

## Effect of Nursing Rehabilitation Program on the Prevention of Lymphedema among Post Mastectomy Women

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### Abstract:

**Background:** Surgical treatment usually the first line of attack against most breast cancer patients. Today, modified radical mastectomy (MRM) is the most ordinarily surgical approach used. Lymphedema is the extreme serious long term complication following MRM. So, nursing rehabilitation program play a critical role in the prevention of post mastectomy lymph edema.

**Objective:** Determine the impact of nursing rehabilitation program on the prevention of lymphedema among post mastectomy women.

**Setting:** The study was conducted at the oncology surgical department at Medical Research Institute in Alexandria and the affiliated outpatients clinics.

**Subjects:** A convenience sample of 70 patients determined to have breast cancer and scheduled for mastectomy with axillary lymph node dissection. They were sequentially divided into 2 equal groups; the first was the control groups which comprised 35 patients and exposed to routine hospital care only, the second was the study group and comprised 35 patients and they received the nursing rehabilitation program. **Tools:** Five tools were used Tool I: Post Mastectomy Patients' Assessment Interview Schedule, Tool II: Subjective Outcome Questionnaires for Post Mastectomy Lymphedema, Tool III: Objective Outcome Measures for Post Mastectomy Lymphedema, Tool IV: Post Mastectomy Women Compliance with Nursing Rehabilitation Program, Tool V: Post Mastectomy Women Satisfaction with the Provided Nursing Rehabilitation Program.

**Results:** The study result revealed that the total scores of overall knowledge with a mean ( $26.49 \pm 2.83$ ) improved significantly in the study group after 6 months from application of nursing rehabilitation program than the control group ( $10.34 \pm 2.47$ ).there were statistical significant difference between study and control group regarding pain severity after 6 months from application of nursing rehabilitation program. The total mean scores of upper extremity functional ability was ( $55.4 \pm 1.88$ ), and increased significantly in the study group after application of nursing rehabilitation program compared to the control group ( $53.66 \pm 1.28$ ). Total mean scores of disabilities of the arm, shoulder and hand was ( $49.03 \pm 5.41$ ) then decreased significantly in the study group after application of nursing rehabilitation program compared with the control group ( $58.63 \pm 5.67$ ). Total mean score of muscle strength was improved in the study group than in control group after application of nursing rehabilitation program. Total mean score of arm circumference measurements in operated side was increased in the control group than in the study group from baseline measure till 6 months of follow up. Total mean score of shoulder motion range was more improved in the study group than in control group after.

**Conclusion:** applying the nursing rehabilitation program had statistically significant improvement of patients' knowledge, muscle strength, shoulder motion range, decrease disability and amend functional ability of arm for studied patients post mastectomy.

**Recommendations:** In service training program should be carried out for nurses working in surgical oncology department, chemotherapy and radiation therapy department about post mastectomy lymphedema ,exercise and arm precautions.

**Keywords:** Nursing Rehabilitation Program, Post Mastectomy Lymphedema, Breast Cancer

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## **I. Introduction**

Breast cancer is a major general medical problem all over the world. It is a common cancer form among women globally and represents 16% of all female cancers. About one out of eight females in the U.S. will develop invasive breast cancer through the span of her lifetime. It is considered the 2<sup>nd</sup> death-leading cause after lung cancer among women in the U.S. and accounts for 18.2% of all cancer death<sup>(1,2)</sup>. Breast cancer hits Egyptian females at a younger age. According to the National Cancer Institute, about 37.5% of all Egyptian female cancers are breast cancer patients<sup>(3)</sup>. In 2015, three hundreds patients admitted to the Medical Research Institute Alexandria, diagnosed with breast cancer and modified radical mastectomy was the first treatment of decision for them<sup>(4)</sup>. There are several treatment styles for breast cancer, depending on its type and stage which include local treatments as surgery, radiation therapy and systemic treatments as chemotherapy, hormonal therapy and targeted therapy<sup>(5)</sup>. Surgery is the primary treatment for most breast cancer patient; it is generally conducted with the objective to totally remove breast tumors, either by mastectomy or lumpectomy, and to evaluate the status of the axillary lymph node, either through sentinel lymph node biopsy (SLNB) or axillary lymph node dissection (ALND)<sup>(6)</sup>.

Modified radical mastectomy (MRM) is still a common surgical procedure used for breast cancer management especially in developing countries . It involves eradication of the whole breast, including the nipple, areola, skin and the fatty tissue underneath the skin, and axillary lymph nodes<sup>(7)</sup>. MRM may result in long term upper limb morbidity as reduced shoulder range of motion, muscle weakness of the arm, lymphedema, pain and numbness called post-mastectomy pain syndrome (PMPS), and cording (axillary web syndrome) in which the patient may feel thick cords (like ropes) under armpit that run down into the arm. This is occasionally a side effect after axillary lymph node dissection. The cords have a tendency to be tight and painful. They can make it difficult to lift the arm, straighten the elbow or reach things over head<sup>(8)</sup>.

Lymphedema is one of the main and most fearful complications of breast cancer and its therapies, and can have long-term physical and psychosocial consequences for patients<sup>(9)</sup>. It is characterized by an abnormal, regional accumulation of protein-rich fluid in the interstitial space that can cause edema formation and chronic inflammation. Axillary lymph node dissection (ALND) and axillary radiation therapy have been mentioned as the most common risk for creating lymphedema<sup>(10)</sup>. The incidence of breast cancer-related lymphedema has been hard to measure because of postponed onset of symptoms and absence of standardized diagnostic criteria. Recent studies showed that 50 -60% of women who treated the breast cancer by surgery develop lymphedema<sup>(11,12)</sup>.

Breast cancer associated lymphedema is a lifelong concern once it develops. There is no remedy for lymphedema, the treatment objectives are to relieve of irritating symptoms and prevent swelling from becoming worse<sup>(13)</sup>. The management of post mastectomy lymphedema includes different modalities as complete decongestive therapy (CDT) which includes arm exercise, manual lymphatic drainage (MLD), skin and nail care, self-massage, compression bandage and hand sleeve. Complete decongestive therapy (CDT) is considered as a gold standard for management of lymphedema. Other treatment includes intermittent pneumatic compression treatment (IPC) and surgery<sup>(14,15)</sup>.

Nurses play an essential role in prevention of post mastectomy lymphedema through pre-symptom patient education, early detection. Every breast cancer patient should be routinely assessed for, and questioned about, swelling, impaired range of limb motion, stiffness in shoulder joint and other lymphedema symptoms. Arm exercise play an imperative role in the rehabilitation of post mastectomy patients and improve upper limb muscle strength and function, decrease pain and discomfort and improve quality of life and confidence<sup>(16)</sup>. The nurse is a corner stone for the program of prevention of lymphedema by providing information about risk reduction practices as avert exposure to extreme hot and cold temperature, avoid pulling, pushing with the affected arm and avoid lifting heavy object, avoid measuring blood pressure from affected arm, proper nutrition and skin care<sup>(17)</sup>.

Therefore, this study will be conducted to determine the impact of nursing rehabilitation program on lymphedema prevention among post mastectomy women.

## **II. Materials And Method**

### **MATERIALS**

#### **Research Design:**

A quasi experimental research design was used to accomplish the research's goal.

#### **Settings:**

The study was done at the clinical and experimental oncology surgical department at Medical Research Institute in Alexandria and the affiliated outpatients clinics.

**Subjects:**

This study comprised a convenient sample of 70 patients, admitted to the above mentioned study setting, diagnosed with breast cancer and scheduled for mastectomy and axillary lymph node dissection. The study subjects was randomly separated into two equal groups : a control group, comprising of 35 adult patients who got the routine hospital care only and a study group, comprising of 35 adult patients who got the nursing rehabilitation program. The patients, who are involved in this study, were chosen based on the following criteria:

- Patients with breast cancer and planned for mastectomy with axillary lymph node dissection.
- Adult female patients aged from 21 years to less than 60 years.
- Unilateral breast cancer.
- Have no previous mastectomy.
- Able to communicate verbally and agreed to participate.

**Tools for data collection:**

Five tools were used to collect the necessary data for this study.

**Tool I: Post Mastectomy Patients' Assessment Interview Schedule.**

Researchers produced this tool after reviewing related literature, to assess the breast cancer surgery patient's health status. It comprised of 3 parts as follows:

**Part I: Patient's Sociodemographic Characteristics:** This part of the tool included age, educational level, marital status, occupation and residence area .

**Part II: Patients 'Clinical Data:** This part of the tool included date of admission, family history, date of operation medical history, side of operation , name of operation, stage of breast cancer, number of axillary lymph nodes dissection, number of positive lymph nodes, onset of disease and type of adjuvant therapy post operatively.

**Part III: Women knowledge:** Researchers produced This this part of the tool after reviewing the related literature <sup>(6,16)</sup> . It included seven questions about definition of mastectomy, post mastectomy complications, definition of lymphedema , risk factors , signs & symptoms, complications of lymphedema and arm precautions post mastectomy.

Knowledge related to post mastectomy exercise, included eight questions about definition, advantages, principle before beginning exercises, principle during performing exercises, warning signs to stop exercise, types and number of sessions per day.

