



Original Research

Effect of Therapeutic Exercise on Range of Motion for Lymphedema Reduction Post-Mastectomy

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Abstract

Background: Lymphedema is known as a progressive and chronic disorder. refers to the accumulation of protein-rich lymphatic fluid in the interstitial space due to damage to the lymph nodes and vessels. Its types include mild, moderate, and severe lymphedema. Lymphedema can cause significant physical and psychological disability, not only due to clinical alterations but also to the adverse effects on work, home, and leisure activities.

Objectives: to assess the impact of these exercises on the range of motion, strength, and functionality of the affected limb(s) in individuals with lymphedema.

Materials and Methods: A quantitative longitudinal follow-up study design was adopted from the 5th of October 2023 until the 25th of May 2024 to conduct the objectives of the present study. Anon-probability (purposive) sample and the sample size assigned was (50) patients; out of the other participants, (4) patients were excluded from the sample. The tools consist of 5 parts, in addition to the therapeutic exercises, which consist of 8 exercises for 5 sessions.

Results: the study found the majority (26.1%) of the sample was in the age group between (46-50) years, a high proportion of stages (0,1a) and (1) rather than other stages (2,3), which do not record any change of results, lymphedema severity show (mild to moderate) change along the 3 episode of observation, finally for evaluation of upper extremity performance post-mastectomy A high percentage ranging from mild to moderate difficulty performance was recorded along the (29) items of the DASH score.

Conclusions: Most cases are in the late middle age group, obese, also breast cancer in stage(0,1A) or in stage (1); and range of motion record insufficient or limited shoulder joint rather than other joints, mild lymphedema severity record third of total cases.

Keywords: “Lymphedema, Post-Mastectomy, Therapeutic, Therapeutic Exercise, Range of Motion

Introduction:

Lymphedema is defined by the buildup of lymphatic fluid in the interstitial space, which is rich in protein. It is caused by damage to the lymph nodes or lymphatic veins. Approximately 140-250 million people worldwide are affected with lymphedema. Lymphedema is typically non-fatal, but it can lead to swelling in the affected limb, causing discomfort and pain, reduced mobility, and increased susceptibility to infections. Furthermore, it has a highly detrimental impact on self-esteem and leads to deficiencies in body perception. ⁽¹⁾

Research indicates that lymphedema impacts almost 90 million individuals globally, with surgery being a primary contributor to lymphedema, particularly among cancer patients. Extremity lymphedema can result in a range of symptoms, such as a sensation of heaviness, pain, reduced function of the limbs, sensory disturbances, and anxiety. ⁽²⁾

Lymphedema can be categorized as primary if it is caused by genetic changes following standard Mendelian inheritance patterns or secondary if acquired due to injury, infection, or surgery. ⁽³⁾

If secondary lymphedema is not treated, it can result in gradual swelling that hinders mobility, restricts joint movement, and limits everyday activities. Lymphedema can also make patients more susceptible to chronic infection, sensory impairments, and tissue fibrosis, resulting in higher rates of illness and healthcare expenses. ⁽⁴⁾

Secondary lymphedema (SL) is a probable consequence of lymph node excision surgery or in combination with radiation. Lymphedema (SL) is commonly characterized by arm swelling and impaired function. It is defined explicitly as a noticeable increase in arm circumference of more than 2 cm. ⁽⁵⁾

Obesity, axillary lymph node dissection, major surgery, and radiotherapy to the regional lymph nodes are factors that contribute to the possibility of developing breast cancer-related lymphedema (BCRL) in the future. ⁽⁶⁾

The classifications of lymphedema encompass mild, moderate, and severe lymphedema. The milder form of the illness may appear shortly after surgery and

typically lasts for a brief period. Moderate lymphedema is distinguished by substantial pain, and the onset of symptoms generally occurs about four to six weeks after surgery, with severe lymphedema being the most common. The illness presents typically without noticeable symptoms and may gradually manifest between eighteen to twenty-four months or later following the surgical procedure. ⁽⁷⁾

Methods:

Study design and setting

A quantitative longitudinal follow-up study design was adopted to assess the impact of these exercises on the range of motion, strength, and functionality of the affected limb(s) in individuals with lymphedema.. The study was conducted among patient in the chemotherapy administration unit at Oncology and Nuclear Medicine Hospital in Mosul City., between from the 5th of October 2023 until the 25th of May 2024.

