 cm below the lateral epicondyle. The elbow was flexed to go and the shoulder in anatomical position. The scale suggested the following working definitions of post mastectomy arm lymphedema.

Mild lymphedema:

The difference in the whole arm circumference (C10+C15) between the affected and normal side should not exceed 2 cm.

Moderate lymphedema:

The difference in the whole arm circumference (C10+C15) between the affected and normal side should not exceed 4 cm.

Severe lymphedema:

The difference in the whole arm circumference (C10+C15) between the affected and normal side should more than 4 cm.

Tool (II) Women's knowledge regarding post-mastectomy exercise (pre/post) (Brown & Ligibel, 2018; Greenlee et al., 2017): It was developed by the researchers and included 10 questions. It was designed to assess women's knowledge regarding exercise after mastectomy such as the source of information, post- mastectomy exercise one week post-mastectomy, time of doing,

how many times to do exercises, and types of exercises.

❖ Scoring system:

When the answer was yes, the woman received a 1 and when the answer was no, she received a 0. Women with a score of 1 to 4 were regarded to have unsatisfactory knowledge (50%) while those with a score of 5 to 10 were considered to have satisfactory knowledge (50%).

Tool (III) Women's practices regarding post-mastectomy exercise (pre/post) (Brown & Ligibel, 2018; Greenlee, et al., 2017):

This tool was designed to assess women's practices regarding post-mastectomy exercise and using the affected arm, practice deep breathing exercises wear comfortable, loose clothing when doing the exercises, do the exercises slowly until you feel a gentle stretch. These exercise regimen include a set of six active assisted range of motion exercises and strengthening exercises such as wand exercise, wand exercise, elbow winging, shoulder blade stretch, shoulder blade squeeze, chest wall stretch, side bends, shoulder stretch, things to keep in mind after breast surgery, and general guidelines for these exercises.

❖ Scoring system:

The scoring system was based on a zero-to-one ratio for "no answer" and a one-to-one ratio for "yes response." The overall score ranged from 0 to 6. The total score was divided into "adequate and inadequate" while inadequate practices receiving less than 50% and adequate practices achieving more than 50%.

Validity of the tools:

The content validity of the tools, their clarity, comprehensiveness, appropriateness, and relevance were reviewed by five experts, two in medical-

surgical nursing; two in community health nursing and one expert in the oncology field. Modifications were made according to the panel judgment to ensure sentence clarity and content appropriateness.

Reliability of the tools:

The Cronbach's test was used to determine the reliability of the knowledge questions, which was 0.89, and the reliability of the reported practices questions was 0.85.

Field work:

An official permission was obtained from the responsible authority before conducting this study explaining the purpose of the study. An extensive review of literature was done to develop data collection tools and program content. Data collection started, and it took 6 months (from March 2021 to the end of September 2021). The researchers interviewed women individually in a private place in the inpatient and outpatient clinic to explain the purpose of the study and obtain the informed written consent and fill in the questionnaires (Tool I, Tool II and Tool III). The average time consumed in answering the questionnaire was 50-60 minutes. The researchers then started implementation steps about knowledge and practices regarding exercise after mastectomy the pretest. Post-test was done at evaluation phase.

A pilot study

To assess the clarity and feasibility of the research method, a pilot study was conducted on 10% (20 women) of the entire sample. To produce the final form of the tools, no alterations were made. Women who took part in the pilot study were not included in the research.

Ethical considerations:

Before beginning the study, approval from the Faculty of Nursing was issued to conduct the study. Official letters were issued to medical and nursing directors of the chosen facility to explain the study's aim and obtain their agreement. Female patients were approached individually to explain the purpose and the nature of the study and to obtain their consent. All females were assured about the confidentiality of obtained data and their information will not be disclosed to anyone other than the researchers. Nameless sheets and a coding system was assured and only known by the study researchers. Voluntary participation and withdrawal at any point of the study was assured without any penalties.

Description of the program:

1. Assessment phase:

Researcher interviewed women and filled in the questionnaires (pre-test).

2. Planning phase:

This phase included analysis of the pre-test findings; researchers designed booklet objectives and content according to the women's learning needs. The booklet was designed by the researchers and written in Arabic. It was printed according to the number of the women and distributed after the program was implemented. It was given to all women in the booklet group (100) and added to the women in the mobile Whats app group (100) after the first session's assessment and intervention. This booklet covered the major ideas of each training session as well as illustrative colorful graphics.

