



EFFECT OF SWISS BALL EXERCISES AND DIAPHRAGMATIC BREATHING EXERCISE ON CHEST EXPANSION AND QUALITY OF LIFE AMONG POST MASTECTOMY PATIENTS.

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Indian medical council research data reported that breast cancer is found to be the most common type of cancer in women with an incidence about 50-60 % cases in India.¹ Nowadays, breast cancer is life threatening cancer in women and the leading cause of cancer death among women. Breast cancer refers to cancers originating from breast tissue most commonly from the inner lining of milk duct or the lobules that supply the ducts with milk.²

Worldwide, breast cancer comprises 10.4% of all cancers incidence among women, making it the second most common type of non-skin cancer and fifth most common cause of cancer death. In 2004 breast cancer caused 519,000 deaths worldwide. Breast cancer is about 100 times more common in women than in men.² Its early symptoms include nipple discharge, breast lump and axillary lymph node enlargement. It is manifested by multiple organ lesion after the metastasis of cancer cells at the advanced stage and it is life threatening if not treated timely.³

According to the studies, women having following high risk factors are prone to breast cancer: menarche < 12 years old, late menopausal age (>55 years), not giving birth or not conducting breast feeding after delivery, first delivery age > 35 years, received estrogen replacement therapy after menopause and family history of breast cancer.³ Breast cancer is mainly treated by surgery combined with chemotherapy, radiotherapy and drugs comprehensively in clinical practice and such a combined treatment can improve the survival rate of patients.³

A mastectomy is a surgical procedure involving removal of all or a part of the breast. The term originates from the Greek word *mastos* meaning “women’s breast” and the Latin term *ectomia* which signifies “excision of”. Mastectomy classifies into partial, simple, modified radical and radical. The most frequent indication for mastectomy is a malignancy of the breast.⁴

Most commonly the approach of choice is a modified radical mastectomy, due to it allowing for both the removal of the main tumor mass and adjacent glandular tissue, which are suspected of infiltration of process and a sentinel axillary lymph node removal.⁵ A transverse or longitudinal fusiform incision can be used on the surgical site, the breast tissue including the lesion was removed, it released in the superficial layer of pectoralis major fascia. Fat and lymphatic tissue should be removed³.

After the lesion is removed axillary lymph nodes should be cleaned and axillary blood vessels and nerve should be protected to avoid collateral injury. The lymph node in the apical, the central and the subclavian area should be removed one by one.³ Wound closure following the classical and well-known methodologies, without drains has reported a higher frequency of occurrence and greater volumes of clinically recognizable seroma, formed in postoperative period. Therefore, drainage placement plays a greater role in. There are multiple options for drainage placement following MRM due to great volume of surgically created free space⁴.

Opinions that early removal of drainage system limits injuries, infections and time of hospital stay, but increased the incidence of seroma seem to be the reigning ones while considering the time of drainage removal. Based on the general result seemingly the best patient outcome with the least complications occurs when the drains removed on second or third postoperative day, or preferably when the amount of drain fluid in the last 24 hours reaches below 50 milliliters⁵.

Post Mastectomy patients are found to have an increased risk of reduced chest wall mobility due to tight fibrous scar tissues and restricted shoulder functions due to the excision of pectoral muscle.¹ Pectoral muscle shortening is more common in patients who undergo mastectomy. It further leads to contracture of costochondral and costovertebral joint and it reduces the rib cage motion due sustain tightness which further has an impact on chest mobility, postural changes such as protracted and depressed scapula, which causes myofascial pain and rotator cuff disease as they affect the functional and health related quality of life⁶.

The Swiss ball exercises are used to improve core stability, muscle strength, muscle endurance, balance, cardio endurance and functional fitness. A study suggests that, the Swiss ball exercises along with breathing exercises were found to improve chest expansion among the breast cancer patient. Swiss ball training is very helpful as it improves oxygen delivery and decreases blood lactate and carbon dioxide output, by that it helps in improving the aerobic capacity and increases the muscle strength. Swiss ball exercises motivate the patients on indulging themselves more on exercise regimen which helps them in improvement of functional capacity.¹

Diaphragmatic breathing emphasizes on the abdominal movement during inspiration which leads to slower and deeper breathing and shoulder girdle relaxation.² Diaphragmatic breathing exercises helps in reducing the respiratory rate, improving tidal volume and pulmonary functions. It is a common conventional protocol followed immediately after any surgery to maintain the tidal volume of the lungs and to prevent the secretion accumulation. The study states that diaphragmatic breathing helps to improve chest wall mobility.¹

A sequence of exercise with Swiss ball along with diaphragmatic breathing exercise as it mobilizes the chest wall which can improve chest expansion.