**A scoring system of patient's knowledge was done as follows:**

- Two scores were given for every correct and complete response by patient.
- One score was given for every correct and incomplete response by patient.
- Zero was given for every unknown and false response by patient.

The scores acquired for each questions set were summed up to get the overall scores for patient's knowledge. Overall knowledge score was categorized by using a scoring system as follows:

- Poor knowledge <50%
- Fair knowledge 50<75%
- Good knowledge 75% and more

**Tool II: Subjective Outcome Questionnaires for Post Mastectomy Lymphedema, consisted of three parts as follows:**

**Part I: Post Mastectomy Patients' Pain Assessment.** This part of tool was used for subjective assessment of the patient's pain level. It included two sections.

1. **Section one;** it was developed by the researcher after reviewing of relevant literature <sup>(18)</sup> to assess pain characteristics that included: site, radiation, quality, duration, aggravating elements, and relieving elements.
2. **Section two;** it was done using Visual Analog Scale (VAS), it was modified by Mccaffery, (1999), to evaluate pain intensity. This scale contains standardized linear range from 0-10. The patient was asked to place a mark indicating where the current pain lies on the line. As 0 is "no pain", 1-3 represents "mild pain", 4-7 represents "moderate pain", 8-9 represents "severe pain", and 10 is the "worst possible pain". <sup>(18)</sup>

**Part II: The Upper Extremity Functional Index (UEFI)**

This tool was adapted and modified by the researcher from the UEFI scale, and was developed by Stratford 2001<sup>(19)</sup>. It comprises 12 questions used to measure effect of upper limb problems on the activities listed in the index. A five-point likert scale was used ranging from (1) Extreme difficulty or unable to perform activity, (2) Quite a bit of difficulty, (3) Moderate difficulty, (4) A little bit of difficulty, (5) No difficulty. The total scores of the scale ranged from 12 to 60 scores, then score percent was categorized as follows: Low functional ability range from 12-28, moderate functional ability range from 29-45 and high functional ability range from 46-60.

**Part III; The Disabilities of the Arm, Shoulder and Hand (DASH) tool.**

This tool was adapted and modified by the researcher from the DASH scale, developed by Hudak et al 1996<sup>(20)</sup>. DASH Questionnaire is composed of 30 questions (Q), ( Q1-16) asking patients about performing daily living activities by using arm during the past week (e.g. make a meal, wash hair, make a bed, use a knife to trim food and open a tight door). (Q17-20) asks about recreational activities ,(Q21) sexual activities, (Q22,23,30) asks about effect of symptoms on social activities ,(Q 24-28) asks about the severity of symptoms including pain, tingling, weakness and stiffness, (Q29) ask about effect of symptoms on sleep

A five-point likert scale is used ranging from (1) no difficulty, (2) mild difficulty, (3) moderate difficulty, (4) severe difficulty, (5) unable. The total scores of the scale ranged from 30 to150 scores. Then score percent was categorized as follows: Low disabilities ranging from 30-79, moderate disabilities ranging from 80-119, higher disabilities ranging from 120-150.

**Tool III: Objective Outcome Measures for Post Mastectomy Lymphedema , It consisted of three parts as follows:**

**Part I; Assessment of the Muscles Strength.**

This part was adopted from Medical Research Council (MRC) scale, Oxford scale for muscle strength<sup>(93)</sup>, to assess muscle weakness as result of nerve affection during axillary lymph node dissection ALND and to evaluate the motor ability of the post mastectomy patients. This include assessment of the following muscles; triceps, biceps, deltoid, wrist and finger. Medical research council (MRC) scale is a six point scale ranging from (0-5)

**Handgrip strength:** A calibrated dynamometer was used to assess handgrip strength with response values in kilogram-force (kg). In order to tell how much force women exert on closing their hands ,and has been validated in a number of studies by Helen et al (2011)<sup>(21)</sup>. The following table clarifies the average adult hold strength:

Rating	Female non dominant hand	Female dominant hand
Strong (excellent)	37	41
Normal (good)	22-33	25-37
Weak (poor)	18	22

**Part II; Arm Circumferences Measurement.**

This method of limb volume calculation has been validated in a number of studies by Megens et al, 2001; Sander et al, 2002; Karges et al, 2003; Taylor et al (2006). Arm measurements were obtained at each marked point at four points, metacarpal phalangeal joint, the wrist, ten centimeters distal to and fifteen centimeters proximal to lateral epicondyles, measuring by cloth tape. Each subject was measured once at each visit for the comparative volume in both arms.

**Tool IV: Post Mastectomy Women Compliance with Nursing Rehabilitation Program:**

This part included questions developed by the investigator, after reviewing the related literature. These questions were checked with "Yes" /or "No" by the postoperative studied patients.

**Tool V: Post Mastectomy Women Satisfaction with the Provided Nursing Rehabilitation Program:**

This part included questions developed by the researcher, after reviewing the related literature. These questions were checked with Yes /or No by the postoperative studied patients.

**Method**

- An official letter from Alexandria University, Faculty of nursing was submitted to the general directors of Medical Research Institute and head of surgical department.
- Verbal explanation was performed by the researcher to medical and nursing staff about the study purpose, time of data collection in order to obtain approval to perform the study.

- Content validity of the tools and booklet were tested by five experts in Medical-Surgical nursing and oncology surgical department in Alexandria University, to test content validity, completeness and items clarity and appropriate translation. Comments and suggestions of the jury were considered and the tool was modified accordingly.
- The reliability of the developed tool was tested by using Cronbach's Alpha test. Coefficient value was 0.891, suggesting reliable tools.
- A pilot study was conducted on 7 adult patients who were not included in the study sample from the previously mentioned settings in order to evaluate the clarity and applicability of the study tools. The data obtained from the pilot study were analyzed, and the final form of tools was reconstructed and ready.
- Oral consent of the patients to participate in the study was obtained.
- Privacy of the patients was maintained.
- Confidentiality of the collected data was secured.
- The study approved by the local ethical committee

**The study was performed on four phase.**

**Phase I: Assessment phase**

- Initial assessment: was performed in 24 hrs preoperative using tools I, tool II,III for both group subjects to collect baseline data, health history, assess existing knowledge about lymphedema, arm exercise, arm precautions, subjective and objective measurements were obtained. This interview took about 30 to 60 minutes.

**Phase II: Planning phase**

- Based on the data assembled from the assessment phase and literature review the nursing rehabilitation program goals, priorities, contents, and expected results were developed by the-researcher according to the individual needs and problems.

**Phase III: Implementation**

- The developed rehabilitation program was conducted and applied individually to each patient in the surgical department and was continued in outpatient clinic and chemotherapy department, using demonstration, redemonstration.
- Illustrated colored booklet was formulated by the researcher and distributed to each patient of study group.
- Patients were asked to repeat the exercise until the investigator was assured that the patient had gained the skills.

**Phase IV: Evaluation phase:**

Aimed to reassess post mastectomy women after nursing rehabilitation program to identify progress in term of differences in patients level of response from baseline. It was done by the following schedule at 7 days, 3 and 6 months postoperatively using:

- Tool I part III and tool II,III
- Tool IV, V were used to evaluate satisfaction and compliance to nursing rehabilitation program after 6 months for study group.

### **III. Indentations and Equations**

**Statistical Analysis**

- After collecting data, codes were assigned and the data was transferred into special design formats, so as to be appropriate for computer feeding. After data entry, checking and verification processes were performed to avert errors during data entry. Data was computed and statistically analyzed using the Statistical Package for Social Sciences "SPSS" software version 20.

**A- Descriptive statistics**

- Count (numbers) and percentage, used for describing and summarizing qualitative data.
- Mean, median and standard deviation were used for describing and summarizing quantitative data.
- Minimum- Maximum used for presenting non parametric quantitative data.

**B-Analytical statistics**

They were used for comparing each group in the study independently between preoperative, one week, 3 and 6 months post-operative, the following tests were used:

- Mann-Whitney U test for the quantitative variable while Chi-Square ( $\chi^2$ ) and Monte Carlo tests for qualitative variables.
- t-test: it was used to test association between two quantitative variable or to detect difference between two or more proportions
- Fisher's exact (FET) test was used for comparison between the distributions of two qualitative variables whenever the Chi-Square ( $\chi^2$ ) test was not appropriate ( $> 20\%$  of the expected cells have expected count  $< 5$ ). The chosen significance level for this study was  $P \leq 0.05$ .
- Monte Carlo test and Fisher's exact test are alternatives for Pearsons Chi-Square ( $\chi^2$ ) test if there were many small expected values.
- Mc Nemar and Marginal Homogeneity test were used to examine the significance between the various stages.
- Wilcoxon signed ranks test: used for abnormally distributed quantitative variables, to compare between two periods.
- Student t-test, used for normally distributed quantitative variables, to compare between two studied categories.

#### IV. Results

**Table (1):** Show frequency distribution of the study and control group according to their socio-demographic characteristics. More than half of both control (54.3%) and study group (42.9%) were aged from 50-60 years old. The majority of patients in the study and control groups were married. The highest percentage of both control and study groups were illiterate. Most of the studied patients in both groups were housewives and are from rural areas. There were no statistically significant differences in socio-demographic characteristics between the two groups.