Sample selection

A non-probability (purposive) sample was selected to implement the research purpose; A(50) patients were the total available sample size, and (4) out of those participants.

Inclusion criteria

1. Female cases of breast cancer post-surgical mastectomy during chemotherapy induction management.
2. Age group between (20-55) years old.
3. Cases of unilateral mastectomy.
4. Lymphoedema stage according to scale grad deterioration (0,1,2).

Exclusion criteria

1. Patient with heart failure, renal insufficiency, advanced liver disease.
2. Age group over (55) years.
3. Inability to participate in the whole study period.
4. Male patients with breast cancer.
5. Neurological Disorder.

Data collection and outcome measurements

The tools and scale of research instrument include the following: Socio-demographic and general health characteristics; health assessment for breast cancer characteristics; lymphedema health characteristics that consist of information about evaluation, determination severity, and stages; following for measuring range of motion performance to give a comprehensive clear image about the lymphedema and advance of the rehabilitation process

socio-demographic data include the following:

Age, education level, Marital status, employment status, and Body mass index (BMI).

The next part includes elements related to surgical intervention for breast characteristics as follows (Breast surgical resection site, Breast cancer stage) and medical health status that involves Comorbidity disease, and finally, oncological characteristics that consist of (chemotherapy regimen, radiotherapy, immunotherapy, and hormone therapy).

Assessment of Arm Health Performance for Range of Motion includes the description of joint movements for the upper extremity, which include (4)main joints (Shoulder, Elbow, Forearm, and Wrist). These joints have a range of motion according to the type of joint articulation. The shoulder has(8)movements (Flexion, Extention, Hyperextension, Abduction, Adduction, Internal rotation, External rotation, and Circumduction), while the Elbow has (3)movements (Flexion, Extension, and Hyperextension); the Forearm has(2)movements (Supination, and pronation); Finally Wrist joint has (5)movements (Flexion, Extention, Hyperextension, Radial flexion, and

Ulnar flexion).

Statistical analysis

The GraphPad Prism 8 software was used for the statistical analysis. The measured parameters' values were given as mean±standard deviation (SD). All the data were analyzed with SPSS Statistics (version 26).

Results:

• Statistical Distribution of female patient sample description according to their socio-demographic and general health characteristics

The first variables that record high proportions (23.9% and 26.1%) for the age group (41 – 45), and (46 – 50) years, respectively, while the lowest proportion (10.9 %) for both age groups (36 – 40 and 51 – 55) years with mean and standard deviation (41.9),(8.249) respectively. Following educational level records, more than half of the sample number (54.3%) were women who completed primary school, while (13%) were those who graduated by secondary and universal or higher studies with mean and standard deviation (2.19),(0.91), respectively. In marital status, married women record almost (93.5 %) of the sample and the lowest proportion (6.5%) for single females, with mean and standard deviation (of 1.39), (0.249) respectively. Concern with employment status, the majority of the sample (84.8%) were not employees, and (15.2%) were employees, with mean and Standard deviations (1.15),(0.363) respectively; finally, Body Mass Index record highest percentages (58.75%) for those obese and (32.6%) for overweight while (2.2%) for those underweight with mean and Standard deviation (3.47),(0.722) respectively.

