

## Effect of Postoperative Mastectomy Exercise Adherence on Pain and Wound healing

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### Abstract

Adherence to prescribed exercise is taken into consideration, especially when there are treatment-related obstacles.

**Aim:** to evaluate effect of postoperative mastectomy exercise adherence on pain and wound healing. **Research**

**design:** quasi-experimental research design. **Setting:** The research was dispensed in general surgical units and an outpatient clinic at Assiut University Hospital. **Tools: four tools were used: Tool I:** Interview structure

questionnaire; designed by the researcher supported current national and international literature, and composed of two parts: **Part (1):** Patient demographics characteristics, **Part (2):** Patient's medical data. **Tool II:** Exercise

adherent rating Scale, **Tool III:** (Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials) IMMPACT panel scale and **Tool IV:** Wound healing assessment scale. **Results:** Wound infections affected nearly

half the control group (46.7%), slightly less than three quarters (73.3%) of the control group didn't complete post-mastectomy activities. In terms of pain severity and pain interference with daily activities, there was a highly

significant difference between the study and control groups  $P < 0.001^{**}$ . **Conclusion:** adherence to post-mastectomy

exercise improve wound healing and reduce pain level. **Recommendations:** Applying post-mastectomy exercise to a wider probability sample from various geographic areas to assist within the generalization of the findings.

**Keywords:** Adherence, Mastectomy, Wound healing & Pain

### Introduction:

Breast cancer is the most frequent cancer among women and the second most prevalent cancer in the general population. Breast cancer will affect 2.3 million women globally in 2020, with 685 000 fatalities. 7.8 million women were surviving at the end of 2020 who had been diagnosed with breast cancer in the previous five years (Wild et al, 2020). The primary risk factor for breast cancer is getting older. Breast cancer is diagnosed at an average age of 60 years, and over 40% of newly diagnosed breast cancer patients are 65 years or older. (National Cancer Institute NCI, 2021).

Following surgery, the patient may experience stiffness in the shoulder or arm. To keep the muscles that surround the shoulder joint on the affected side flexible and elastic, the patient need to do progressive exercises. If possible, the patient begins exercising two or three times each day the day after surgery. Brushing or combing hair, slowly reaching up behind the back to touch just beneath the shoulder blades are just a few examples of simple arm exercises. Once the drains and stitches are removed, the patient can undertake more exercises such as wand exercise, side bends, shoulder blade stretch, elbow winging, and others to increase their range of motion (Sri et al. 2019)

These exercises should not be uncomfortable, but the patient may experience arm stretching. Taking pain relievers before beginning exercise can be beneficial. The patient should continue arm exercises until he or she remains in the same range of motion as before the surgery and is no longer in pain. This could take weeks or months The patient should continue arm exercises until the same range of motion as before the surgery are remains and is no longer in pain. This could take weeks or months (Cardoso, 2019).

A high level of exercise adherence, described by the World Health Organization as "the extent to which a person's behavior conforms with established recommendations," is a key component in promoting the optimal effectiveness of exercise. This definition of adherence takes into account both the number of sessions attended as well as the intensity and duration of the individual training sessions as prescribed (Lenja et al, 2019).

Adherence to prescribed exercise is notoriously difficult, owing to treatment-related obstacles. Attitudes, beliefs, pain aversion, medical professional supervision, and social and familial support were all critical elements influencing exercise adherence Many research have found that a lack of social support and a low level of self-efficacy can affect breast cancer

patients' postoperative exercise adherence (Wang et al, 2019).

Postoperative physical therapy is required to alleviate postoperative discomfort and limited range of motion, as well as to prevent further upper limb impairments and limits in everyday activities in the long run .It can also help with adhesions, limb edema, joint stiffness, and muscle atrophy in affected upper limb flaps. However, it takes a long time for patients to be able to conduct postoperative functional exercises, and early functional exercise while in the hospital is simply a stage in the rehabilitation of the upper limbs to their best state (Casla et al, 2015).