Patients who undergo mastectomy usually have a generalized reduction in physical activity and with that they also experience anxiety as well as depression. This shows that it has an impact on their physical, social, emotional and mental wellbeing affecting the quality of life.⁶

The Body Image and Relationship scale is a 32-item Likert scale, developed and validated for the patients with breast cancer in order to measure their quality of life. Scoring includes a total score as well as three subscales for strength and health, social barriers, appearance and sexuality. Higher scores indicate greater impairment in quality of life.⁷

The aim of Physiotherapy to assist and enhance the patient recovering at its optimal capacity and improve the quality of life with minimum difficulties and maximum independence in routine activities during the recovering. It requires the evaluation of physical function, risk of post operative complication, counseling and education. Intervention methods such as deep breathing exercises, thoracic mobility, shoulder girdle exercises and upper limb strengthening program are important among many techniques in physiotherapy management.⁸ In this study we'll be seeing the effect of Swiss ball exercises and diaphragmatic breathing exercises on chest expansion and quality of life among post mastectomy patients. There might be affection on QOL among post mastectomy Patients.

NEED FOR STUDY

- Previous studies have compared effect of Swiss ball exercises and stretching along with diaphragmatic breathing among post mastectomy patients and they have proved that Swiss ball exercises along with diaphragmatic breathing are more effective on post mastectomy patients.
- Another study has proved that there is impaired quality of life by using Body Image and Relationship scale among the post mastectomy patients.
- Therefore, the need for study is to find out effect of Swiss ball exercises and diaphragmatic breathing exercises on chest expansion and quality of life by using Body Image and Relationship scale among post mastectomy patients.

AIM

- To study the effect of Swiss ball exercises and diaphragmatic breathing exercise on chest expansion and quality of life among post mastectomy patients.

OBJECTIVES

- To find out the effect of Swiss ball exercises and diaphragmatic breathing exercise on chest expansion among post mastectomy patients.
- To find the effect of Swiss ball exercises and diaphragmatic breathing exercise on quality of life using the Body Image and Relationship Scale among post mastectomy patients.

METHODOLOGY

- Type of study – Experimental study
- Study design – Randomized Clinical Trial
- Study duration – 6 months
- Sample size – 37
- Type of sampling – Purposive sampling
- Study setting – Shri Siddhivinayak Ganpati Cancer hospital, Miraj.