**Table (2):** Shows frequency distribution of the study and control group according to their clinical data, this table revealed that, all patients of the study group did not develop lymphedema, while a minority of control group (5.7%, 5.7%) developed lymphedema at (1 - <3 months and 3 – 6 months) respectively. Majority of patients in both study and control groups had no associated medical diseases and hadn't family history of breast cancer. More than half of both control and study groups were diagnosed with breast cancer at stage II and undergone modified radical mastectomy on the right side. Additionally, the table shows that around half (51.4%) of the study group had <20 axillary lymph nodes dissected, while two thirds (60.0%) of the control group had  $\geq 20$  axillary lymph nodes dissected with positively involved lymph nodes in  $\geq 5$  in (54.3%) of the study group and in (62.9%) of control group. Most of both control (88.6%) and study group (91.4%) received chemotherapy as adjuvant treatment post mastectomy.

**Figure (1):** Illustrate Frequency distribution of the study group according to total score of knowledge before and immediately after implementing of nursing rehabilitation program. This table showed that the overall knowledge of the study group was poor pre program and then improved significantly throughout follow up period to be good in the majority of study patients after nursing rehabilitation program, with highly statistically significant difference between the two groups ( $<0.001^*$ ).

**Figure (2):** Illustrate Frequency distribution of the control group according to total score of knowledge before and immediately after implementing of nursing rehabilitation program. This table observed that the overall knowledge of the control group was poor pre program and still poor throughout follow up period after routine hospital care, with statistically significant difference between the two groups ( $<0.001^*$ ).

**Figure (3):** Illustrate the distribution of the study group according to pain severity before and after one week, 3 and 6 months of implementing nursing rehabilitation program. The figure reveals that around two thirds 65.7% of the study group had moderate pain at the first week post operatively. However, after 3 and 6 months postoperative, most patients in the study group improved and mentioned no pain after application of nursing rehabilitation program with statistically significant difference between the two groups ( $P=0.007$ ).

**Figure (4):** Illustrate the distribution of the control group according to pain severity before and after one week, 3 and 6 months of implementing nursing rehabilitation program. On the first week, post operatively the results reflected that around two thirds (62.9%) of the control group complained of moderate pain. Furthermore, some of patients in control group still suffered from moderate pain and more than half of them experienced moderate pain at 6 months post operatively.

**Table (3):** Illustrates the comparison between the study and control groups according to total score of Disabilities of the Arm, Shoulder and Hand (DASH) before and after week, 3 and 6 month of implementing nursing rehabilitation program. The total mean scores of disabilities of the arm, shoulder and hand was ( $49.03 \pm 5.41$ ) then decreased significantly in the study group after application of nursing rehabilitation program compared with the control group ( $58.63 \pm 5.67$ ) indicating significant difference between the two groups after application of program ( $<0.001^*$ ).

**Table (4):** Illustrates the comparison between the study and control groups in relation to muscles strength of the operated limb at before and after one week, 3 and 6 months of implementing nursing rehabilitation program. The total mean score of all assessed muscle strength was improved from preoperative to one weeks, 3and six months after application of nursing rehabilitation program in the study group than in control group with statistically significant difference between the two groups (0.006<sup>\*</sup>).

**Table (5):** Illustrates the comparison between the study and control groups in relation to handgrip strength at before and after one week, 3 and 6 months of implementing nursing rehabilitation program. The total mean score of handgrip strength increased significantly from the preoperative assessment to one week,3 and 6months postoperatively. The mean scores of handgrip strength amongst study group were  $4.17 \pm 0.45$  after 6months from application of nursing rehabilitation program which denotes improvement to normal handgrip. Also among the control group, there were a significant increase in the mean scores all over the periods of assessment although the mean score it was around  $3.74 \pm 0.44$ with statistically significant difference between the two groups ( $<0.001^*$ ).

**Table (6):** Shows comparison between the study and control groups according to arm circumferences measurement before and after one week, 3 and 6 months of implementing nursing rehabilitation program. This table illustrates no increase in circumferences measurement in study group at all four pre-determined points (metacarpal phalangeal , wrist, 10 cm distal to lateral epicondyle and15 cm proximal to lateral epicondyle)throughout the follow-up period till 6 months, while in control group circumference measurements there was gradually and slightly increase from baseline measure till 6 months. This table also showed that the mean total score of arm circumference measurements in operated side was increased in the control group than in the study group from baseline measure till 6 months of follow up, with no statistically significant difference between the two groups ( $p=0.494$ ).

**Table (7):** Illustrates the comparison between the study and control groups according to shoulder joint ranges of motion before and after one week, 3 and 6 months of implementing nursing rehabilitation program. The total mean score of shoulder range of motion increased significantly from the preoperative assessment to one week,3 and 6months postoperatively. The mean scores of shoulder range of motion among study group were  $7.51 \pm 0.74$  after 6months from application of nursing rehabilitation program which denotes improvement to normal motion. Also among the control group, there was a significant increase in the mean scores all over the periods of assessment although the mean score it was around  $6.26 \pm 1.34$ . with statistically significant difference between the two groups( $<0.001^*$ ).

**Table (8):** shows Post mastectomy satisfaction with the provided nursing rehabilitation program among studied group. The majority of the study patients were satisfied with the nursing rehabilitation program for all the items including; instructions included in the provided nursing rehabilitation program, satisfaction with the instruction received from the provided program, and improvement since starting the nursing rehabilitation program, (82.9%, 97.1%, 88.6%) respectively

## V. Discussion

Mastectomy is the first choice treatment for breast cancer today. Even though advances in breast cancer treatment, for example, chemotherapy, radiotherapy and surgical treatment lessen breast cancer-related mortality rates, they likewise prompt the development of dangerous complications such as lymphedema <sup>(24)</sup>.

Nursing rehabilitation program post mastectomy is a significant and potentially powerful tool that can have beneficial effects in restoring shoulder range of motion , preventing stiffness, decreasing pain, improving functional ability of upper limb and improving quality of life. This program should begin before surgery and is restarted immediately after surgery <sup>(25)</sup>.

**Regarding age group,** the results revealed that most of the study and control group patients were in the age group ranging from 50 to less than 60 years. This finding agrees with **Mahdy (2011)** <sup>(25)</sup> who found that the highest percentage of the studied women were above 40 years old. In addition, **Shabaan** <sup>(26)</sup> stated that the highest incidence of breast cancer occurs in older women and is strongly related to age. This finding may be justified that the aging process is the biggest risk factor for breast cancer because of the longer life expectancy, changes in reproductive patterns in women over 40 years, menopausal hormonal use, genetic damage (mutations) in the body at this age and bodies are less capable of repairing genetic damage.

**As regards educational level,** the study revealed that most of the study and control group were illiterate. This finding is supported by **Abd El-Razik (2010)** <sup>(28)</sup> who reported that the highest percentage of the studied groups were illiterate. This can be interpreted by that educated women can get more information sources about their condition through internet or media than uneducated women. Also, education level can highly affect patients' perception of the tumor, thus influencing the level of early detection, diagnosis, and treatment. This contradicts **Beiki et al (2012)** <sup>(29)</sup> who revealed that women with the highest educational level had a significantly higher incidence of breast cancer compared to those with lower education. In addition, women account for 69% of the total number of illiterate people in Egypt and all sample of the study were women.

**Concerning marital status**, most of the patients in the control and study group were married. This result is similar to **Armer's (2015)** <sup>(30)</sup> who found that most of the women in both groups were married. This finding also contradicted **Hayes et al (2012)** <sup>(31)</sup> who mentioned that unmarried and nulliparous had an increased risk for developing breast cancer due to prolonged or repeated exposure to estrogen hormones.

**In relation to the residence area**, this study indicated that the highest percentage of the study and control groups were living in urban areas. This finding was supported by **Hawash (2014)** <sup>(32)</sup> who reported that the majority of women with breast cancer came from urban areas. This can be explained by the fact that the women in urban area are prone to use plastic and electrical appliances, cosmetics, high fat diet and processed meat, low fruits, vitamins and vegetables. Dietary fat intake may be a factor in indirectly increasing serum estrogen levels, and well-done meat may contain specific genotoxins as well as exposure to air pollution. Also, one or more westernized lifestyle differs strongly between rural and urban women. This finding disagrees with **Bahgat (2016)** <sup>(33)</sup> who documented that the highest percentage of the included sample were from rural areas.

**Regarding occupation**, it was observed that housewives represented the highest percentage among the study and control groups. This may be due to that the majority of this sample were illiterate and had no formal education to have professional work. Based on the result of the study, this could be interpreted by that the majority of the sample were married and housewives; that may expose them to household insecticides and detergents that increase breast cancer risk. This result is in line with **Qalawa et al (2011)** <sup>(34)</sup> who mentioned that the majority of breast cancer subjects were housewives; which emphasizes the association between breast cancer and occupational factors including environmental stimuli.