Aim of the booklet: Upon completion of this booklet, the post-mastectomy women will gain knowledge and practices regarding post-mastectomy exercise.

Specific objectives:

- To improve the studied post-mastectomy women' knowledge and practices regarding exercise after mastectomy
- To increase woman's' mastery of performance of post-mastectomy exercise as well as increase their adherence to prescribed exercise regimen.
- Decrease the incidence of breast cancer-related lymphedema among those females with its varying degrees.

Post Mastectomy Exercise Educational Booklet:**A. Post-mastectomy Exercise Theoretical Overview**

- 1- Post-mastectomy exercises overview.
- 2- Definition of Post-mastectomy exercises.
- 3- Types of Post-mastectomy exercises
- 4- Timing of Post-mastectomy exercises
- 5- Schedule to Post-mastectomy exercises
- 6- Special clothing needs and importance of wearing suitable clothing during doing exercises (comfortable and loose clothing)
- 7- Key point regarding post-mastectomy exercises
- 8- Affected arm care guidelines and post-mastectomy exercises.
- 9- Breast cancer-related lymphedema.

B. Post-mastectomy Exercise Practical section

- 1- Deep breathing exercises practice
- 2- Personal hygiene for the affected arm
- 3- Bathing and skin care
- 4- Injection and heat exposure
- 5- Post mastectomy exercise regimen include a set of six active assisted ROM and strengthening exercises such as wand exercise, wand exercise,

elbow winging, shoulder blade stretch, shoulder blade squeeze, chest wall stretch, side bends, shoulder stretch, things to keep in mind after breast surgery, and general guidelines for these exercises.

B-Implementation phase:

The researchers gathered data from all post-mastectomy women who went to pre-determined setting three days a week from 9 a.m. to 1 p.m. The researcher divided the sample into groups each group contain ten post-mastectomy women were in each group. The program's key themes were knowledge and practices following mastectomy. The researchers created and executed a theoretical and practical component to the instructional guidelines for exercise post mastectomy. An introduction to the instructional program addressing fitness post mastectomy was presented at the outset of the first session, and each session began with summary feedback about the previous session.

The post-mastectomy women were interviewed face to face during pre-intervention for data collection, and then education was offered through a mobile Whats App group by taking the post-mastectomy women's phone numbers and adding them to the group. To create the online questionnaire and start the study, the researchers used an online Google form spreadsheet. In the initial interview with the post-mastectomy women during their visit to a previously mentioned setting, the researchers connected the connection to an online questionnaire and collected telephone numbers of the researched sample. All the data were gathered to compare the effect of mobile-based education versus booklet-based education on post-mastectomy women's knowledge and practice towards exercise post mastectomy.

Degree of arm lymphedema as measured by arm circumference measurement among post mastectomy women in both groups pre intervention by measuring the upper limb circumference. The limb circumference was measured with a tape and measure 15 cm above the lateral epicondyle bone (C15) and 10 cm below the lateral epicondyle bone (C10), with the elbow flexed 90 degree and the shoulder in the anatomical position. Tape measurement assessment is obtained when the sum calculated by differences in circumferences below and above the lateral epicondyle bone is taken (C10+ C15) of the affected side minus (C10+ C15) of the free side and this was expressed as the differences in the width of the arm circumference (Kissin et al., 1986).

Women in the Whats App group were educated using the same educational information as those in the booklet group, but with adding a recorded power point presentation, audio, and animation; figures demonstrate the teaching material. Women in the Whats App group can use an android phone to access these materials after a mastectomy.

The educational information for exercise after mastectomy was similar in both the mobile phone application and the booklet utilized in this study. The educational content was simplified and provided in the form of text and pictures in the booklet and text, image, and video in the mobile application; the content utilized in the two educational methods was gathered depending on the learner's needs.

The tools in the pre-test were completed by post-mastectomy women. They were also given a phone number to call if they had any queries regarding the

educational material. For 3–4 weeks, the group utilized the mobile phone application; while the group used the instructive booklet three text messages were delivered weekly to the subjects in both groups to train them on how to utilize the mobile Whats App application and booklet during the 3–4-week intervention. The questionnaire was completed again by all of the subjects during the post-test via a telephone call.