Table 1 Statistical Distribution of female patient sample description according to their socio-demographic and general health characteristics

Variable	Group	Frequency	Percentage	$\bar{X}$	S. D
Age	25 – 30 Year	6	13.0%	41.9	8.249
	31 – 35 Year	7	15.2%		
	36 – 40 Year	5	10.9%		
	41 – 45-Year	11	23.9%		
	46 – 50 Year	12	26.1%		
	51 – 55 Year	5	10.9%		
Educational level	Not Read or Write	9	19.6%	2.19	0.91
	Primary School	25	54.3%		
	Secondary School	6	13%		
	University and above	6	13%		
Marital status	Single	3	6.5%	1.93	0.249
	Married	43	93.5%		
	Divorce	0	0.0%		
	Widow	0	0.0%		
Employment status	Not employee	39	84.8%	1.15	0.363
	Employee	7	15.2%		
	Retired	0	0.0%		
BMI	Less than (18.5) Underweight	1	2.2%	3.47	0.722
	(18.5 – 24.9) Normal	3	6.5%		
	(25 – 29.9) Overweight	15	32.6%		
	(Over 29.9) Obese	27	58.7%		

• **Statistical distributions of female patient sample description according to their breast cancer health assessment characteristics.**

approximately the proportion between the left and right side of breast resection for mastectomy (47.8, and 52.2%) respectively; following breast cancer stages show (28.3%,23.9%,19.6%) for (stages IV, IIA, IIIA) respectively, while the lowest proportion found in Stages (IA, IB) (4.3) respectively, with mean and standard deviation (6.04),(2.210) respectively. Comorbidity disease shows a total

proportion (30.4%) of patients complained of chronic illness; hypertension was the vast majority (26%) of total cases and (4%) with hematological disease. Regarding the chemotherapy regimen (100%) of the total sample received the majority (41.3%) in the fourth session and (28.3%) for the sixth session, and a low proportion was recorded in the second and third sessions (6.5%, 4.3%) respectively; in the other hand radiotherapy, immunotherapy, and hormone therapy administration record (21%,21%,12%) respectively.

Table 2 Statistical distributions of female patient sample description according to their breast cancer health assessment characteristics.

Variable	Group	Frequency	Percentage	$\bar{X}$	S. D
Breast surgical resection Site: (mastectomy)	Left	22	47.8%	1.52	0.505
	Right	24	52.2%		
Breast Cancer Stages	Stage 0	0	0.0%	6.04	2.210
	Stage IA	2	4.3%		
	Stage IB	2	4.3%		
	Stage IIA	11	23.9%		
	Stage IIB	5	10.9%		
	Stage IIIA	9	19.6%		
	Stage IIIB	4	8.7%		
	Stage IIIC	0	0.0%		
	Stage IV	13	28.3%		
Comorbidity Disease	Yes	14	30.4%	1.69	0.465
	No	32	69.5%		
Type of Comorbidity Diseases	Hypertension	12	26.0%	0.86	1.694
	Hematologic Disease	2	4.0%		
	Metabolic Disease	0	0.0%		
	Lung Disease	0	0.0%		
Chemotherapy Regimen	Yes	46	100.0%	1.0	0
	No	0	0.0%		
Chemotherapy Cycle	Second session	3	6.5%	4.58	1.146
	Third session	2	4.3%		
	Fourth session	19	41.3%		
	Fifth session	9	19.6%		
	Sixth session	13	28.3%		
Radiotherapy	Yes	21	45.7%	1.54	0.503
	No	25	54.3%		
Immunotherapy (Herceptin)	Yes	21	45.7%	1.54	0.503
	No	25	54.3%		
Hormone therapy	Yes	12	26.1%	1.73	0.443
	No	34	73.9%		

• **Descriptive statistics for female patients sample according to their post-mastectomy for lymphedema health characteristics (Signs and Symptoms)**

significant percentage recorded for the presence of swelling (67.4%), pain in the affected arm or hand (95.7%), numbness (91.3%), heaviness (93.5%), and tightness in skin, (58.7%) with mean and standard deviation

(1.32,0.473),(1.04,0.206),(1.08,0.284), (1.05,0.249), and (1.41,0.497) respectively;. In contrast, minor percentages are recorded for the presence of trunk edema (8.7%), weakness (6.5%), and joint pain (13.0%) with mean and standard deviation (1.91,0.284), (1.93,0.249), and (1.86,0.340) respectively.