**Regarding lymphedema occurrence** throughout the study period, the results revealed that all patients of the study group didn't develop lymphedema while the minority of control group developed lymphedema at 3 – 6 months. This comes in agreement with **Armer (2013)** <sup>(35)</sup> who emphasized that early physiotherapy with an educational strategy after surgery for breast cancer that included dissection of axillary lymph nodes was associated with a lower danger of secondary lymphoedema after 12 months of follow-up. Also, this result revealed that, around half of the study group had <20 axillary lymph nodes dissected, while two thirds of the control group had  $\geq 20$  axillary lymph nodes dissected. This comes in line with **Bahgat (2016)** <sup>(33)</sup> who found a significant association between number of axillary lymph nodes dissected and lymphedema occurrence. Despite the increased awareness of cancer and attempts at early detection in Egypt, we are still facing subjects with clinically palpable axillary nodes.

**In relation to associated disease**, the findings showed that around two thirds of patients of both study and control groups had diabetes mellitus and hypertension. This result is supported by **Ahmed et al (2010)** <sup>(36)</sup> who reported that most of studied patients had associated disease. This result could be justified by that most of the sample were in the age group from 50- 60 years.

**Regarding family history**, the current study displayed that most of both study and control groups had negative family history. This finding was in line with the findings of **Wilf-Miron et al (2011)** <sup>(37)</sup> who reported that the highest percentage of their patients had negative family history. However, **Aly et al (2012)** <sup>(38)</sup> contradicted this study and they revealed that a higher percentage of studied patients had positive family history especially first relative degree related to genetic factors.

**Concerning stage of breast cancer**, the study's findings showed that more than half of both control and study groups were diagnosed with breast cancer at stage II. This result is supported by **Mahdy (2012)** <sup>(39)</sup> who mentioned that a higher percentage of studied group were diagnosed at second stage. This result could be due to that the majority of the sample were illiterate and were not aware about breast self examination for early detection of cancer at first stage. Another contradicting point of view is that most of the sample were married and were not embarrassed to seek medical advice and examination and take support from their husbands, thus the disease was discovered at stage II.

**In relation to name of operation**, the present study revealed that most of the study and control group undergone modified radical mastectomy with axillary lymph node dissections (ALND). This result comes in line with **Salem et al (2010)** <sup>(40)</sup> who reported that modified radical mastectomy is the most widely used surgical procedure to treat operable breast cancer patients in Egypt.

**In relation to overall patient's knowledge**, the results of the current study reported that there were no statistically significant difference between study and control group pre implementing of rehabilitation program related to patient knowledge, while 6 months after implementing the nursing rehabilitation program, total knowledge improved among study group than in control group with statistically significant difference between both groups. This goes in the same line with **Krzywonos (2014)** <sup>(41)</sup> who found that overall women knew little to nothing about lymphedema before they developed it. After diagnosis, the primary information source about lymphedema was a physical therapist or doctor. Most physicians reported that they did not routinely advise women or provide written information on lymphedema prevention to their patients, and the degree to which women's daily life was influenced. This result could be due to that the majority of studied women had no past experience about breast cancer and lymphedema. In addition doctor and nurse focus on providing brief



guidelines just before discharge and most of nurses don't have knowledge about lymphedema and its prevention.

The current study results reported that there was statistically significant improvement among the study group than control group regarding total knowledge after six months from implementing nursing rehabilitation program. This might be due to health instruction given to study patients using different teaching strategies as lecture, discussion, and colored booklet. Also, the researcher emphasized up on the importance of reinforcement of patient's knowledge. These results in accordance with **Paiva (2013)**<sup>(42)</sup> who explained that arm lymphedema has received little attention even from health care providers as well as clinicians caring for breast cancer survivors, besides they had limited knowledge on that condition. After implementing the health education intervention, there was a significant increase and improvement in women's knowledge regarding arm lymphedema characteristics and its consequences.

**As regards shoulder pain severity**, the results of the present study showed that most women in the control and the study groups had moderate pain in the 1<sup>st</sup> week postoperatively, this may be due to surgical incision and presence of drain. However, there was statistically significant difference between study and control group concerning pain severity at 6<sup>th</sup> months from application of rehabilitation program, in which no pain was observed in most of the study group than in control group. This may be due to that study women being knowledgeable on topics that can decrease pain as arm elevation and positioning, gradual exercise and arm precautions in daily living. This result is in line with **Taha (2013)**<sup>(43)</sup> who found that during the early months after mastectomy, pain and decreased shoulder movements are more common and then decrease gradually after 6 months.

In addition, **Chan (2010)**<sup>(44)</sup> emphasized that early rehabilitation program post mastectomy seems to accelerate recovery and prevent complication and is effective in lessening shoulder disability and pain. However, this could be contributed to the fact that the importance of pain management is further increased when benefits for the patients are realized earlier mobilization, shortened hospital stay and reduced expenses.

**Regarding upper extremity functional abilities**, the results illustrated that most of study and control group exhibited lower functional ability in the first post-operative week with no statistically significant difference among both group. This might be due to that modified radical mastectomy with axillary lymph nodes dissection usually decreased muscle strength, increased shoulder stiffness and interfered with ability to practice daily life activity.

The improvements occurred in both groups at the third and sixth month, but the improvement was higher among the study group than in control group post application of nursing rehabilitation program with statistically significant difference among both groups at end of program. These findings are attributed to adherence of the studied patients to the instructions provided for them by the researcher to perform self-care activities or due to incorporating home exercises regularly into their daily living. These findings come in line with **Mishra et al (2012)**<sup>(45)</sup> and **Eyigor et al (2010)**<sup>(46)</sup> who found that the mean percent value of independency in performing activity of daily living was higher among the study group compared to control group.

In addition, the current results revealed that most of the study patients showed higher functional ability than control group regarding indoor arm care and outdoor arm care at the end of rehabilitation program.

This is supported by **McNeely et al (2010)**<sup>(47)</sup> who found that early physical therapies are important in improving overall functional capacity, upper extremity strength and shoulder joint ROM, lessening pain and managing lymphedema.

**Regarding the shoulder, arm and hand disabilities**, the results of the present study reported that the most of women in the control and the study groups had no shoulder disability preoperatively. Also, this result represented that the majority of the study and control group had a moderate shoulder disability in the first week postoperatively. Shoulder mobility limitation is one of the most important factors that deteriorate the daily functional capacity of the patient after mastectomy, so **Mohammed (2016)**<sup>(48)</sup> mentioned that the early onset of rehabilitation program is effective in terms of recovery of daily living activities and provide improvement in shoulder movement and prevent disabilities.

Additionally, most of the study group and some of control group had lower disabilities at six months. However, the improvement was higher among the study group after application of nursing rehabilitation program than in control group. This result corresponds to **Fung et.al (2011)**<sup>(49)</sup> who concluded that physiotherapy program proved to be secure and effective in improving shoulder function without major complications. This may be related to the adherence of study women to home exercise program and arm precaution, and our the patients were instructed to do daily living activities independently such as dressing, bathing, ambulation and preparing meals which is considered part of rehabilitation movement to improve functional ability.

**As regards muscle strength**, the current study showed that the majority of the study and control group had a severe and moderate muscle weakness in the first week postoperatively. This might be due to fatigue and

patient feared to perform exercise, whereas there was a significant improvement of the muscle strength of the upper limb in the majority of the study group than control group at six months from application of nursing rehabilitation program. This may be related to the application of the rehabilitation program which included isometric exercises that were demonstrated to the patient by the researcher. That was illustrated in a colored booklet by pictures so that they were clear and easy to the patients when performed at home.

The finding of this result are in agreement with **Kwan et al (2011)**<sup>(50)</sup> who illustrated that weight-training exercise does not increase the risk or severity of breast cancer related lymphedema (BCRL) but it enhances limbs' muscle strength, as well as physical components of quality of life. This result is supported by **Chan (2010)**<sup>(51)</sup> who pointed that in order to keep muscle strength, patient should perform isometric exercise properly. Disuse of muscles leads to loss of approximately one eighth of its strength each week of disuse. In addition immobilization of muscles leads to changes in structure and function as well as accumulation of lymphatic fluid in arm and hand. In contrast, **Anderson (2012)**<sup>(52)</sup> showed that vigorous exercise interventions harmful to women with or at risk of breast cancer-related lymphoedema, and strenuous activity should be avoided post mastectomy.

**In relation to handgrip strength**, the present study illustrated that, in the 1st week post operatively, the majority of study and control group had low scores of hand grip strength. This may be due to weak upper limb muscles after ALND, while on the 3<sup>rd</sup> & 6<sup>th</sup> months postoperatively, improvement was observed in the study group than the control group as the majority of study groups returned to normal hand grip strength compared to a small proportion of the control group. Also, the result showed that there was highly statistically significance difference between the control group and the study groups at end of program. This result is in line with **Hagrass (2012)**<sup>(53)</sup> who revealed a significant increase in hand grip strength of operated side after application of exercise program in the study group compared to the control group. This result comes in contrast with **Kilbreath et.al (2012)**<sup>(54)</sup>, who conducted a study to investigate "The efficacy of physiotherapy treatment of shoulder function, pain and quality of life in patients who have undergone breast cancer surgery and axillary lymph node dissection". They declared that there was no significant improvement in handgrip strength between both groups.