### Significance of the study

Over the course of her lifetime, one out of every eight women within the U. S. (about 13 percent) will get invasive carcinoma. In 2021, women within the US are predicted to be diagnosed with 281.550 new cases of invasive carcinoma and 49.290 new cases of non-invasive (in situ) carcinoma.(According to the American Cancer Society, 2021). According to general surgery unit records at Assiut University Hospital, 400 mastectomy surgeries will really be wiped out 2020 (Assiut University Hospital record, 2020)

### Aim of the study

The goal of the study was to evaluate effect of postoperative mastectomy exercise adherence on pain and wound healing.

### Hypothesis:

- The pain level within the study group are below the pain level within the control group.
- Wound healing within the study group is best than within the control group.

### Sample and Method

A quasi-experimental research design was employed during this study.

### Setting:

The research was dispensed in surgery units and an outpatient clinic at Assiut University Hospital.

### Sample:

A sample of sixty female patients who underwent mastectomy surgery, followed by a one-month follow-up period after discharge. Their ages ranged from eighteen to over eighty. The patients were divided into two groups ( study and control). The study group received post-mastectomy exercise furthermore routine medical care, whereas the control group received only routine medical care.

### Sample size

A convenience sample of all patients available (60).

$$n = \frac{NZ^2\sigma^2}{Z^2\sigma^2 + Ne^2}$$

$$n = \frac{150 * (1.96)^2 * (4)^2}{(1.96)^2 * (4)^2 + 150 * (0.05)^2} = 50.21$$

### Study tools:

**Tool:** Interview structure questionnaire: comprised of two parts and ready by the researcher supported current national and international literature

**Part 1:** Assessment of patient demographics patient demographics characteristics : age, residence, marital status, educational level, and occupation are all factors to contemplate.

**Part 2:** Patient's medical data, which incorporates the affected side, chronic disease, and wound complications.

**Tool II: Exercise adherence rating scale, (Naomi A, et al., 2016):** This This scale contains 16 items and is used to assess patient adherence to exercise

### System of evaluation:

The scale had a whole score of 0–4 points. a complete score of 4 points indicated good adherence, whereas a whole score of over or adequate one point indicated poor adherence.

**Tool III:** Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) panel scale adopted from from (Turk DC1, et al . , 2003)

It's accustomed measure what proportion pain you're in and the way much it's interfering along with your life. It consists of nine items, each with a score starting from 1 to 10.

### Scoring system:

- Pain severity score = average items on a 3- to 6-point scale (pain at its worst , pain at its least , average pain).
- Interference score = average of scale items from 9A to 9G (interference of pain with: general activity, mood, walking, normal work, relations, sleep, and enjoyment of life).

**Tool IV: Wound healing assessment scale: Southampton classification system adopted from Bailey I et al, 1992**

It includes four items: normal healing, normal healing with minor bruising or erythema, erythema plus other indicators of inflammation, and normal healing with mild bruising or erythema. Whether it's a transparent or a bloody discharge, assessing the wound's grade and appearance could also be a significant complication.

**Postoperative mastectomy exercise:** This exercise was developed in easy Arabic language with illustrated photographs, and patients within the study group were shown a video show on the guide

that contained exercises, and got a duplicate to require home.

The following may be a list of mastectomy exercises that were categorized by time:

- Deep breathing exercise on the primary day after surgery.
- On the third day after surgery, do pump ups, shoulder shrugs, arm lifts, and bone squeezes.
- General sleeping suggestions, general safety advice, discomfort, swelling, and discharge instructions were all provided within the booklet.
- Method

#### **Ethical considerations:**

The study was approved by the faculty ethics committee as well as the hospital authorities of general surgery units and surgical outpatient clinics; enlisted patients signed a written consent form after being informed of the study's nature and purpose. Participation is entirely voluntary, according to the researcher. Patients were given the option of refusing to participate in the study and withdrawing at any time.

#### **Procedure:**

**The study was performed in three phases:**

##### **Preparatory phase:**

**Tool development:** A overview of current and previous related literature at both the local and international levels. In various areas, books, journals, periodicals, and magazines were used.