Evaluation:

After one month, the program was evaluated. The post-mastectomy women were given a post-test to evaluate their knowledge, practices, and degree of arm lymphedema using the same pre-test tools that were scored using the same tools as before the program was implemented.

Statistical analysis:

SPSS was used to examine the data (version 19). The demographic characteristics and information sources of the individuals were investigated, and the results were expressed as frequencies and percentages. To examine the homogeneity of demographic characteristics, the Chi-square and Two-Sample Kolmogorov-Smirnov tests were utilized. The U test and analysis of covariance were used to compare the knowledge and practice subscales. The ANCOVA was done with the assumptions in mind, with the influence of pre-test scores as a covariate variable corrected and the adjusted means compared. The threshold for significance was set at P 0.05.

Results:

Table (1): Showed the characteristics of the post-mastectomy women who were studied. In the mobile-based education group, it was discovered that 60% of the studied post-mastectomy women were between the ages of 40 and 60, with a mean age of 47.4 ± 3.3 and 55%

of them had secondary education, 68 % of post-mastectomy women were housewives, and 70% of them lived in urban areas. While in the booklet-based education group, it was discovered that 59% of the studied sample after mastectomy women were between the ages of 40 and 60, with an average age of 48.2 ± 2.1 and 54% of them had secondary education, 65% of post-mastectomy women were housewives, and 72% of them lived in cities. There were no statistically significant variations in demographic features between the two groups.

Table (2): In terms of medical data, it was discovered in the mobile-based education group that 63% of the women studied had cancer for more than a year, 40% of them were in stage 3 of the disease, and 39% of them had received chemotherapy and surgery. While in the booklet-based education group, it was discovered that 61% of the investigated women had cancer for more than a year, 39% of them were in stage 3 of the disease, and 37% of them had received chemotherapy and surgery for cancer treatment. The table also shows that there were no statistically significant differences between the two groups.

Figure (1): Illustrated that in a mobile-based education group, (67%) of post-mastectomy women had a non-spreading tumor. While, the booklet-based education group 61% of the women were had a non-spreading tumor.

Figure (2): Showed that 43% of post-mastectomy women were having a family history of cancer in the mobile-based education group compared to 49% of the women in the booklet-based education group.

Figure (3): Revealed that 70% of the studied post-mastectomy women reported that the main source of

information regarding post-mastectomy exercises knowledge was doctors.

Table (3): that the most frequently affected side of carcinoma among the studied post mastectomy women in mobile-based education was the left breast (63%) compared to (65%) in booklet-based education. Concerning type of mastectomy, it was observed that (94%) of women in mobile-based education had modified radical mastectomy compared to (97%) in booklet-based education.

Table (4): Showed severity of arm lymphedema after post mastectomy exercise pre and post education mobile-based education group, it was observed that (58%) of the studied post mastectomy women had mild degree arm lymphedema compared to (33%) pre education, and (15%) had severe degree arm lymphedema post education compared to (30%) pre education. While in booklet-based education group, it was observed that (35%) of the studied post mastectomy women had mild degree arm lymphedema compared to (20%) pre education, and (15%) had severe degree arm lymphedema post education compared to (30%) pre education. The same table illustrated that a significant improvement was detected between the two groups regarding improving degree of arm lymphedema post education.

Table (5): Revealed a significant difference relation between the studied post-mastectomy women knowledge level one month following program implementation between both group mobile-based education and booklet-based education groups at $p < 0.001$. Before program implementation, the majority of individuals in both the mobile-based education and booklet-based education groups 78 % and 85% respectively had unsatisfactory knowledge. Furthermore, as compared to

booklet-based education groups, mobile-based education showed an improvement; with the majority achieving a satisfactory knowledge level one month after program implementation 89% vs. 69%, respectively.

Table (6): showed a highly significant improvement in practices level for exercises after mastectomy compared to before education ($p = 0.001$). Before the educational program, only 26% of post-mastectomy women had adequate practice in mobile-based education, while 74% had inadequate practice. The majority of patients 92% had adequate practices following the educational program. Before the training program, only 21% of post-mastectomy women had adequate practices, and 79% had inadequate practices in Booklet-based instruction. 63% had appropriate practice after completing the instructional program.

Table (7): showed no association between the studied women's age with their total knowledge and practices at $p > 0.001$, While there were a statistically significant correlation between studied women's occupation, residence & practice score and their total knowledge at $p < 0.001$.