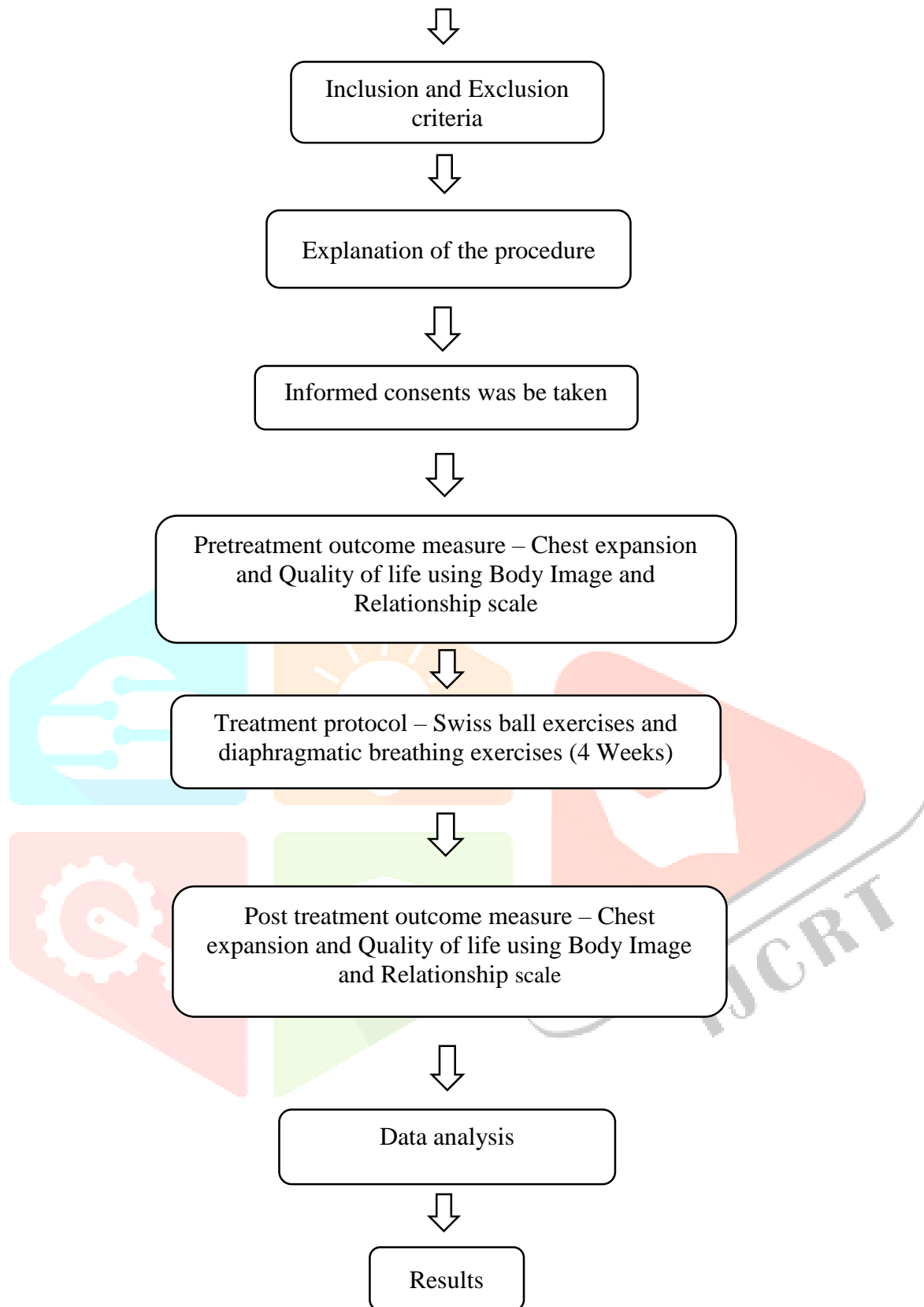
INCLUSION AND EXCLUSION CRITERIA

INCLUSION CRITERIA

- Age group – 40-60 years.
- Patient who underwent modified radical mastectomy.
- Patient with post operative day 2 and 3
- Patient who are willing to participate.
- Reduced chest expansion

EXCLUSION CRITERIA

- Patients with movement limitation before surgery evaluated with a difference >20 degree in flexion and abduction.
- History of recent shoulder dysfunction like, Adhesive capsulitis, rotator cuff disease, recent fractures.
- Unstable vitals.
- Presence or history of any cardiovascular, respiratory and neurological diseases.

PROCEDURE**SWISS BALL EXERCISES****Swiss ball roll away**

Patient was asked to sit with Swiss ball on either side, resting their palm on the ball, with the shoulders abducted laterally and palms placed over the Swiss ball tightly. We had made sure that the elbows were extended. And asked them to sway the trunk laterally by leaning on one side and on the other side; repeated the exercise for 10 times.

Swiss ball roll on

Patient was asked to sit with Swiss ball on either sides, with the elbows and hands rested on the ball, with shoulders slightly abducted with elbows flexed, and asked to roll the ball away from the body in forward and backward direction; repeated the exercise for 10 times.

Swiss ball hold on

The patient was asked to lie on crook lying by holding the Swiss ball between the hands above the head. The patient was asked to lift the ball and bring it back to tummy level; repeated the ex for 10 times.