Table 3 Descriptive statistics for female patients sample according to their post-mastectomy for lymphedema health characteristics (Signs and Symptoms)

Variable	Group	Frequency	Percentage	$\bar{X}$	S. D
Swelling	Present	31	67.4%	1.32	0.473
	Non – Present	15	32.6%		
Pain in the affected arm \ or hand	Present	44	95.7%	1.04	0.206
	Non – Present	2	4.3%		
Numbness	Present	42	91.3%	1.08	0.284
	Non – Present	4	8.7%		
Heaviness	Present	43	93.5%	1.05	0.249
	Non – Present	3	6.5%		
Tightness in skin	Present	27	58.7%	1.41	0.497
	Non – Present	19	41.3%		
Trunk edema	Present	4	8.7%	1.91	0.284
	Non – Present	42	91.3%		
Weakness	Present	3	6.5%	1.93	0.249
	Non – Present	43	93.5%		
Joint pain	Present	6	13.0%	1.86	0.340
	Non – Present	40	87.0%		

- Statistical description of post-mastectomy female patient sample according to their lymphedema severity**

The majority of the frequency sample (100%) percentage for mild severity in the wrist. Also high percentage (95.7%) records a mild severity in the measurement site (10cm) below the level of the

epicondyle, while (71.7%) and (28.3%) record mild and moderate severity for the site (10cm) above the level of epicondyle respectively; and the affected arm show (47.8%,52.2%) for right and left arm respectively with lymphedema severity it record (71.7%,28.3%) for mild and moderate respectively.

Table 4 Statistical description of post-mastectomy female patient sample according to their lymphedema severity

Site of Measurements/ Variable	Severity / Group	Frequency	Percentage	$\bar{X}$	S. D
Wrist	Mild = less than 3 cm	46	100.0%	1.0	0.0
	Moderate = between 3 – 5 cm	0	0.0%		
	Sever = Above 5 cm	0	0.0%		
(10 cm) below the level of epicondyle	Mild = less than 3 cm	44	95.7%	1.04	0.206
	Moderate = between 3 – 5 cm	2	4.3%		
	Sever = Above 5 cm	0	0.0%		
(10 cm) above the level of epicondyle	Mild = less than 3 cm	33	71.7%	1.28	0.455
	Moderate = between 3 – 5 cm	13	28.3%		
	Sever = Above 5 cm	0	0.0%		
Affected Arm	Right	22	47.8%	1.52	0.505
	Left	24	52.2%		
Lymphedema Severity	Mild	33	71.7%	1.28	0.455
	Moderate	13	28.3%		

- Statistical description of the post-mastectomy female patient sample according to clinical lymphedema stages**

majority of frequency sample was found in (0,1a,1) stages in their characteristics (Subclinical lymphedema) by frequency percentages (32.6%,

67.4%,67.4%) respectively; and (spontaneous reversible "Acute Phase") by frequency percentages (26.1%, 28.3%,28.3%) respectively. At the same time, other stages (2,3) show no frequency percentages for related characteristics (Spontaneous Irreversible "Chronic Phase," Lymphostatic Elephantiasis).

Table 5 : Statistical description of the post-mastectomy female patient sample according to clinical lymphedema stages

Variable	Descriptions	Characteristics	F	%	$\bar{X}$	S. D
Stage 0 or 1a	Subclinical Lymphedema	No noticeable swelling	15	32.6	1.67	0.473
		No pitting edema	31	67.4	1.32	0.473
		Feeling of heaviness	31	67.4	1.32	0.473
Stage1	Spontaneous Reversible "Acute Phase"	Visible swelling (Pitting edema)	12	26.1	1.73	0.443
		Heaviness feeling and pitting edema	13	28.3	1.71	0.455
		Reversible with elevation of the arm	13	28.3	1.71	0.455
Stage 2	Spontaneous Irreversible "Chronic Phase"	Spongy consistency and non-pitting edema	0	0.0	2.0	0.0
		Tightness of tissue	0	0.0	2.0	0.0
		Fibrosis	0	0.0	2.0	0.0
Stage 3	Lymphostatic Elephantiasis	Severe lymphedema	0	0.0	2.0	0.0
		Trophic skin change	0	0.0	2.0	0.0