Table (8): Portrayed that there was a significant positive correlation between the knowledge score and practice score with statically significant differences pre and post the educational program ($p < 0.05$).

Table (9): Illustrated women's evaluations of prepared educational program content; all 100% reported that the educational program content answered all questions related to post-mastectomy exercises and that the content was easy to understand, written in a simple language, and beneficial in the mobile-based education group. While the majority of post-mastectomy women in booklet-based education groups reported that educational program content answered all questions related to post-mastectomy exercises and that the content was easy to understand, written in simple language, and beneficial (87%, 90%, and 93%), respectively.

Table (10): Illustrated that there was a positive correlation between post mastectomy exercise and breast cancer-related lymphedema regarding upper extremity range of motion, strength, pain and activities of daily living.

Table (1): Distribution of the studied post-mastectomy women according to their demographic characteristics (n=200).

Item	Mobile-based education (n=100)		Booklet-based education(n=100)		P-value	x ²
	No.	%	No.	%		
Women' age						
- 18 < 30	18.C	18.0	20	20	.14	1.33
- 30 ≤ 40	22.C	22.0	21	21		
- 40 ≥ 60	60	60	59	59		
Mean ±Stander deviation	47.4±3.3		48.2±2.1			NS
Women' education						
-Primary education	22.C	22.0	22	22	.16	1.43
-Secondary education	55.C	55.0	54	54		
-University education	23.C	23.0	24	24		
Occupation:						
-Working	32	32	35	35	1.30	.20 ^{NS}
- Housewives	68	68	65	65		
Residence:						
-Urban	70	70	72	72	1.21	532
-Rural	30	30	28	28		
						NS

NS: No statistically significant.

Table (2): Distribution of the studied post-mastectomy women regarding their medical data (n=200).

Medical data	Mobile-based education(n=100)		Booklet-based education(n=100)		P-value	x ²
	No.	%	No.	%		
Duration of disease:						
< one year	37	37	39	39	0.21	1.6
≥ one year	63	63	61	61		
Stages of disease						
Stage 1	24	24	22.5	22.5	.26	1.13
Stage 2	27	27	29	29		
Stage 3	40	40	39	39		
Stage 4	9	9	9.5	9.5		
Treatment received						
Radiotherapy	20	20	17	17	0.845	1.450
Chemotherapy	23	23	23	23		
Chemotherapy and surgery	39	39	37	37		NS
Surgery	28	28	23	23		

NS: No statistically significant.

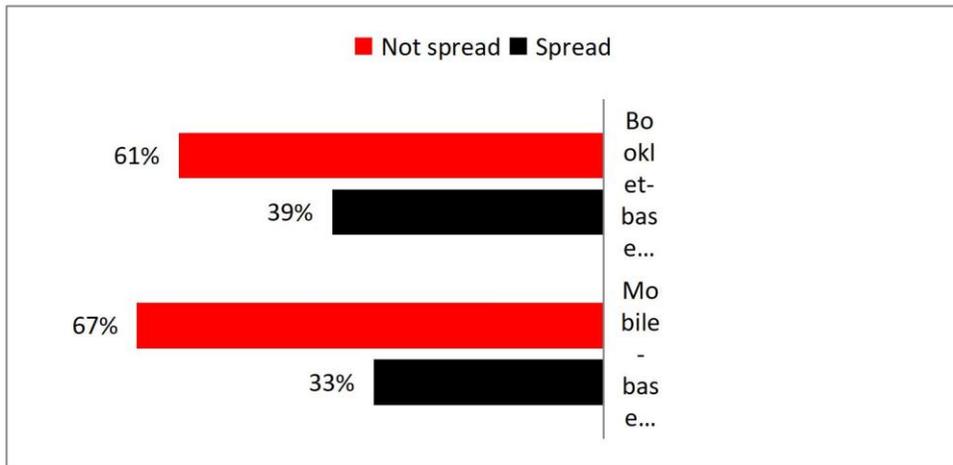


Figure (1): Frequency distribution of the studied post-mastectomy women regarding their type of tumor (n=200).