Swiss ball hold up

The patient was asked to lie on crook lying position by holding the Swiss ball between the hands, facing forward with shoulders in 90° flexion and elbow extended, and asked to perform an internal rotation of shoulder and external rotation of shoulder; repeated the exercise for 10 times.

Swiss ball cat press

Patient was asked to sit on a mat with hands-on Swiss ball which has been placed in front of the patient, with elbows stretched and asked to perform trunk flexion and extension; repeated the exercise for 10 times.

Diaphragmatic breathing exercise

Patient was asked to sit straight with her shoulder girdle and upper chest relaxed with head and neck supported. Therapist had placed her hands over the lower costal margin and over the upper abdomen of the patient. To facilitate and feel the diaphragm movement. Patient was asked to blow out gently and be aware of the movement. At the end of expiration, therapist had gently applied pressure over the diaphragm and commanded the patient to breathe in when applying pressure which serves as the resistance for diaphragm, and it helped to strengthen the diaphragm. The patient was assisted by the therapist by repeating the same procedure until she was mastered.

The protocol was given for four weeks , five days per week, one session per day.

Fig. No. 3 – Swiss ball roll away



Fig. No. 4 – Swiss ball roll on



Fig. No. 5 – Swiss ball holds on



Fig. No. 6 – Swiss ball holds up



Fig. No. 7 – Swiss ball cat press



Fig. No. 8 – Diaphragmatic breathing



STATISTICAL ANALYSIS

Statistical analysis was done using: -

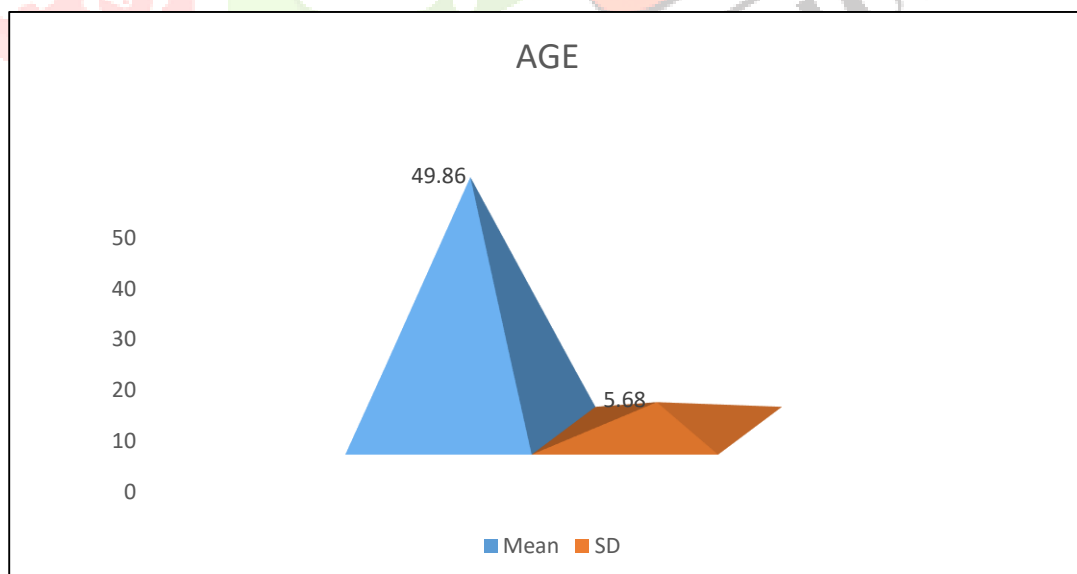
- Shapiro wilk test to assess pre-post changes in Quality of life by using BIRS.
- Paired sample t test to assess pre-post changes in the chest expansion.