##### **Validity of content:**

It was created by a panel of five professionals from the medical surgical, gerontological nursing, and general surgery fields, who examined the instrument for clarity, relevance, comprehensiveness, comprehension, and applicability. A few minor adjustments were required. Cronbach's alpha =0.82 was used to determine the test reliability of the proposed tools

##### **Pilot Study:**

In January 2019, a pilot study was done on 10% of patients who were included in the research to assess the clarity and feasibility of the utilized tool; those patients were enrolled in the main study because no changes to the study instrument were required.

##### **Implementation Phase:**

- Data was collected at morning shift from February to July 2019(15\ 2\2019 to 15\ 6 \2019).
- One day before surgery, the researcher meets with each patient individually (about 15 case each week ) and informs them about the study and its objectives.
- At the first interview, the researcher introduces herself to establish a line of contact, explains the study's nature and goal, and completes the patient assessment sheet (**tool I**).

- For the study group, after filling out the patient's assessment form, the researcher describes the mastectomy to the patient and shows a video for ten minute about mastectomy exercise .
- The patient received the mastectomy exercise in two sessions, each lasting about half an hour and involving a quarter hour for discussion and feedback.
- During the first session, the researcher provides the patient with basic information regarding mastectomy, the purpose of exercise, and the first day's activity.
- The second session was reserved for the third day's mastectomy exercise, which the researcher demonstrated to the patients.
- Each patient in the study group received a copy of the mastectomy exercise.
- The control group receives usual postoperative advice from the hospital.
- The researcher set up a follow-up appointment with the patients after two weeks in the general surgery outpatient clinic at Assiut University Hospital.

##### **Evaluation phase:**

Following the patient's discharge from the hospital , the researcher contacts with patients to schedule a follow-up appointment in an outpatient general surgery clinic (during his or her first visit 2 weeks after the surgery) to re-evaluate the patient's condition. This is for members of the control and study groups who use it **Tool II, III, IV**

##### **Statistical design:**

Using a computer program (SPSS) version, the obtained data were tabulated and statistically analyzed to determine the differences between the study groups in terms of several variables (frequency and percentages, mean and standard deviation) . The relationship between the two groups was studied using independent sample T-tests, Chi-square tests, one-way ANOVA testing, and Pearson correlation tests. When the P value is less than 0.05, it is regarded significant; when the P value is greater than 0.05, it is considered non-significant; when the P value is less than 0.05, it is considered significant; and when the P value is less than 0.05, it is considered significant.

## Result

Table (1): Distribution of studied sample as regarding to their demographic characteristics (n=60 study and control).

	Study(n=30)		Control(n=30)	
	N.	%	N.	%
<b>Age group</b>				
18->60 years	10	33.3	8	26.7
60 years & more	20	66.7	22	73.3
<b>Mean ±SD</b>	35.46±7.86		55.07±5.84	
<b>Residence</b>				
Rural	20	66.7	22	73.3
Urban	10	33.3	8	26.7
<b>Marital Status</b>				
Single	-	-	2	6.7
Married	22	73.3	16	53.3
Widow or widower	8	26.7	12	40.0
<b>Level of education</b>				
Non educated	16	53.3	20	66.7
Read and write	10	33.3	6	20.0
Secondary education	4	13.3	4	13.3
<b>Occupation</b>				
Employee	2	6.7	4	13.3
House wife	28	93.3	26	86.7

- Chi-square test,

\* Significant difference at p. value<0.05,

\*\* Significant difference at p. value<0.01

Table (2): Distribution of studied sample as regarding to their, medical data (n=60 study and control).

	Study(n=30)		Control(n=30)	
	N.	%	N.	%
<b>Affected side</b>				
Right	16	53.3	14	46.7
Left	14	46.7	16	53.3
<b>Wound Complication</b>				
Wound Ischemia	-	-	4	13.3
wound Seroma	-	-	6	20.0
Wound infection	-	-	14	46.7
Wound Bleeding	-	-	2	6.7

Table (3): Distribution of studied sample as regarding to exercise adherent rating scale (n=60 study and control).