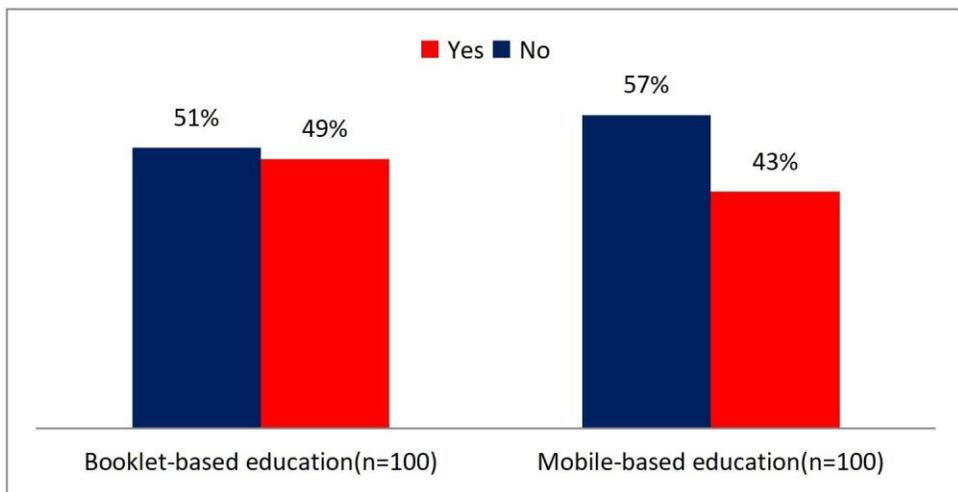


Figure (2): Distribution of the studied post-mastectomy women regarding their family history (n=200).

Table (3): Clinical manifestation of the studied post-mastectomy women regarding their mastectomy related variables (n=200).

Medical data	Mobile-based education(n=100)		Booklet-based education(n=100)		P-value	χ^2
Site of carcinoma:						
Right breast	37	37	35	35	0.23	1.5
Left breast	63	63	65	65		NS
Affected quadrant:						
UOQ	65	65	67	67		
UIQ	8	8	9	9	0.27	1.16
LOQ	4	4	3	3		NS
LIQ	10	10	9	9		
Central	13	13	12	12		
Type of mastectomy:						
Modified radical mastectomy	94	94	97	97		1.452
Simple mastectomy	6	6	3	3	0.856	NS
Development of arm lymphedema						
Yes	79	79	87	87		1.32 NS
No	21	21	13	13	0.754	
Dominancy of the affected arm:						
Yes	41	41	44	44		
No	59	59	56	56		

NS: No statistically significant.

UOQ: Upper outer quadrant, UIQ: upper inner quadrant, LOQ: lower outer quadrant, LIQ: lower inner quadrant.

Table (4): Comparison between studied post-mastectomy women regarding degree of arm lymphedema as assessed by arm circumference measurements after practice exercises of mastectomy pre and post program.

Degree of arm lymphedema:	Mobile-based education (n=100)				Booklet-based education (n=100)				χ^2	P-Value
	pre education		One month post education		pre education		One month post education			
	No.	%	No.	%	No.	%	No.	%		
Absent	22	22	17	17	25	25	29	29	4.45	<0.001
Mild	33	33	58	58	30	30	35	35	6.13	<0.001
Moderate	20	20	10	10	15	15	16	16	7.85	<0.001
Severe	30	30	15	15	30	30	20	20	6.18	<0.001

Highly significance at 0.001 levels*

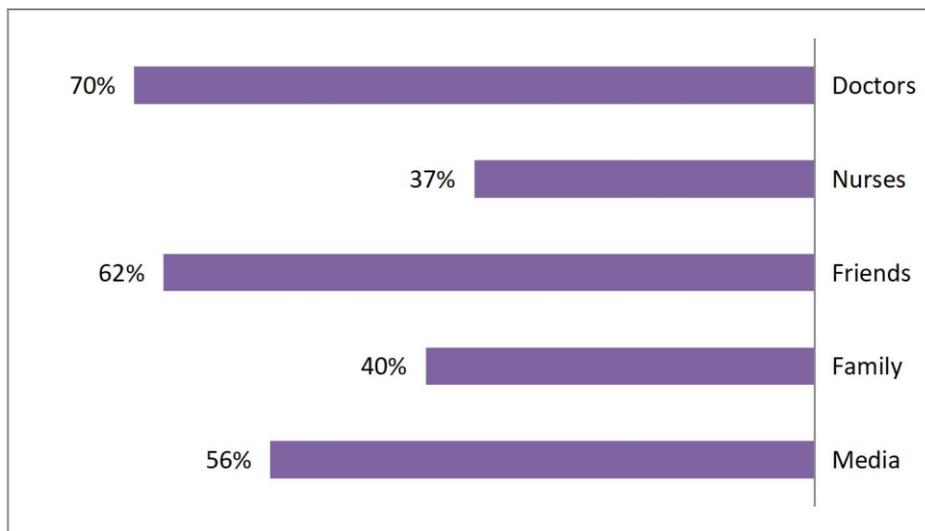


Figure (3): Distribution of the studied post-mastectomy women regarding their source of knowledge about post-mastectomy exercise (200).