• **Comparative statistical description of the post-mastectomy female patient sample according to their assessment of a joint range of motion performance during (1st, 2nd, 3rd, 4th, and 5th) observation episodes**

the assessment range of motion performance for shoulder, elbow, forearm, and wrist joints in (5) different observational episodes. Throughout findings results review of each observation episode it appears developmental change in frequency percentage (2.2%,4.3%) in (1st) observation to (0.00, &0.00) along to (5th) for (flexion, & extension) respectively; and high percentage frequencies

(67.4%,71.7%,37.0%,80.4%,95.7%,87.0%) respectively in (1st) observation to (2.2%,6.5%,0.00%,0.00%,26.1%, &10.9%) respectively along to (5th) for (hyperextension, abduction, adduction, internal rotation, external rotation, & circumduction) respectively. Elbow joint movement shows low-frequency percentage (4.3%,4.3%) in (1st) observation to (0.00, &0.00) along to (5th) for (flexion, & extension); while hyperextension record(39.1%) in (1st) observation to (0.00, &0.00) along to (5th) by review the findings of forearm joint performance results which show low-frequency percentage (4.3%,4.3%) in (1st) observation to (0.00, &0.00) along to (5th) for supination, & pronation respectively.

Table 6 Comparative statistical description of the post-mastectomy female patient sample according to their assessment of a joint range of motion performance during (1st, 2nd, 3rd, 4th, and 5th) observation episode Continued of table (4.8)

Variable	Group	R.o.M Negative Outcome									
		First Observation		Second Observation		Third Observation		Fourth Observation		Fifth Observation	
		F	%	F	%	F	%	F	%	F	%
Shoulder Movement	Flexion	1	2.2	0	0.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 1.97, 0.147		$\bar{X}$, S.D = 0.00, 2.0		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
	Extension	2	4.3	0	0.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 1.95, 0.206		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
	Hyperexte -nsion	31	67.4	6	13.0	3	6.5	1	2.2	0	0.0
		$\bar{X}$, S.D = 1.32, 0.473		$\bar{X}$, S.D = 1.86, 0.340		$\bar{X}$, S.D = 1.93, 0.249		$\bar{X}$, S.D = 1.97, 1.474		$\bar{X}$, S.D = 2.0, 0.00	
	Abduction	33	71.7	33	71.7	22	47.8	13	28.3	3	6.5%
		$\bar{X}$, S.D = 1.28, 0.455		$\bar{X}$, S.D = 1.28, 0.455		$\bar{X}$, S.D = 1.52, 0.505		$\bar{X}$, S.D = 1.71, 0.455		$\bar{X}$, S.D = 1.934, 0.249	
	Adduction	17	37.0	6	13.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 1.63, 0.488,		$\bar{X}$, S.D = 1.86, 0.340		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
	Internal rotation	37	80.4	8	17.4	2	4.3	0	0.0	0	0.0
		$\bar{X}$, S.D = 1.19, 0.401		$\bar{X}$, S.D = 1.82, 0.382		$\bar{X}$, S.D = 1.95, 0.206		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
	External rotation	44	95.7	44	95.7	7	15.2	25	54.3	12	26.1
		$\bar{X}$, S.D = 1.04, 0.206		$\bar{X}$, S.D = 1.04, 0.206		$\bar{X}$, S.D = 1.15, 0.363		$\bar{X}$, S.D = 1.45, 0.503		$\bar{X}$, S.D = 1.739, 0.443	
	Circumduction	40	87.0	35	76.1	12	26.1	7	15.2	5	10.9
		$\bar{X}$, S.D = 1.13, 0.340		$\bar{X}$, S.D = 1.23, 0.431		$\bar{X}$, S.D = 1.73, 0.443		$\bar{X}$, S.D = 1.84, 0.363		$\bar{X}$, S.D = 1.891, 0.314	