Exercise adherent rating scale	Study(n=30)		Control(n=30)		P.value
	N.	%	N.	%	
Poor adherence	2	6.7	22	73.3	<0.001**
Good adherence	28	93.3	8	26.7	
<b>Mean±SD</b>	52.53±9.78		28.20±19.50		<0.001**

- Chi-square test,

\*\* Significant difference at p. value<0.01

Mann-Whitney Test

\*\* Significant difference at p. value<0.01

**Table (4): Distribution of studied sample as regarding to impact panel scale (n=60 study and control).**

Scale of impact panel	Study(n=30)	Control(n=30)	P.value
	Mean±SD	Mean±SD	
<b>Pain intensity</b>			
- Worst pain	2.2±1.75	3.93±1.87	0.001**
- Least pain	2.2±1.86	3.93±1.87	<0.001**
- Pain on average	2.13±1.66	3.93±1.87	<0.001**
- No pain	2.17±1.9	3.93±1.87	<0.001**
<b>Interference of pain with daily activities</b>			
-General activity	1.8±1.54	3.87±1.85	<0.001**
- Mood	1.87±1.57	3.93±1.8	<0.001**
- Walking ability	1.7±1.82	3.93±1.8	<0.001**
- Normal work	1.77±1.81	3.87±1.78	<0.001**
- Relationships with people	0.9±2.09	3.73±1.84	<0.001**
- Sleep	1.63±1.9	3.93±1.8	<0.001**
- Enjoyment of life	0.87±2.03	4±1.82	<0.001**

Mann-Whitney Test

\*\* Significant difference at p. value&lt;0.01

**Table (5): Relation between study and control groups as regard Southampton wound assessment scale for mastectomy patients (n=60 study and control). Use Fisher test**

Southampton wound assessment scale	Study (n=30)		Control (n=30)		P.value
	N.	%	N.	%	
<b>Grade and appearance</b>					
Normal healing	24	80.0	10	33.3	<0.001**
Normal healing with mild bruising or erythema	2	6.7	-	-	
Erythema plus other Signs of inflammation	2	6.7	-	-	
Clear or haemoserous discharge	2	6.7	4	13.3	
Major complication pus	-	-	16	53.3	
<b>Normal healing with mild Bruising or erythema</b>					
Mild erythema	2	6.7	-	-	0.468
<b>Erythema Plus other Signs of inflammation</b>					
Around wound	2	6.7	-	-	0.468
<b>Clear or haemoserous discharge</b>					
At the point only(<2 cm)	2	6.7	2	6.7	0.673
Prolonged (>3 days)	-	-	2	6.7	
<b>Major complication pus</b>					
At one point (<2cm)	-	-	12	40.0	<0.001**
Along wound(>2 cm)	-	-	4	13.3	

- Chi-square test,

\*\* Significant difference at p. value&lt;0.01

**Table (6): Correlation Co- efficient between Southampton wound assessment scale and exercise rating scale and impact panel scale (n=60 study and control).**

Correlations	Southampton wound assessment scale		
	All(n=60)	Study(n=30)	Control(n=30)
Exercises adherent rating Scale	-.829**	-.506**	-.782**
<b>IMPACT PANEL:</b>			
- Pain severity	.741**	.937**	.607**
- Interference Score	.773**	.844**	.632**

Statistically Significant Correlation At P. value &lt;0.01\*\*\*

**Table (1):** Shows that the majority of patients in both groups (study and control) were over 50 years old, residence in rural regions, were married, illiterate, and were housewives.

**Table (2):** In terms of affected side, it was discovered that less than half (53.3%) of the study group's affected side was right, whereas more than two-fifths (46.7%) of the control group's affected side was right. In respect of chronic disease, it was observed that more than half of both groups (46.7 %) had hypertension. In terms of wound complications, it was discovered that half of the control group (46.7 %) developed wound infections.

**Table (3):** Slightly less than three quarters (73.3%) of the study group had poor adherence to post-mastectomy exercises after nursing instructions, while the vast majority (93.3%) had strong adherence to post-mastectomy exercises after nursing instructions. In concerns of adherence to post-mastectomy exercises, there was a highly significant difference between the study and control groups.