Normality test using Shapiro-Wilk

Variable	Time frame	z-value	p-value
BIRS	Pre	0.964	0.273
	Post	0.936	0.053
LEVEL1	Pre	0.950	0.097
	Post	0.920	0.051
LEVEL2	Pre	0.937	0.053
	Post	0.946	0.074
LEVEL3	Pre	0.933	0.052
	Post	0.934	0.053

Data set is normally distributed as all the variables have indicated non-significant outcome in the observation. The researcher shall use parametric test for data analysis purpose in the following sections. **Descriptive Statistics**

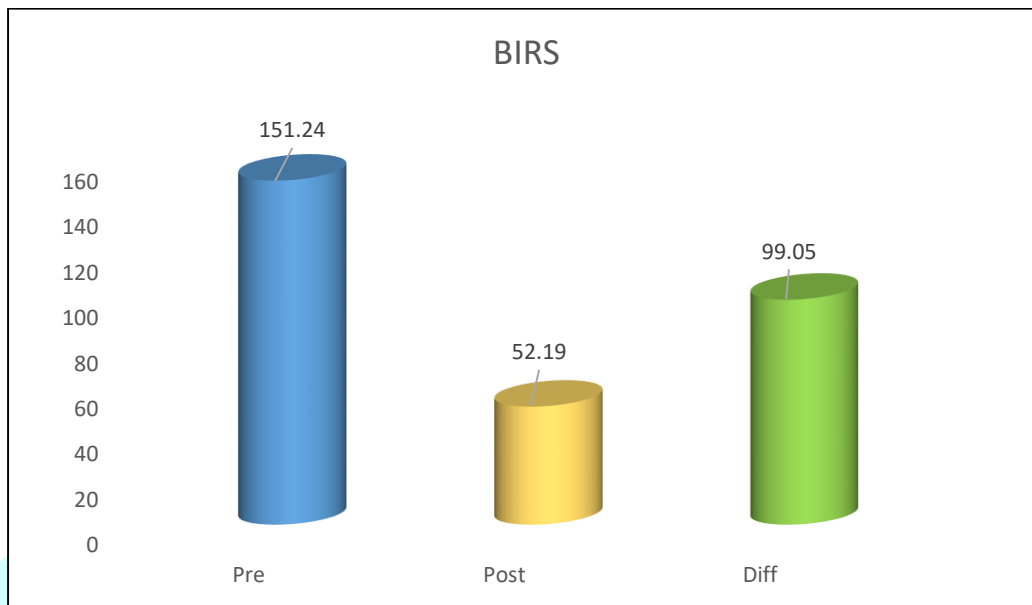
Particular	Minimum	Maximum	Mean	SD
AGE	40.00	60.00	49.86	5.68



Graph 1 - Descriptive Statistics

Pre and Post Paired Sample t test for BIRS

Variable	Pre		Post		Diff		Effect size	t – value	p – value
	Mean	SD	Mean	SD	Mean	SD			
BIRS	151.24	4.91	52.19	9.94	99.05	10.15	9.76	59.385	0.001*

**Graph 2 - Pre and Post Paired Sample t test for BIRS**

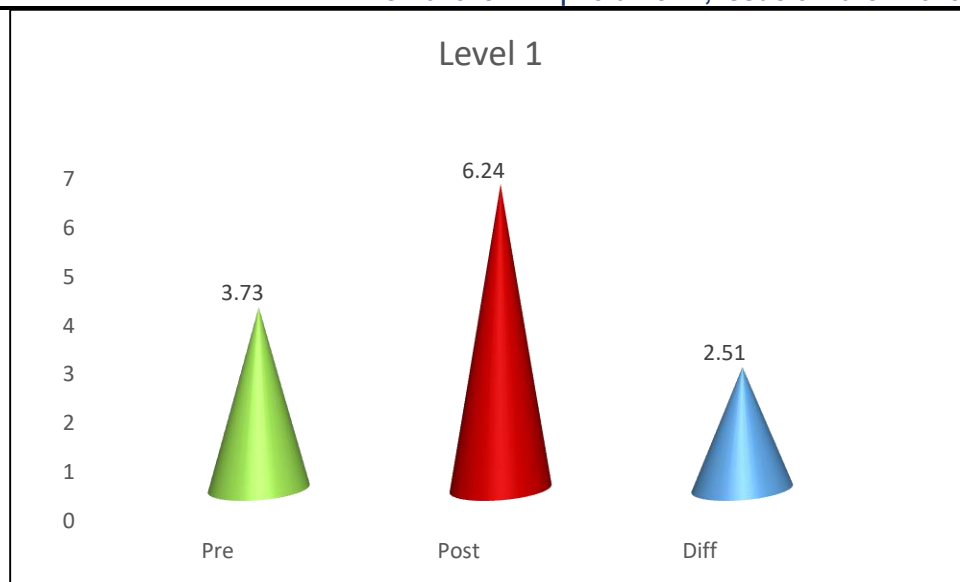
The BIRS mean value indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the limited consistency with post treatment value which is more than pre value.