**Arm circumference** at specific distance from anatomic landmarks is presently the most widely recognized method for assessing changes in limb girth in patients with breast cancer. Any change in arm circumference by 2 cm or more between influenced and uninfluenced limb is known as lymphedema (LE). The current study showed that the mean circumferential differences were increased in control group while in study group they did not change from baseline measure till the end of program period. However, there was no statistically significant difference between both groups. This result comes in line with **Bulley (2013)**<sup>(55)</sup> who revealed no statistical significant among group mean changes for the four circumference measurement differences after exercise program. This might be due to the fact that the duration of the follow-up program was not long enough to result in statistical significance.

The study findings are incongruent with **Czerniec et al (2011)**<sup>(56)</sup> and **Aaronson (2014)**<sup>(57)</sup> who found a statistically significant differences among both group after application of rehabilitation program. In addition they emphasized that early physiotherapy could be effective in the prevention of secondary lymphedema in women for approximately one year after surgery.

**Concerning range of motion**, the current study proved that in the 1st week postoperatively, most of study and control groups have limited shoulder range of motion. This may be due to axillary scar post ALND that limited the shoulder motion, while in the third and six months post operatively, the present study revealed a significant increase in flexion, internal and external rotation of shoulder range of motion without limitation in the study group than in control group. This result may be due to the continuous demonstration of home exercises by studied women as instructed by the researcher and reviewed by the colored booklet which was distributed to each patients, where continuous arm exercise improved circulation, increased shoulder flexibility, prevented joint stiffness, improved range of motion of affected arm and improved overall physical conditioning. Moreover, decreased pain level experienced by studied patients might increase the adherence to the exercise program.

These findings agree with **Galantino (2013)**<sup>(58)</sup> who found that rehabilitation program is an effective way to improve shoulder mobility and range of motion during the immediate 2- week recovery period following surgery. This result is also corresponding with **Bendz & Olse (2012)**<sup>(59)</sup> who concluded their study that in both on the short term as well as long term, early onset of exercises is beneficial in averting deterioration in a range of shoulder motion.

The present study findings showed compliance of most of postoperative studied patients with the nursing rehabilitation program. This might be due to that commitment was the result of a sense of the extent of importance of these instructions and their application. It may also be attributed to the fact that exercises performed at home are more convenient, and therefore participants adhered more to the prescribed exercise program and arm precautions. This result is congruent with **Brown (2014)**<sup>(60)</sup> who concluded that strict

compliance with the nursing rehabilitation program significantly decreased the time to heal and prolonged the time to recurrence and improved overall condition.

**Regarding patient satisfaction**, the majority of study patients were satisfied with the instructions included in the nursing rehabilitation program. This result is in line with **Wolf (2015)**<sup>(61)</sup>, who stated that patient satisfaction with rehabilitation program increased, and satisfaction level ranked highly immediately before discharge. Also, this result contradicts **Papastavrou (2014)**<sup>(62)</sup> who pointed out that there was a communication gap between nurses and their patients which led to patient dissatisfaction.

Finally, the present study emphasized that a well-planned rehabilitation program carried out by the researcher could be a successful tool to help in improving shoulder muscles strength, ROM, functional abilities and reducing pain in women post mastectomy. Nurses play an important role in planning and applying exercise program. So, nurses should incorporate exercise program into their routine general practice activities. Successful implementation combines education for patients, training for nurses in the context of an organization committed to both the concept and practice of supported rehabilitation program. Trusting relationship between the patient and nurses enables a feeling of working together to achieve the aim of rehabilitation program.<sup>(63)</sup>

## **VI. Conclusion**

From the findings of the present study, it can be concluded that: early application of post mastectomy nursing rehabilitation program significantly improved the studied patients' pain intensity, muscle strength, range of motion, hand grip strength, lower level of disability of shoulder, arm and hand and higher functional ability of upper limb post operatively than their controls.

## **Recommendations**

Based on the findings of the present study the following recommendation are derived and suggested:

### **Recommendations for patients:**

- All women who had mastectomy must perform early postoperative exercises and comply with them for at least 6 months after mastectomy.
- A colored illustrated educational booklet should be available and distributed to all women who had mastectomy pre operatively.

### **Recommendations for nurses:**

- In service training program should be carried out for nurses working in surgical oncology department, chemotherapy and radiation therapy department about post mastectomy lymphedema ,exercise and arm precautions.
- Procedure manual should be updated and available for nurses working in surgical oncology department about lymphedema, and a rehabilitation program that should be implemented to each patient post mastectomy.
- Newly recruited nurses should be attending rehabilitation program about post mastectomy lymphedema

### **Recommendations for further researchers:**

- Further research is needed to be conducted on larger sample size to attain more generalized results.
- Further studies are needed to increase follow up period post mastectomy.

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**Table (1): Frequency distribution of the study and control groups according to their sociodemographic characteristics**

Socio demographic characteristics	Study group (n=35)		Control group (n=35)		Test of sig. (P-value)
	N	%	N	%	
<b>Age (years)</b>					
20 - <30	2	5.7	0	0.0	$\chi^2=2.871$ ( <sup>MC</sup> P=0.42)
30 - <40	6	17.1	4	11.4	
40 - <50	12	34.3	12	34.3	
50-< 60	15	42.9	19	54.3	
Mean ± SD	46.57±6.97		48.60±6.20		t=-1.286 (P=0.203)
Min-Max	29 - 57		35 - 56		
<b>Level of education</b>					
Illiterate	23	65.7	30	85.7	$\chi^2=6.725$ ( <sup>MC</sup> P=0.071)
Read & write	8	22.9	2	5.7	
Primary & preparatory	2	5.7	0	0.0	
Secondary	2	5.7	3	8.6	
<b>Marital status</b>					
Married	23	65.7	26	74.3	$\chi^2=0.628$ ( <sup>MC</sup> P=0.757)
Divorced	5	14.3	4	11.4	
Widowed	7	20.0	5	14.3	
<b>Occupation</b>					
Professional work	3	8.6	2	5.7	$\chi^2=0.217$ ( <sup>MC</sup> P=1.0)
Manual work	3	8.6	3	8.6	
Housewife	29	82.8	30	85.7	
<b>Residence area</b>					
Urban	24	68.6	30	85.7	$\chi^2=2.917$ (P=0.088)
Rural	11	31.4	5	14.3	

$\chi^2$ : Calculated value for Chi square test

<sup>MC</sup>P: P-value of Monte Carlo test

t: Calculated value of Student t-test

**Table (2): Frequency distribution of the study and control groups according to their clinical data.**

Clinical data	Study group (n=35)		Control group (n=35)		Test of sig. (P-value)
	N	%	N	%	
<b>Occurrence of lymphedema</b>					
Not occurred	35	100.0	31	88.6	$\chi^2=4.242$ ( <sup>MC</sup> P=0.119)
1 - <3 months	0	0.0	2	5.7	
3 – 6 months	0	0.0	2	5.7	
<b>Associated disease</b>					
No	20	57.1	20	57.1	$\chi^2=0.762$ ( <sup>MC</sup> P=0.962)
<b>Yes</b>	<b>15</b>	<b>42.9</b>	<b>15</b>	<b>42.9</b>	
Hypertension	6	40.0	8	53.3	
Heart disease	3	20.0	3	20.0	
Diabetes mellitus	4	26.7	3	20.0	
Asthma	2	13.3	1	6.7	
<b>Family history</b>					
No	26	74.3	32	91.4	$\chi^2=3.954$ ( <sup>MC</sup> P=0.422)
<b>Yes</b>	<b>9</b>	<b>25.7</b>	<b>3</b>	<b>8.6</b>	
Mother	3	33.3	1	33.3	
Grandma	3	33.3	1	33.3	
Sister	1	11.1	0	0.0	
Aunt	2	22.2	1	33.3	
<b>Onset since diagnosis(month)</b>					
<1	18	51.4	8	22.9	$\chi^2=13.941^*$ ( <sup>MC</sup> P=0.004)*
1 - <2	8	22.9	20	57.1	
2 - <4	4	11.4	2	5.7	
4 - <6	5	14.3	2	5.7	
6 – 12	0	0.0	3	8.6	
<b>Stage</b>					
Stage I	11	31.4	13	37.2	$\chi^2=0.272$ ( <sup>MC</sup> P=0.941)
Stage II	20	57.2	18	51.4	
Stage III	4	11.4	4	11.4	
<b>Name of operation</b>					
Modified radical mastectomy	35	100.0	34	97.1	$\chi^2=1.014$ ( <sup>MC</sup> P=1.0)
Radical mastectomy	0	0.0	1	2.9	
<b>Side of operation</b>					
Right side	21	60.0	16	45.7	$\chi^2=1.433$ (P=0.231)
Left side	14	40.0	19	54.3	
<b>Number of lymph nodes dissected</b>					
<20	18	51.4	14	40.0	$\chi^2=0.921$ (P=0.337)
≥20	17	48.6	21	60.0	
<b>Number of positive lymph nodes</b>					
<5	16	45.7	13	37.1	$\chi^2=0.530$ (P=0.467)
≥5	19	54.3	22	62.9	
<b>Adjuvant treatment after surgery</b>					
Radiation therapy	3	8.6	4	11.4	$\chi^2=0.159$ ( <sup>MC</sup> P=1.0)
Chemotherapy	32	91.4	31	88.6	