**Table (4):** Demonstrated that there was a highly significant difference in pain severity and pain interference with daily activities between the study and control groups ( general activity, mood, walking ability, normal work, relationships with people, sleep, enjoyment of life) P. value <0.001\*\*

**Table (5):** Indicated that one-third (33.3%) of the control group had normal healing, while the majority (80%) of the study group had normal healing. In addition to the major complications, there was a substantial difference between the study and control groups (pus)

**Table (6):** Revealed that the exercise adherence rating scale, the impact panel scale (pain severity, pain interference with daily activities), and the Southampton wound evaluation scale had a very statistically significant correlation.

### Discussion:

Postoperative exercise is required to relieve postoperative pain and limited range of motion, as well as to prevent other upper limb impairments and limits in everyday activities in the long term **Stubblefield & Keole, (2014)**. Physical therapy techniques are employed to begin with; passive mobilization treatments are suggested for restoring joint mobility and preventing muscle shortening. Second, manual stretching and transverse strain are required to prevent pectoral muscle tightness **Ebaugh & colleagues (2011)**.

Myofascial dysfunctions, which are typically palpable as painful muscular trigger points, are found in 45 percent of breast cancer patients over time. As a result, myofascial treatments like myofascial release and continuous trigger point compression may be

beneficial. Recurrent several types of workouts should be included. Active, active-assisted, and/or active-assisted mobilization exercises are needed. Because an increased posterior tilt, protraction, and decreased lateral rotation of the scapula is frequently found following breast cancer treatment, stretching exercises should be complemented by scapulothoracic exercises **Torres et al., (2010)**

In terms of age, the current study found that the majority of people in both categories were over fifty years old. In a similar vein, **David et al., (2019)** discovered that one-third of the study group was over fifty years old. Also According to **Sri et al., (2019)**, the study group had a mean age of (51.79) while the control group had a mean age of (49.7). This contradicts the findings of **Atik, Irfan (2019)**, who claim that the participants' average age was (34.69 6.76) years. **Elsayed (2012)** found that nearly a third of the patients investigated were under 45 years old. According to researchers point of view, ageing in the general changes the demography and biology of cancer.

According to the current study, the largest percentages in both groups were married, illiterate, and housewives who resided in rural areas, this is consistent with **Weimei et al. (2017)**, who found that the majority of patients were married, without a job, with only a third of them having completed high school, and living in rural areas. In a similar manner, **Atik, Irfan (2019)** discovered that the majority of patients were married, uneducated, and housewives. In terms of marital status, roughly three-quarters of the participants were married. From researcher opinion; Egyptian societies support early marriage, particularly in rural regions.

In the current study, it was observed that more than half of the study group's affected side was right, while more than two-fifths of the control group's affected side was right. In the same way as **Claudia et al., (2017)** reported that the right side was the most affected, also **Atik, Irfan (2019)** showed that almost half of the patients underwent right mastectomy. The findings of the study contradict those of **Sri et al., (2019)**, who found that the affected side was left in both groups.

Wound infections are the most prevalent problem, according to **Iram et al., (2010)**, who found that seroma development was the most common complication. Wound infection, flap necrosis, Wound dehiscence, seroma, surgical site infection, hematoma, altered sensation, and pain were the most common postoperative mastectomy complications, according to **Naman & Raju., (2019)**.

In terms of exercise adherence, the study found that the vast majority of the study group adhered to mastectomy exercises. In the similar spirit, **Sri et al.,**

(2019) & Linnea et al., (2019) state that the majority of the study group adhered to mastectomy exercises, while Andréa et al., (2018) found that the number of individuals who adhered to exercise was high.