The effect size or Cohen's D indicates 9.76 value which is assumed to be very high in effect size as per the standard parameters of reference.

Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. $0.001 < 0.05$) in the study and therefore it justifies the improvements in health outcome post intervention.

Pre and Post Paired Sample t test for Chest Expansion

Variable	Pre		Post		Diff		Effect size	t – value	p – value
	Mean	SD	Mean	SD	Mean	SD			
Level 1	3.73	0.74	6.24	0.52	2.51	0.96	2.60	15.829	0.001*



Graph 3 - Pre and Post Paired Sample t test for Chest Expansion Level 1

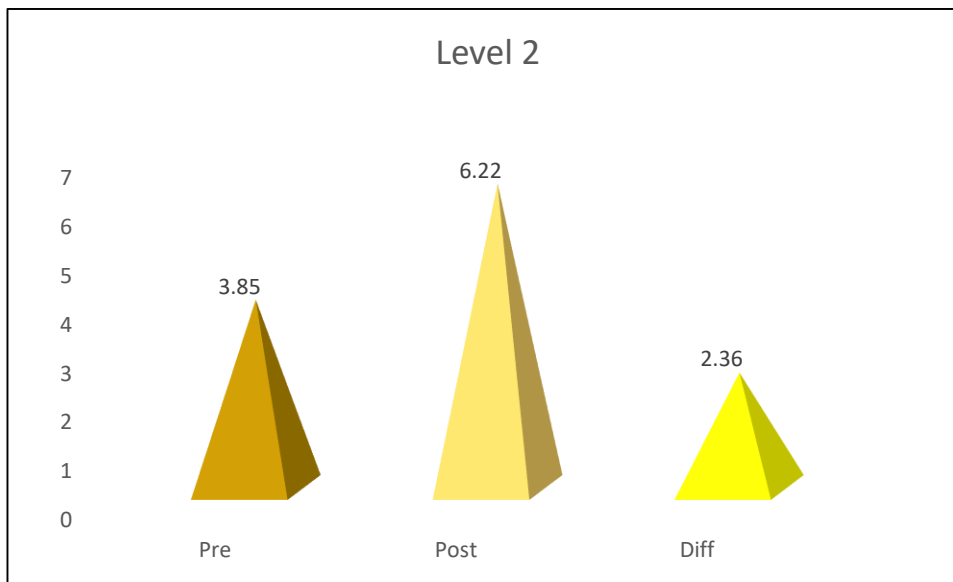
The Chest Expansion level 1 mean value indicated changes post treatment and higher values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value.

The effect size or Cohen's D indicates 2.60 value which is assumed to be very high in effect size as per the standard parameters of reference.

Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. $0.001 < 0.05$) in the study and therefore it justifies the improvements in health outcome post intervention.

Pre and Post Paired Sample t test for Chest Expansion

Variable	Pre		Post		Diff		Effect size	t – value	p – value
	Mean	SD	Mean	SD	Mean	SD			
Level 2	3.85	0.80	6.22	0.45	2.36	1.04	2.28	13.882	0.001*