$\chi^2$ : Calculated value for Chi square test

<sup>MC</sup>P: P-value of Monte Carlo test\*: Statistically significant at  $p \leq 0.05$

**Table (3): Comparison between the study and control groups according to total score of Disabilities of the Arm, Shoulder and Hand (DASH) Score at before and after, one week, 3 and 6 months of implementing nursing rehabilitation program**

DASH Score	Study group (n=35)								Control group (n=35)								Test of sig. (P-value)			
	Before operation		1 week after		3 months after		6 months after		Before operation		1 week after		3 months after		6 months after		P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%				
Low disabilities (30-79)	35	100.0	0	0.0	35	100.0	35	100.0	35	100.0	0	0.0	27	77.1	34	97.1	-	$\chi^2=6.293^*$ ( $p=0.012^*$ )	$\chi^2=9.032$ ( $FEp=0.005^*$ )	$\chi^2=1.014$ ( $FEp=1.000$ )
Moderate disabilities (80-119)	0	0.0	31	88.6	0	0.0	0	0.0	0	0.0	22	62.9	8	22.9	1	2.9				
Higher disabilities (120-150)	0	0.0	4	11.4	0	0.0	0	0.0	0	0.0	13	37.1	0	0.0	0	0.0				
<b>P<sub>0</sub></b>			MH $p<0.001$		-		-		MH $p<0.001$		McN $p=0.008^*$		McN $p=1.000$							
<b>Total score</b>																				
Min - Max.	30 - 32		109 - 120		55 - 79.0		41.0 - 64.0		30 - 31		111 - 126		59.0 - 83.0		52 - 87		U=553.50 (0.430)			
Mean ± SD.	30.71±0.75		114.49±3.43		63.51±5.78		49.03±5.41		30.77±0.43		118.0±4.31		70.49±7.35		58.63±5.67		U=341.0* (0.001*)			
<b>W<sub>x</sub>p</b>			<0.001*		<0.001*		<0.001*				<0.001*		<0.001*		<0.001*		U=257.5* (<0.001*)			
																	U=141.5* (<0.001*)			

$\chi^2$ : Calculated value for Chi square test  
 MH: Marginal Homogeneity Test  
 McN: McNemar test  
 Wx: Wilcoxon signed ranks test  
 U: Mann Whitney test  
 p<sub>0</sub>: p-value for comparing between before operation and each other period  
 p<sub>1</sub>: p-value comparing between study and control group before operation,  
 p<sub>2</sub>: p-value comparing between study and control group 1 week after operation,  
 p<sub>3</sub>: p-value comparing between study and control group 3 months after,  
 p<sub>4</sub>: p-value comparing between study and control group 6 months after operation.  
 \*: Statistically significant at  $p \leq 0.05$

**Table (4): Comparison between the study and control groups in relation to muscles strength of the operated limb before and after one week, 3 and 6 months of implementing nursing rehabilitation program**

Operated side	Study group (n=35)								Control group (n=35)								Test of sig. (P-value)			
	Before operation		1 week after		3 months after		6 months after		Before operation		1 week after		3 months after		6 months after		P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%				
<b>Deltoid Muscles strength</b>																				
• Very severe weakness	0	0.0	2	5.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	$\chi^2=2.276$ ( $McP=0.469$ )			
• Severe weakness	0	0.0	16	45.7	0	0.0	0	0.0	0	0.0	15	42.9	0	0.0	0	0.0				
• Moderate weakness	0	0.0	17	48.6	0	0.0	0	0.0	0	0.0	20	57.1	0	0.0	0	0.0				
• Mild weakness	0	0.0	0	0.0	7	20.0	3	8.6	0	0.0	0	0.0	16	45.7	8	22.9	$\chi^2=5.245^*$ ( $P=0.022$ )			
• Normal	35	100.0	0	0.0	28	80.0	32	91.4	35	100.0	0	0.0	19	54.3	27	77.1	$\chi^2=2.696$ ( $P=0.101$ )			
<b>P<sub>0</sub></b>			<0.001*		0.008*		0.083				<0.001*		<0.001*		0.005*					
<b>Biceps muscles strength</b>																				
• Very severe weakness	0	0.0	7	20.0	0	0.0	0	0.0	0	0.0	17	48.6	0	0.0	0	0.0	$\chi^2=8.30^*$ ( $P=0.016$ )			
• Severe weakness	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0				
• Moderate weakness	0	0.0	16	45.7	0	0.0	0	0.0	0	0.0	14	40.0	4	11.4	0	0.0				
• Mild weakness	0	0.0	12	34.3	12	34.3	2	5.7	0	0.0	4	11.4	14	40.0	13	37.1	$\chi^2=5.054$ ( $McP=0.082$ )			
																	$\chi^2=10.267^*$ ( $P=0.001$ )			

Normal	35	100.0	0	0.0	23	65.7	33	94.3	35	100.0	0	0.0	17	48.6	22	62.9				
<b>p<sub>0</sub></b>			<0.001*		0.001*		0.157				<0.001*		<0.001*		<0.001*					
<b>Triceps muscles strength</b>																				
• Very severe weakness	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0				
• Severe weakness	0	0.0	12	34.3	0	0.0	0	0.0	0	0.0	24	68.6	0	0.0	0	0.0				
• Moderate weakness	0	0.0	23	65.7	6	17.1	0	0.0	0	0.0	10	28.5	6	17.1	0	0.0				
• Mild weakness	0	0.0	0	0.0	2	5.7	3	8.6	0	0.0	1	2.9	11	31.5	5	14.3				
• Normal	35	100.0	0	0.0	27	77.2	32	91.4	35	100.0	0	0.0	18	51.4	30	85.7				
<b>p<sub>0</sub></b>			<0.001*		0.008*		0.083				<0.001*		<0.001*		0.025*					
<b>Total</b>	15.0 ± 0.0		8.23 ± 1.29		14.06 ± 1.43		14.77 ± 0.60		15.0 ± 0.0		7.54 ± 1.15		13.26 ± 1.20		14.26 ± 0.60		-	t=2.355* (0.021*)	t=2.534* (0.014*)	t=2.846* (0.006*)
<b>p<sub>0</sub></b>			<0.001*		<0.001*		<0.001*				<0.001*		<0.001*		<0.001*					

χ<sup>2</sup>: Calculated value for Chi square test  
 P<sub>0</sub>: p-value for Wilcoxon signed ranks test for comparing between before operation and each other period  
 P1: P-value comparing between study and control group before operation, P2: P-value comparing between study and control group 1 week after operation,  
 P3: P-value comparing between study and control group 3 months after, P4: P-value comparing between study and control group 6 months after operation. \*: Statistically significant at p ≤ 0.05

**Table (5): Comparison between the study and control groups in relation to Handgrip strength before and after one week , 3 and 6 months of implementing nursing rehabilitation program.**

Handgrip strength	Study group (n=35)								Control group (n=35)								Test of sig.(P-value)			
	Before operation		1 week after		3 months after		6 months after		Before operation		1 week after		3 months after		6 months after		P1	P2	P3	P4
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%				
<b>Operated side</b>																				
• Weak	0	0.0	28	80.0	4	11.4	2	5.7	0	0.0	28	80.0	15	42.9	11	31.4				
• Normal	28	80.0	7	20.0	27	77.2	30	85.7	32	91.4	7	20.0	20	57.1	24	68.6	χ <sup>2</sup> =1.867 (P=0.172)	χ <sup>2</sup> =0.0 (P=1.0)	χ <sup>2</sup> =11.411* (MC P=0.003*)	χ <sup>2</sup> =9.897 (MC P=0.004)
• Strong	7	20.0	0	0.0	4	11.4	3	8.6	3	8.6	0	0.0	0	0.0	0	0.0				
<b>p<sub>0</sub></b>			<0.001*		0.106		0.014*				<0.001*		<0.001*		0.002*					
<b>Non-operated side</b>																				
• Weak	0	0.0	2	5.7	2	5.7	0	0.0	0	0.0	3	8.6	5	14.3	0	0.0				
• Normal	31	88.6	28	80.0	26	74.3	30	85.7	31	88.6	29	82.8	27	77.1	33	94.3	χ <sup>2</sup> =0.0 (FE P=1.0)	χ <sup>2</sup> =0.718 (MC P=0.810)	χ <sup>2</sup> =2.905 (MC P=0.257)	χ <sup>2</sup> =1.429 (FE P=0.428)
• Strong	4	11.4	5	14.3	7	20.0	5	14.3	4	11.4	3	8.6	3	8.6	2	5.7				
<b>p<sub>0</sub></b>																				
<b>Total</b>	4.31±0.58		3.29±0.71		4.14±0.65		4.17±0.45		4.20±0.53		3.20±0.58		3.51±0.70		3.74±0.44		U=546.50 (p=0.266)	U=601.0 (p=0.872)	U=349.0* (p<0.001*)	U=381.50* (p<0.001*)
<b>p<sub>0</sub></b>			<0.001*		0.237		0.132				<0.001*		<0.001*		0.002*					