Table (5): The statistical differences between studied post-mastectomy women knowledge level pre and post-program.

Knowledge level	Mobile-based education (n=100)				Booklet-based education (n=100)				x ²	P-Value
	Pre education		One month post education		Pre education		One month post education			
	No.	%	No.	%	No.	%	No.	%		
Satisfactory	22	22	89	89	15	15	69	69	46.156	<0.001**
Unsatisfactory	78	78	11	11	85	85	31	31		

** Highly statistically significant.

Table (6):The statistical differences between studied post-mastectomy women regarding practice exercises of mastectomy pre and pots program.

Practice level	Mobile-based education (n=100)				Booklet-based education (n=100)				x ²	P-Value
	Pre education		One month post education		Pre education		One month post education			
	No	%	No.	%	No	%	No.	%		
Inadequate	74	74	8	8	79	79	27	27	39.594	<0.001
Adequate	26	26	92	92	21	21	63	63		

** Highly statistically significant

Table (7): Correlation between demographic data of post-mastectomy women, total knowledge, and their practice.

Variables		Total knowledge	Total practice
Age	r	0.076	0.207
	P	0.379	0.057
Education	r	0.13	0.14
	P	0.34*	0.24
Residence	r	.179 *	-
	P	.036	-
Occupation	r	0.34*	0.41**
	P	0.002	0.001
Practice score	r	.178 *	-
	P	.037	-

*. Correlation is significant at the 0.05 level

Table (8): Correlation Coefficient between the knowledge scores and practices scores pre and post-educational program.

Correlation	Practices scores	
	R	P
Knowledge score		
Pre instructional guidelines	0.162	0.377
Post instructional guidelines	0.384	0.045*

* Correlation is significant at the 0.05 level

Table (9): Post mastectomy women's evaluation of the educational program content regarding exercises after mastectomy (n=200).

Educational program content Post-mastectomy women's of the educational program content	Mobile-based education (n=100)		Booklet-based education (n=100)	
	No	%	No	%
Educational program content answered all questions related to exercises after mastectomy.				
• Yes	100	100	87	87
• No	0	0.0	13	13
The educational program content was easy and written in a simple language				
• Yes	100	100	90	90
• No	0	0.0	10	10
The educational program content was beneficial.				
• Yes	100	100	93	93
• No	0	0.0	0	0.0

Table (10): Correlations between correlation between post mastectomy exercise and breast cancer-related lymphedema regarding upper extremity range of motion, strength, pain and activities of daily living.

Post mastectomy exercise	Pre- educational program	Post- educational program
Upper extremity range of motion	.135	.253*
Strength	.136	.305**
Pain	.132	.237*
Activities of daily living	.163	.287*

(*) Statistically significant at $p < 0.05$

(**) statistically significant at $p < 0.01$

Discussion:

Worldwide breast cancer is the most frequent cancer in women and represents the second leading cause of cancer death. Recent advances in treatment of breast cancer have resulted in improved survival and the focus has now shifted to rehabilitation and improvement in quality of. The focus is

now on educational techniques in order to give patients an adequate mental and physical quality of life. To prevent loss of arm function and achieve a rapid return to an active social life after breast cancer surgery, exercise plays an important role in the rehabilitation of patients after modified radical mastectomy (Bray et al., 2018).

According to demographic characteristics of the studied women, the majority of post-mastectomy women were between the ages of 40 and 60, with a mean age of (47.4±3.3 and 48.2±2.1) in the mobile-based education group and the booklet-based education group, respectively. This result is comparable to that of **Saleh, Rageh, Alhassanin, and Megahed (2018)** as they studied 'Upper limb cancer related to breast cancer therapy: incidence, risk factors, diagnostic techniques, risk reduction and optimal management' in Egypt who reported that the average age of the study subjects, was 48.65±8.17 years.