Table 7 : Comparative statistical description of the post-mastectomy female patient sample according

**to their assessment of a joint range of motion performance during (1st, 2nd, 3rd,4th, and 5th)
observation episodes**

Variable	Group	R.o.M Negative Outcome									
		First Observation		Second Observation		Third Observation		Fourth Observation		Fifth Observation	
		F	%	F	%	F	%	F	%	F	%
Elbow	Flexion	2	4.3	0	0.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 1.95, 0.206		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
	Extension	2	4.3	0	0.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 1.95, 0.206		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
	Hyperexten- sion	18	39.1	0	0.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 1.60, 0.493		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
Forearm	Supination	2	4.3	0	0.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 1.95, 0.206		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
	Pronation	2	4.3	0	0.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 1.95, 0.206		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
Wrist	Flexion	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
	Extension	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
	Hyperexten- sion	2	4.3	0	0.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 1.95, 0.208		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
	Radial flexion	1	2.2	0	0.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 1.97, 0.147		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	
	Ulnar flexion	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00		$\bar{X}$, S.D = 2.0, 0.00	

Discussion:

Throughout the present study, characteristics of patient health status who are attending an oncology hospital with breast cancer where the characteristics showed a parallel percentage in resection site (mastectomy). In contrast, the stages of breast cancer showed a high rate in stages (IIA, IIIA, IV). These findings may be due to the diffusion of breast cancer in the lymph nodes that gives discretion of bilateral or unilateral resection; on the other hand, stages may be due to the time of diagnosis.

These findings come along with a study by ⁽⁸⁾, which showed equality (50%) of the cases had either left or right resection site, while a study by ⁽⁹⁾ showed (47.8%) (left) instead (right), on the other hand, the study by ⁽¹⁰⁾ showed high percentage for stages (IIIA, and IV) diagnosed histologically.

determining lymphedema severity in the first observation of patient admission according to the arm measurement site, which shows a minimum change in the measurement. This measurement result was essential to give a clear image of lymphedema severity and development, which may be changed in the other observation episode according to the disease process, mobility, and management; these findings can be interpreted that lymphedema severity can not be detected through a few days of admission due to several lymph node removal.

The findings of our study agreed with the result by ⁽¹¹⁾, which shows that (52.6 %) of patients who had surgical intervention of mastectomy had minimum to mild measurement of lymphedema severity according to the type of surgical intervention.

Throughout the exploration findings which deals with developmental negative outcomes regarding joint range of motion, presents a detailed comparison of breast cancer patients in different stages of observation (First, Second, Third, Fourth, and Fifth) observation episodes according to movement of shoulder joint that show highly proportion percentage in (hyperextension, abduction, adduction, internal rotation, external rotation, and circumduction) which show development through the (First, Second, Third,

Fourth, and Fifth) observation episodes. These findings reveal that the application of therapeutic exercise to the patients can differ along the 1st to fifth observation episodes.

These findings were concurrent with a study by ⁽¹²⁾, which corroborated that performing arm workouts aids in overcoming restricted range of motion.

Conclusion:

Notably, Lack of special rehabilitation or training programs regarding the reduction and relief of lymphedema in post-mastectomy patients. Most cases of women post-mastectomy are in the late middle age group, obese, also breast cancer in stage(0,1A) or in stage (1); and range of motion record insufficient or limited shoulder joint rather than other joints, mild lymphedema severity record third of total cases. Therapeutic exercise significantly affects the patients' lymphedema limitation and early mobilization. Significant differences were established in the developmental change of joint range of motion, lymphedema characteristics and severity, achieved along and post-application of therapeutic exercise.