Graph 4 - Pre and Post Paired Sample t test for Chest Expansion Level 2

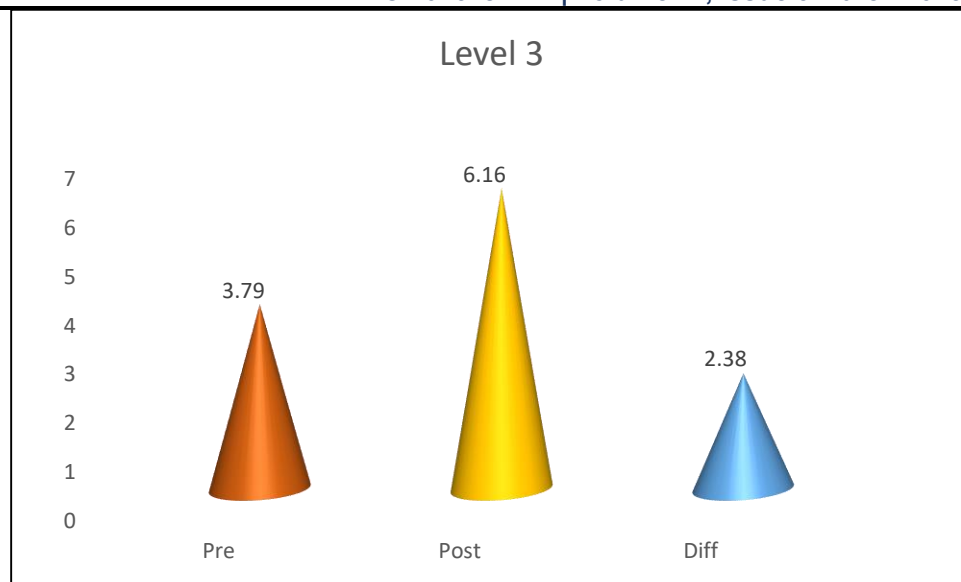
The Chest Expansion level 2 mean value indicated changes post treatment and higher values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value.

The effect size or Cohen's D indicates 2.28 value which is assumed to be very high in effect size as per the standard parameters of reference.

Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. $0.001 < 0.05$) in the study and therefore it justifies the improvements in health outcome post intervention.

Pre and Post Paired Sample t test for Chest Expansion

Variable	Pre		Post		Diff		Effect size	t – value	p – value
	Mean	SD	Mean	SD	Mean	SD			
Level 3	3.79	0.78	6.16	0.53	2.38	1.01	2.36	14.363	0.001*



Graph 5 - Pre and Post Paired Sample t test for Chest Expansion Level 3

The Chest Expansion level 3 mean value indicated changes post treatment and higher values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value.

The effect size or Cohen's D indicates 2.36 value which is assumed to be very high in effect size as per the standard parameters of reference.

Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. $0.001 < 0.05$) in the study and therefore it justifies the improvements in health outcome post intervention.

DISCUSSION

Breast cancer is most frequent diagnosed malignant tumor among women worldwide, the complications of the treatment are enormous which have an impact in daily activities and quality of life in women. An increase in incidence has made way for improvement in advanced treatment approaches which had an impact among breast cancer survival. Breast cancer patients showed marked impairment in muscle strength and joint dysfunction before and after anticancer treatment.

Breast cancer is mainly treated by surgery combined with chemotherapy, radiotherapy and drug comprehensively in clinical practice and such a combined treatment can improve the survival rate of patients. Mastectomy is a surgical procedure involving removal of all or a part of the breast. Mastectomy classifies into partial, simple, modified radical and radical. The most frequent indication for mastectomy is a malignancy of the breast. Mostly the approach of choice is a modified radical mastectomy, in which both, the

main tumor mass and adjacent glandular tissues are removed, which are suspected of infiltration of process and a sentinel axillary lymph node removal.

Post operative breast cancer patients tend to have a poor functional status and reduced QOL which is commonly caused due to pain, radiation induced fibrosis, surgical scarring or intercostal brachial nerve damage, which can persist from months to years after surgery. Anxiety, depression, anger, fatigue, insomnia, hot flashes, mood disturbance, poor body image, swelling, weakness, stiffness, limited ROM, declined cardiovascular and pulmonary functions are other common sequel. So, we aimed to study the overall effect of swiss ball exercises and diaphragmatic breathing exercise on chest expansion and range of motion and quality of life among post mastectomy patients.