Regarding to occupation of the studied women, the results of the current study showed that more than two thirds of the studied women in both the mobile-based education group and the booklet-based education group were house wives. This result was supported by the study done by (**Velaga et al., 2021**) they studied the level of knowledge among post-mastectomy mothers about danger signs in Bhueneswar in India and revealed that more than two thirds of the participant women (68.8%) were house wives. This result might be due to increase percentage of unemployment and most of participants lived in rural areas.

Regarding to residence the majority of post-mastectomy women resided in urban areas, according to the findings of this study. This finding is comparable to that of **Sayed et al., (2017)**, who conducted a study on "Informational Needs of Newly Diagnosed Breast Cancer Women" in Egypt and found that three quarter of their participant women (76%) lived in urban areas and less than quarter of them had joint family.

This finding is also, consistent with **Hawash's (2014)** study, "Assessment of health-related knowledge and habits among female cancer women after mastectomy," which found that the majority of females with breast cancer came from urban areas.

Similar to **Abo-Elazm et al., (2018)**, who conducted a cross-sectional study titled "Trends in demography and reproductive variables in breast cancer in Egypt" and discovered that slightly more than half of the study patients were from rural areas. This might be due to life style and culture in rural areas.

Concerning of breast cancer diagnostic duration, the current study found that nearly two-thirds of the women evaluated had been diagnosed with breast cancer for more than a year (**Abo-Elazm et al., 2018**), they studied "Trends in Demographics and Reproductive Factors in Breast Cancer" in Egypt, found that came to the same conclusion, stating that there have been significant changes in reproductive and hormonal patterns in Egyptian females diagnosed with breast cancer over the last 25 years and that these trends should be considered when developing future national breast cancer screening and prevention plans.

Concerning to breast cancer stages, the current study found that more than a third of the women investigated had stage III disease. This finding is confirmed by a study by **Saleh et al., (2018)**, they studied Upper limb cancer related to breast cancer therapy: incidence, risk factors, diagnostic techniques, risk reduction and optimal management, In Egypt, who found that breast cancer women in stage III who had undergone a modified radical mastectomy had a lower risk of

recurrence. Meanwhile, this finding contradicts a study by **Hawash, Alaa Eldeen, El Shatby, El Moghazy, and Hamida (2018)** "Effect of nursing rehabilitation program on the prevention of lymphedema among post-mastectomy women," In Alexandria, which found that more than half of the women studied had stage II breast cancer. This finding could be explained by the fact that the majority of the participants in the study were unaware of the importance of breast self-examination in the early identification of cancer, resulting in breast cancer being diagnosed at stage III.

As regards to family history the current study showed that less than half of post-mastectomy women in the mobile-based education group had a family history of cancer compared to the women in the booklet-based education group. **El-Shinawi et al., (2013)**, in a study about "Assessing the Level of Breast Cancer Awareness among Recently Diagnosed Patients in Ain Shams University Hospital" found that the majority of the patients evaluated had a family history of breast cancer, Furthermore, they found that the risk of breast cancer increases as risk factors, such as family history increase. This might be due to the genetic factors that help on spread the disease through generation.

The result of the present study revealed that majority of the studied post-mastectomy women's information source regarding exercises after mastectomy was the doctor. This might be due to sufficient information provided by the health care team about the topic.

According to hypothesis no. 1 women's knowledge and practices regarding exercise after mastectomy will

be improved in both mobile and booklet groups after implementing the educational program.

According to the women knowledge level of booklet-based education and mobile-based education both improved after implementation and were more in the mobile education group. These findings are consistent with those of **Salimi et al., (2021)** they studied "Comparing the effects of mobile-based education and booklet-based education" on Iranian discovered that mobile-based education may considerably improve knowledge in the experimental group.

Similarly, **AlKlayb et al., (2017)** they studied "Comparison of the effectiveness of a mobile phone-based education program in educating mothers as oral health providers" in Saudi Arabia, reported that the mobile educational method had positive results.

These findings contrast with those of **Feil et al. (2018)**, they studied "A randomized study of a mobile behavioral parent training application" In China, found that the mobile phone application intervention did not significantly improve the behavior of parents; however, the results could be due to the small sample size.

From the researchers' point of view, the results of the effectiveness of this educational method might be attributed to the availability of educational content that is not limited by time or location with the majority obtaining a satisfactory knowledge level one month after program implementation. This result reflects the positive effect of education, which met the needs of the women and provided them with sufficient knowledge to maintain health. It also reflects the need of the studied women to

increase their awareness and know adequate practicing to improve their information about exercises after mastectomy surgery, and it clarifies the importance of education implementation.