χ<sup>2</sup>: Calculated value for Chi square test  
 P<sub>0</sub>: p-value for Wilcoxon signed ranks test for comparing between before operation and each other period  
 P1: P-value comparing between study and control group before operation,  
 P2: P-value comparing between study and control group 1 week after operation,  
 P3: P-value comparing between study and control group 3 months after,  
 P4: P-value comparing between study and control group 6 months after operation. \*: Statistically significant at p ≤ 0.05



**Table (6): Comparison between the study and control groups according to arm circumference measurements before and after week , 3 and 6 month of implementing nursing rehabilitation program.**

Arm circumference measurement (cm)	Study group (n=35)				Control group (n=35)				Mann Whitney U test (P-value)			
	Before operation	1 week after	3 months after	6 months after	Before operation	1 week after	3 months after	6 months after	P1	P2	P3	P4
<b>Metacarpal-phalangeal Operated</b>												
Mean ± SD.	19.8±2.61	19.8±2.61	19.8±2.61	19.8±2.61	20.17±1.91	20.17±1.91	20.34±2.06	20.51±2.34	Z=-0.382 (0.702)	Z=-0.382 (0.702)	Z=-0.780 (0.436)	Z=-0.780 (0.436)
Min. – Max.	12 – 22	12 – 22	12 – 22	12 – 22	12 – 22	12 – 22	12 – 23	12 – 25				
<b>p<sub>0</sub></b>		1.0	1.0	1.0		1.0	0.083	0.083				
<b>Non-operated</b>												
Mean ± SD.	19.8±2.61	19.8±2.61	19.8±2.61	19.8±2.61	20.17±1.91	20.17±1.91	20.17±1.91	20.17±1.91	Z=-0.382 (0.702)	Z=-0.382 (0.702)	Z=-0.382 (0.702)	Z=-0.382 (0.702)
Min. – Max.	12 – 22	12 – 22	12 – 22	12 – 22	12 – 22	12 – 22	12 – 22	12 – 22				
<b>Wrist joint Operated</b>												
Mean ± SD.	18.23±1.31	18.23±1.31	18.23±1.31	18.23±1.31	18.2±1.47	18.2±1.47	18.29±1.54	18.63±2.21	Z=-0.170 (0.865)	Z=-0.170 (0.865)	Z=-0.315 (0.753)	Z=-0.461 (0.645)
Min. – Max.	16 – 21	16 – 21	16 – 21	16 – 21	15 – 21	15 – 21	15 – 21	15 – 24				
<b>p<sub>0</sub></b>		1.0	1.0	1.0		1.0	0.083	0.083				
<b>Non-operated</b>												
Mean ± SD.	18.23±1.31	18.23±1.31	18.23±1.31	18.23±1.31	18.2±1.47	18.2±1.47	18.2±1.47	18.2±1.47	Z=-0.170 (0.865)	Z=-0.170 (0.865)	Z=-0.170 (0.865)	Z=-0.170 (0.865)
Min. – Max.	16 – 21	16 – 21	16 – 21	16 – 21	15 – 21	15 – 21	15 – 21	15 – 21				
<b>10 cm distal to lateral epicondyle Operated</b>												
Mean ± SD.	26.43±1.84	26.43±1.84	26.43±1.84	26.43±1.84	26.4±2.17	26.4±2.17	26.66±2.61	26.74±2.8	U=-0.144 (0.885)	U=-0.144 (0.885)	U=-0.216 (0.829)	U=-0.216 (0.829)
Min. – Max.	24 – 29	24 – 29	24 – 29	24 – 29	22 – 29	22 – 29	22 – 32	22 – 33				
<b>p<sub>0</sub></b>		1.0	1.0	1.0		1.0	0.083	0.083				
<b>Non-operated</b>												
Mean ± SD.	26.43±1.84	26.43±1.84	26.43±1.84	26.43±1.84	26.4±2.17	26.4±2.17	26.4±2.17	26.4±2.17	U=-0.144 (0.885)	U=-0.144 (0.885)	U=-0.144 (0.885)	U=-0.144 (0.885)
Min. – Max.	24 – 29	24 – 29	24 – 29	24 – 29	22 – 29	22 – 29	22 – 29	22 – 29				
<b>15 cm proximal to lateral epicondyle Operated</b>												
Mean ± SD.	34.57±4.53	34.57±4.53	34.57±4.53	34.57±4.53	34.86±4.69	34.86±4.69	35.29±5.12	35.43±5.06	U=-0.202 (0.840)	U=-0.202 (0.840)	U=-0.476 (0.634)	U=-0.576 (0.564)
Min. – Max.	30 – 45	30 – 45	30 – 45	30 – 45	30 – 45	30 – 45	30 – 45	30 – 45				
<b>p<sub>0</sub></b>		1.0	1.0	1.0		1.0	0.039*	0.025*				
<b>Non-operated</b>												
Mean ± SD.	34.57±4.53	34.57±4.53	34.57±4.53	34.57±4.53	34.86±4.69	34.86±4.69	34.86±4.69	34.86±4.69	U=-0.202 (0.840)	U=-0.202 (0.840)	U=-0.202 (0.840)	U=-0.202 (0.840)
Min. – Max.	30 – 45	30 – 45	30 – 45	30 – 45	30 – 45	30 – 45	30 – 45	30 – 45				
<b>Total operated</b>	99.03±7.06	99.03±7.06	99.03±7.06	99.03±7.06	99.63±8.19	99.63±8.19	100.6±9.51	101.3±10.78	U=581.0 (p=0.707)	U=581.0 (p=0.707)	U=558.5 (p=0.520)	U=555.0 (p=0.494)
<b>p<sub>0</sub></b>		1.000	1.000	1.000		1.000	0.039*	0.038*				

Z: Wilcoxon signed ranks test

p<sub>0</sub>: p-value for Wilcoxon signed ranks test for comparing between before operation and each other period

P1: P-value comparing between study and control group before operation,

P2: P-value comparing between study and control group 1 week after operation,

P3: P-value comparing between study and control group 3 months after,

P4: P-value comparing between study and control group 6 months after operation.

\*: Statistically significant at p ≤ 0.05

**Table (7): Comparison between the study and control groups according to shoulder joint ranges of motion before and after ones week , 3 and 6 months of implementing nursing rehabilitation program.**

Shoulder ranges of motions (Operated side)	Study group (n=35)								Control group (n=35)								Test of sig. (P-value)				
	Before operation		1 week after		3 months after		6 months after		Before operation		1 week after		3 months after		6 months after		P1	P2	P3	P4	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%					
Flexion motion	Limited	0	0.0	35	100.0	11	31.4	8	22.9	0	0.0	35	100.0	23	65.7	27	77.1	-----	-----	$\chi^2=8.235^*$ (P=0.004)*	$\chi^2=20.629^*$ (P<0.001)*
	Normal	35	100.0	0	0.0	24	68.6	27	77.1	35	100.0	0	0.0	12	34.3	8	22.9				
	<b>p<sub>0</sub></b>			<0.001*		0.001*		0.005*				<0.001*		<0.001*		<0.001*					
Abduction motion	Limited	0	0.0	35	100.0	11	31.4	4	11.4	0	0.0	35	100.0	15	42.9	12	34.3	-----	-----	$\chi^2=0.979$ (P=0.322)	$\chi^2=5.185^*$ (P=0.023)*
	Normal	35	100.0	0	0.0	24	68.6	31	88.6	35	100.0	0	0.0	20	57.1	23	65.7				
	<b>p<sub>0</sub></b>			<0.001*		0.001*		0.046*				<0.001*		<0.001*		0.001*					
External rotation motion	Limited	0	0.0	32	91.4	8	22.9	3	8.6	0	0.0	35	100.0	12	34.3	9	25.7	-----	$\chi^2=3.134$ ( <sup>FE</sup> P=0.077)	$\chi^2=1.120$ (P=0.290)	$\chi^2=3.621$ (P=0.057)*
	Normal	35	100.0	3	8.6	27	77.1	32	91.4	35	100.0	0	0.0	23	65.7	26	74.3				
	<b>p<sub>0</sub></b>			<0.001*		0.005*		0.083				<0.001*		0.001*		0.003*					
Internal rotation motion	Limited	0	0.0	30	85.7	3	8.6	2	5.7	0	0.0	35	100.0	9	25.7	13	37.1	-----	$\chi^2=5.385$ ( <sup>FE</sup> P=0.054)	$\chi^2=3.621$ (P=0.057)	$\chi^2=10.267^*$ (P=0.001)*
	Normal	35	100.0	5	14.3	32	91.4	33	94.3	35	100.0	0	0.0	26	74.3	22	62.9				
	<b>p<sub>0</sub></b>			<0.001*		0.083		0.157				<0.001*		0.003*		<0.001*					
<b>Total</b>	8.0 ± 0.0		4.23 ± 0.43		7.06 ± 0.97		7.51 ± 0.74		8.0 ± 0.0		4.0 ± 0.0		6.31 ± 1.55		6.26 ± 1.34		-	t=3.174* (0.003*)	t=2.406* (0.019*)	t=4.866* (<0.001*)	
<b>p<sub>0</sub></b>			<0.001*		<0.001*		<0.001*				<0.001*		<0.001*		<0.001*						