As an outcome measure, we used Body Image and Relationship scale and measuring tape for chest expansion. We screened participants through inclusion and exclusion criteria. In which mean of pre test of chest expansion at axillary level was 3.73 ± 0.74 (Table no. & Graph.), at fourth intercoastal level was 3.85 ± 0.80 , at xiphisternal level was 3.79 ± 0.78 there was a significant difference seen in chest expansion post test, at axillary level with the mean 6.24 ± 0.52 , at fourth intercoastal level with mean 6.22 ± 0.45 , at xiphisternal level mean is 6.16 ± 0.53 . Therefore pre test score of chest expansion is lower than the post test score which indicates that there was significant increase in the chest expansion post test with value $p=0.001$. Body Image and Relationship Scale mean value pre test was 151.24 ± 4.91 , there was a significant difference seen in post mean value was 52.19 ± 9.94 . Therefore pre test score of Body Image and Relationship Scale is higher than the post test score with value $p=0.001$ which indicates that there was significant change and improvement in the quality of life of the patients. Higher the score of Body Image and Relationship Scale indicates greater impairments and lower score indicates lesser impairments. Thus, swiss ball exercise and diaphragmatic breathing exercise has highly effective impact on chest expansion and quality of life of patients .

According to Rekha k et.al [2020], The study aimed determine and compare the effects of Swiss ball exercises and stretching exercises in improving chest expansion, forced expiratory volume in 1 second and shoulder range of motion among post operative breast cancer women. 20 Female participants who underwent surgery for breast carcinoma were included, among which 10 participants were assisted for chest expansion at Three levels, FEV1, and shoulder range of motion for flexion and abduction. Participants were divided into two groups. Group A was treated with Swiss ball exercises and group B was treated with stretching exercises. The treatment was conducted for 4 weeks ,5 days/weeks, following which post test was performed same as of pre-test. There was a significant difference seen in chest expansion at axillary level with the mean $p= 0.0001$, at fourth intercoastal level mean with $p= 0.004$, at xiphisternal level $p=0.001$. FEV1 has also shown a difference between the groups in post-test with $p = 0.0481$. Shoulder range of motion for flexion has shown a difference while comparing with pre test scores with $p= 0.0042$ and abduction of shoulder with $p= 0.0463$ which has also shown a significant difference when compared with pre test score. Therefore post test score of group A is higher than the post test score of group B. Thus the studies conclude that swiss ball exercises are more effective than the stretching exercises in post operative patients of breast carcinoma. Our study also found these similar results of effectiveness of swiss ball exercises in post operative breast cancer patients.

As per the Melissa J et.al [2014], evaluate the effect of age on quality of life (QOL) in breast cancer survivors

after resistance training, 20 women were included to 1 of 2 groups based on age. 3 sets of 8 exercises twice a week for 8 week was carried out by both the groups. Measurements were taken before and after the training program. QOL was measured using the Body Image and Relationship Scale (BIRS). Both groups improved in chest press ($p < .001$), leg press ($p < .001$), arm curls ($p < .05$), and chair stands ($p < .001$). For QOL, YRT reported greater improvements compared with ORT in BIRS total score (Group \times Time interaction, $p = .002$) and strength and health subscale score (Group \times Time interaction, $p = .001$), and greater age was related to greater perceived impairment (BIRS total: $r = .61$, $p = .004$; strength and health subscale: $r = .69$, $p = .001$). Despite significant improvements in strength and function, older women perceived relatively little improvement in QOL compared with younger women, and age had a differential negative influence on improvements in QOL. Our study supports this article because we also found out significant positive change using QOL scale after the exercise program.

CONCLUSION

- Present study was done in Shri Siddhivinayak Ganpati Cancer Hospital, Miraj to assess the effect of Swiss ball exercises and diaphragmatic breathing exercise on chest expansion and quality of life among post mastectomy patients with the help of Measuring Tape and Body Image and Relationship Scale. Breast cancer is found to be the most common type of cancer in women. Breast cancer is life threatening cancer and leading cause of cancer death among women. Mastectomy is surgical procedure which is use for breast cancer. The study concluded that the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-values less than the 5% significance level $0.001 < 0.05$ in the study and therefore it justifies the improvements in health outcome post intervention.

LIMITATIONS AND SUGGESTIONS

Limitations: -

Sample size is small.

Study is done only on post operative Modified Radical Mastectomy patients.

Suggestions: -

Sample size can be increased.

Study can also be done on male patients. (As per 2020s research revealed that 23,149 male patients have been diagnosed for breast cancer in Tamilnadu.)

Study can also include patients undergoing different type of mastectomy

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