Acknowledgement:

Conflict of interests

No conflict of interest was declared by the authors.

Funding source

The authors did not receive any source of funds.

Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

References:

1. de Sire A, Losco L, Lippi L, Spadoni D, Kaciulyte J, Sert G, et al. Surgical Treatment and Rehabilitation Strategies for Upper and Lower Extremity Lymphedema: A Comprehensive Review. Vol. 58, Medicina (Lithuania). MDPI; 2022.
2. Wu X, Liu Y, Zhu D, Wang F, Ji J, Yan H. Early prevention of complex decongestive therapy and rehabilitation exercise for

- prevention of lower extremity lymphedema after operation of gynecologic cancer. *Asian J Surg*. 2021 Jan 1;44(1):111–5.
3. Bonetti G, Paolacci S, Samaja M, Maltese PE, Michelini S, Michelini S, et al. Low Efficacy of Genetic Tests for the Diagnosis of Primary Lymphedema Prompts Novel Insights into the Underlying Molecular Pathways. *Int J Mol Sci*. 2022 Jul 3;23(13):7414.
4. Darrach H, Yesantharao PS, Persing S, Kokosis G, Carl HM, Bridgham K, et al. Surgical versus Nonsurgical Management of Postmastectomy Lymphedema: A Prospective Quality of Life Investigation. *J Reconstr Microsurg*. 2020 Oct 5;36(08):606–15.
5. Baumann FT, Reike A, Hallek M, Wiskemann J, Reimer V. Does Exercise Have a Preventive Effect on Secondary Lymphedema in Breast Cancer Patients Following Local Treatment? - A Systematic Review. Vol. 13, *Breast Care*. S. Karger AG; 2018. p. 380–5.
6. Baumann FT, Reike A, Reimer V, Schumann M, Hallek M, Taaffe DR, et al. Effects of physical exercise on breast cancer-related secondary lymphedema: a systematic review. Vol. 170, *Breast Cancer Research and Treatment*. Springer New York LLC; 2018.
7. Jehan Sayyed Ali LMGTMKESaidy. Effect of Prophylactic Physical Activities on Reducing Lymphedema among Women Post Mastectomy. *Journal of Health, Medicine and Nursing*. 2019 Apr;
8. Tomić S, Malenković G, Mujičić E, Šljivo A, Tomić SD. Impact of risk factors, early rehabilitation and management of lymphedema associated with breast cancer: a retrospective study of breast Cancer survivors over 5 years. *BMC Womens Health*. 2024 Apr 6;24(1):226.
9. Seraj M, Akbari ME, Angooti Oshnari L, Yousefi M, Bagherhosseini N, Omrani Hashemi M. Lymphedema and Axillary Sentinel Lymph Node Biopsy (SLNB) in Node-Negative Patients with Breast Cancer. *Int J Cancer Manag*. 2024 Feb 8;17(1).
10. Gabriele G, Nigri A, Chisci G, Massarelli O, Cascino F, Komorowska-Timek E, et al. Combination of Supramicrosurgical Lymphatico-Venular Anastomosis (sLVA) and Lymph-Sparing Liposuction in Treating Cancer-Related Lymphedema: Rationale for a Regional One-Stage Approach. *J Clin Med*. 2024 May 13;13(10):2872.
11. Kaveh V, Kargar F, Torkashvand Z, Ghalichi L, Pirjani P, Heydari H. The Effects of Palliative Supportive Care on the Quality of Life of Women with Breast Cancer Related Lymphedema. 2024; Available from: <https://doi.org/10.21203/rs.3.rs-3881003/v1>
12. Qiu L, Wu J, Huang Y, Ye M, Song L, Huang H, et al. Protocol: Comparison of the effects of different functional exercise sequences on lymphedema in breast cancer: protocol for an exploratory randomised controlled cross-over trial. *BMJ Open*. 2024;14(3).