The specific origin of mastectomy pain is unknown; however, numerous hypotheses have been proposed, such as injury to the brachial plexopathy following radiotherapy, neuroma formation after nerve injury, or the existence of an axillary hematoma. The current investigation found a highly significant difference in pain intensity and pain interference with daily activities between the study and control groups. Following in the footsteps of Lenja et al. (2019), who found that more than two-thirds of mastectomy patients experience shoulder pain and disability, Furthermore, connective tissue fibrosis of the shoulder joint appears to be the only cause of disability, and physical therapy following mastectomy can aid in shoulder pain prevention. Sri et al., (2019) also indicated that exercise therapies resulted in considerably reduced pain and decreased impairment in activities of daily life. This difference was shown to be substantial between the study and control groups.

In concerns of wound healing, the current study found that one-third of the control group had normal healing whereas the majority of the study group had normal healing. Also, according to Kim et al., (2009), exercise is important for increasing cardiovascular function, psychological events, and muscular strength, as well as Ajay et al., (2011), who concluded that exercise accelerated wound healing and that exercise resulted in significant gains in cardiorespiratory fitness, as measured by increased oxygen consumption.

### Conclusion:

Adherence to post mastectomy exercise improve wound healing and reduce pain level.

### Recommendations:

Applying post-mastectomy exercise to a wider probability sample from various geographic areas to assist within the generalization of the findings.

### References:

- Ajay P., Arun G., & Mamidipudi S, (2011): Effect of home-based exercise program on lymphedema and quality of life in female post mastectomy patients: Pre-post intervention study , Journal of Rehabilitation Research & Development, Volume 48, Number 10, Pages (1261–1268).
- American Cancer Society, (2021): How Common Is Breast Cancer? Jan. 2020. Available at:

<https://www.cancer.org/cancer/breast-cancer/about/how-common-is-breast-cancer.html>

- Assiut University Hospital record, (2020): Number of mastectomy patient admitted to general surgical units.
- Assiut University Hospital record, (2020): Number of mastectomy patient admitted to general surgical units.
- Atik A, & Irfan U, (2019): Shoulder Pain and Disability Among Post Mastectomy Patients , Phys Med Rehab Kuror Journal ,volume 29,pages (151–155 ) .
- Bailey IS, Karran SE, Toyn K, Brough P, Ranaboldo C, & Karran SJ. (1992) : Southampton scoring system Community surveillance of complications after hernia surgery. BMJ 1992; 304(6825): 469-71.
- Cardoso, (2019): Early Breast Cancer: ESMO Clinical Practice Guidelines , Annals of Oncology, Volume 30, Issue 8, Pages 1194–1220.
- Casla S, Hojman P, & Márquez-Rodas I (2015): Running away from side effects: physical exercise as a complementary intervention for breast cancer patients. Clin Transl Oncol Journal , 17:180.
- Claudia C., Maria A. , Guido M., Giuseppe L., Roberto T., Nicola V., & Filippo C., (2017): Focal Muscle Vibration and Physical Exercise in Postmastectomy Recovery: An Explorative Study Hindawi BioMed Research International Volume 2017, Article ID 7302892, 6 pages.
- David M., John T., & Kenneth D., (2019): Mastectomy or Breast-Conserving Therapy: Which Factors Influence A Patient's Decision? The Permanente Journal Perm J 2019;23:18-049 during adjuvant treatment ACTA ONCOLOGICA 2019, VOL. 58, NO. 5, 650–657 <https://doi.org/10.1080/0284186X.2018.1560497>.
- during adjuvant treatment ACTA ONCOLOGICA 2019, VOL. 58, NO. 5, 650–657 <https://doi.org/10.1080/0284186X.2018.1560497>
- Ebaugh D, Spinelli B, & Schmitz K, (2011): Shoulder impairments and their association with 421 symptomatic rotator cuff disease in breast cancer survivors. Med Hypotheses 2011;77(4):481.
- Florentino A, Francisco N, & João B, (2018): Effect of exercise on pain and functional capacity in breast cancer patients. Health and Quality of Life Outcomes (2018) 16:58 <https://doi.org/10.1186/s12955-018-0882->
- Iram B., zahid M, mehvis N, & asadullah K, (2010): early complications of mastectomy with axillary clearance in patients with stage ii and iii carcinoma breast , Journal of Surgery Pakistan (International) 15 (4) .
- Kim S, Susan R, Joseph M, & Donna L (2008): Effects of Pilates Exercises on Shoulder Range of

Motion, Pain, Mood, and UpperExtremity Function in Women Living With Breast Cancer: A Pilot Study Physical Therapy Journal ,Volume 88 Number 4 April 2008.