$\chi^2$ : Calculated value for **Chi square test**      <sup>FE</sup>P: P-value of Fisher's exact test      <sup>MC</sup>P: P-value of Monte Carlo test

p<sub>0</sub>: p-value for **Wilcoxon signed ranks test** for comparing between before operation and each other period  
 P1: P-value comparing between study and control group before operation,  
 P2: P-value comparing between study and control group 1 week after operation, P3: P-value comparing between study and control group 3 months after, P4: P-value comparing between study and control group 6 months after operation.\*: Statistically significant at p ≤ 0.05

**Table (8): Post mastectomy satisfaction with the provided nursing rehabilitation program among studied group.**

Post mastectomy satisfaction with the provided nursing rehabilitation program	Study group (n=35)	
	N	%
<b>Do you agree to and understand the instructions included in the provided nursing rehabilitation program?</b>		
• Yes	29	82.9
• No	6	17.1
<b>Are you satisfied with the nursing rehabilitation program?</b>		
• Yes	34	97.1
• No	1	2.9
<b>Have you improved since starting the nursing rehabilitation program?</b>		
• Yes	31	88.6
• No	4	11.4

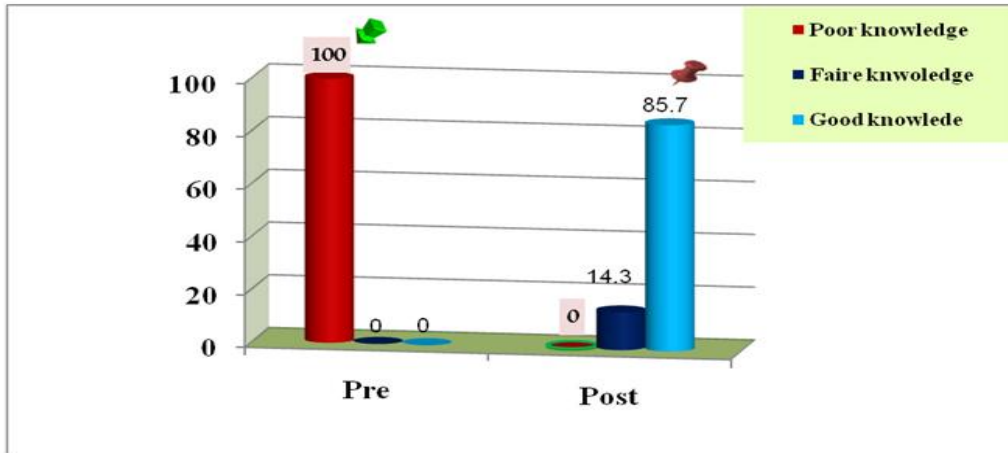


Figure (1):Frequency distribution of study group related to total score of knowledge.

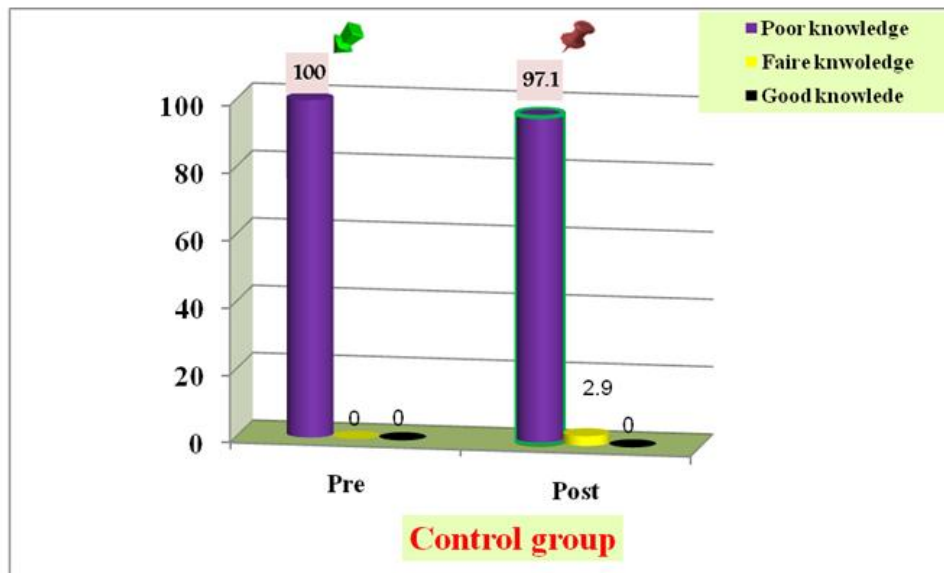


Figure (2):Frequency distribution of control group related to total score of knowledge

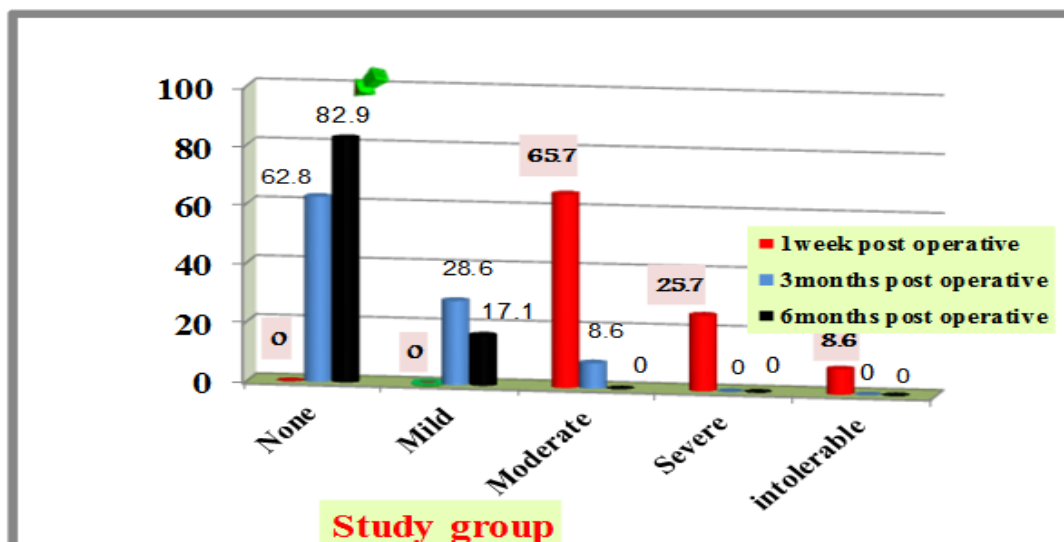


Figure (3):Frequency distribution of the study group according to pain severity.

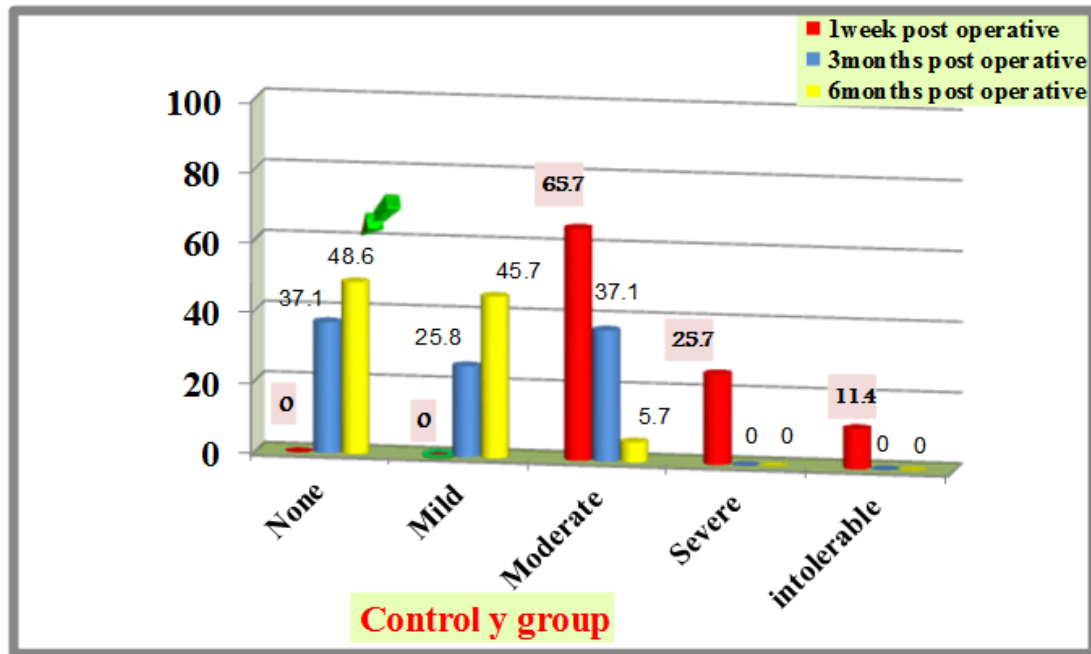


Figure (4):Frequency distribution of the control group according to pain severity.

Mervate A E. Hawash. "Effect of Nursing Rehabilitation Program on the Prevention of Lymphedema among Post Mastectomy Women" IOSR Journal of Nursing and Health Science (IOSR-JNHS) , vol. 7, no.6 , 2018, pp. 68-87.