According to hypothesis no: 2 Education through the mobile method will be more effective in improving the Women's knowledge and practices regarding exercise after mastectomy than the booklet method.

The current study findings revealed that, the majority of post-mastectomy women in the mobile-based education group improved their practice level for post-mastectomy exercises, with the majority becoming satisfied one month after program implementation. These results agreed with (**Kamath et al., 2019**) they studied "perception and practice regarding breast cancer among post-mastectomy women" in Southern India and found that majority of their subjects (95%) started exercises immediately after mastectomy.

From the point of view of the researchers, the noticeable positive influence of education in improving habits. The major changes in women's practices that mirrored the key goals of the education implementation were validated by these findings.

This result also demonstrates the beneficial effect of mobile-based education over booklet-based education, and the effectiveness of these educational methods may be linked to the convenience of access to educational content in the smallest amount of time.

The findings of these studies show that mobile-based education can help women improve their knowledge in a variety of care areas; however, to create a

sustainable education that allows women to improve their knowledge by referring to educational content regularly. These results agreed with (**Ango et al., 2021**) who studied "knowledge and practice of post-mastectomy women" in Nigeria and found that the majority of women used smart phone application to improve their knowledge & practice by referring to educational content regularly at any time they need it.

The current study's findings revealed that there was a substantial positive association between the knowledge and practice scores of post-mastectomy women before and post-educational programs and there were statistically significant differences ($p = 0.05$) between the knowledge and practice scores. These finding agreed with (**Kamath et al., 2019**) they studied "perception and practice regarding breast cancer among post-mastectomy women" in Southern they reported that many factors such as knowledge & practice have significant effects on the women's practices regarding exercise post-mastectomy.

These findings highlighted the significance of strengthening women's knowledge and practice to assist them in learning and applying good information. This link can be explained by the fact that when the women in the study acquired sufficient knowledge, they were able to practice effectively.

The results of the current study revealed that women' evaluation of prepared educational program content was positive, women reported that the educational program content answered all questions related to exercises after mastectomy and that the content was easy to understand, written in a simple

language, and beneficial in the mobile-based education and booklet-based education groups among post-mastectomy women. From the researchers' point of view, this result reflects the positive effect of educational program contents which help in improving post-mastectomy women's knowledge and practice regarding exercises after mastectomy.

According to the hypothesis no: 3, There will be a positive correlation between post mastectomy exercise and breast cancer-related lymphedema in term of upper extremity range of motion, strength, lymphedema, pain and activities of daily living .

The results of the current study indicated that there was a positive correlation between post mastectomy exercise and breast cancer-related lymphedema regarding upper extremity range of motion, strength, pain and activities of daily living. From the researchers' point of view, its reflected the success of implementation of post mastectomy exercise and its positive effects which lead to improve upper extremity range of motion, strength, decrease pain and promote activities of daily living.

Conclusion:

Based on the findings of the current study, it can be concluded that:

- ✓ Women's knowledge and practices regarding exercise after mastectomy will be improved in both mobile and booklet groups after implementing the educational program.
- ✓ There was a significant positive correlation between the knowledge

score and practice score in both mobile-based education group and booklet-based education group with statically significant differences ($p < 0.05$).

- ✓ A significant improvement was detected between the two groups regarding improving degree of arm lymphedema post education in mobile-based education group than booklet-based education group.
- ✓ Mobile-based education was more effective in improving post-mastectomy women's knowledge and practice regarding exercise after mastectomy than booklet-based education.

Recommendations

In light of the current study results, the following recommendations are proposed:

- Mobile-based educational methods can be used for post mastectomy women regarding exercise after mastectomy to improve their knowledge and practice.
- Replication of the current study on a larger probability sample is recommended for generalized results.
- A simplified illustrated booklet regarding exercise after mastectomy should be available to post-mastectomy women as a reference.
- Community health nurses can use mobile-based educational methods for different groups of society to promote health in various fields of community problems.
- Using a mobile phone is recommended since it can reach a huge number of learners from diverse social groups, and health care

practitioners can use it to improve health in a variety of ways.

- Using of both interventions had a direct effect to minimize degree of post mastectomy arm lymphedema.

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