- **Lenja W, Miranda J., Jennifer H., Charlotte N., Steins B., Elsken W., Wout J., Carin D., Petra H., & Anne M., (2019):** Attendance and compliance with an exercise program during localized breast cancer treatment in a randomized controlled trial: The PACT study <https://doi.org/10.1371/journal.pone.0215517>.
- **Linnea W, Gunn A, Dorte G, Elisabeth A, Susanne O (2019):** Adherence to a long-term progressive resistance training program, combining supervised and home-based exercise for breast cancer patients
- **Naman Chandrakar1, Raju K. & Shinde, (2019):** Study the early complications of modified radical mastectomy performed, International Surgery Journal Chandrakar N et al. Int Surg J. 2019 Jan;6(1):239-243 <http://www.ijsurgery.com> .
- **Naomi B, Norton S, Dowling D, & Gavrilof D (2016):** The Development and Initial Psychometric Evaluation of a Measure Assessing Adherence to Prescribed Exercise: the Exercise Adherence Rating Scale (EARS), November 2016 ,[Physiotherapy](https://doi.org/10.1016/j.physio.2016.11.001) 103(2) DOI:[10.1016/j.physio.2016.11.001](https://doi.org/10.1016/j.physio.2016.11.001)
- **National Cancer Institute (2021):** Incidence rates by age at diagnosis, all cancer types. Source: SEER 21 2013–2017, all races, both sexes. <https://www.cancer.gov/about-cancer/causes-prevention/risk/age> .
- **Roasoft, Sample Size Calculator, Inc. (2004):** Roasoft.Com. [http:// www. roasoft. com/ sample size. Html](http://www.roasoft.com/sample_size.Html). Retrieved at March, 02nd 2020.
- **Sri A., Sathasivam., Vijayakumar C., Vikram K, & Srinivasan K., (2019):** Effect of exercise on shoulder function and morbidity following mastectomy with axillary dissection in patients with breast cancer: a prospective randomized clinical study , International Surgery Journal Das SAP et al. Int Surg J. 2018 Oct;5(10):3217-3225 <http://www.ijsurgery.com>.
- **Stubblefield M., Keole N., (2014):** Upper Body Pain and Functional Disorders in Patients 415 With Breast Cancer. PM R 2014;6(2):170-83.
- **Torres L., Mayoral O., Coperias Z., Gerwin R., & Goni A., (2010):** 424 Incidence of myofascial pain syndrome in breast cancer surgery: a prospective study. Clin J 425 Pain 2010;26(4):320-5.
- **Turk DC1, Dworkin RH, Allen RR, Bellamy N, Brandenburg N, Carr DB, Cleeland C, Dionne R, Farrar JT, Galer BS, Hewitt DJ, Jadad AR, Katz NP, Kramer LD, Manning DC, McCormick CG, McDermott MP, McGrath P, Quessy S, Rappaport BA, Robinson JP, Royal MA, Simon L, Stauffer JW, Stein W, Tollett J, & Witter, (2003):** IMMPACT Panel Scale .
- **Wang X, Jia M, & Li Y,(2019):** Validation of an information-motivation- behavioral skills model of upper limb functional exercise adherence among Chinese postoperative patients with breast cancer. Breast Cancer 2019;26:198–205.
- **Weiwei T., Zhouxiao L., Chongyin T., Xiaowei W., & Hanjin W., (2017):** Health literacy and functional exercise adherence in postoperative breast cancer patients , Patient Preference and Adherence .
- **Wild CP, Weiderpass E, & Stewart BW, (2020):** World Cancer Report: Cancer Research for Cancer Prevention. Lyon, France: International Agency for Research on Cancer. Available from: <http://publications.iarc.fr/586> .