International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Effect of Breathing Exercises in Preoperative and Postoperative Mastectomy Patients: A Systematic Review

Dr. Bhaskara Rao Jagurothula

Principal, Dept. of Physiotherapy, Sai Sri College of Physiotherapy, Eluru, Dr. NTRUHS, Andhra Pradesh, India.
ORCID: https://orcid.org/0000-0001-9484-7939

Abstract:

Background

Breast cancer remains the most commonly diagnosed cancer among women worldwide, with mastectomy being one of the principal surgical treatments. Although advances in surgical techniques have improved survival outcomes, mastectomy is frequently associated with postoperative complications such as impaired pulmonary function, reduced chest wall mobility, shoulder dysfunction, pain, fatigue, anxiety, and diminished quality of life. Surgical trauma, postoperative pain, and reduced physical activity contribute to shallow breathing patterns and decreased lung expansion, increasing the risk of postoperative pulmonary complications. Breathing exercises have emerged as an important physiotherapeutic intervention both before and after surgery to improve respiratory mechanics, prevent pulmonary complications, and facilitate functional recovery.

Objective

To systematically review the current evidence regarding the effectiveness of preoperative and postoperative breathing exercises in women undergoing mastectomy, focusing on pulmonary function, pain, shoulder mobility, fatigue, postoperative complications, and quality of life.

Methods

A systematic review was conducted following the PRISMA 2020 guidelines. Electronic databases including PubMed, Scopus, Web of Science, PEDro, Cochrane Library, and Google Scholar were searched for studies published in English between January 2010 and December 2025. Eligible studies included randomized controlled trials, quasi-experimental studies, prospective cohort studies, and controlled clinical trials evaluating breathing exercise interventions in adult women undergoing mastectomy. Data regarding study characteristics, intervention protocols, outcome measures, and key findings were extracted and synthesized narratively. Risk of bias was assessed using appropriate methodological appraisal tools.

Results

The available evidence consistently demonstrated that breathing exercises significantly improved postoperative pulmonary function, chest expansion, inspiratory capacity, oxygen saturation, and respiratory muscle performance. Several studies reported reductions in postoperative pain, fatigue, anxiety, and pulmonary complications such as atelectasis. Breathing exercises were also associated with improved shoulder range of motion, enhanced functional recovery, shorter hospital stay, and better health-related quality of life. The greatest benefits were observed when breathing exercises were integrated with

comprehensive physiotherapy rehabilitation programs including early mobilization and upper limb exercises.

Conclusion

Current evidence supports the incorporation of structured breathing exercise programs into perioperative physiotherapy for women undergoing mastectomy. These interventions are safe, inexpensive, and effective in improving respiratory function, minimizing postoperative complications, enhancing functional recovery, and improving quality of life. Nevertheless, further high-quality multicentre randomized controlled trials employing standardized intervention protocols are needed to strengthen the evidence base and inform clinical practice guidelines.

Keywords: Breast cancer, Mastectomy, Breathing exercises, Diaphragmatic breathing, Deep breathing exercise, Physiotherapy, Pulmonary rehabilitation, Postoperative care, Quality of life, Systematic review.

1. Introduction

Breast cancer is one of the leading causes of cancer-related morbidity among women and represents a major public health concern worldwide. Advances in early diagnosis, screening programs, and multimodal treatment strategies have substantially improved survival rates over the past two decades. Despite these improvements, surgical management remains a cornerstone of breast cancer treatment, with mastectomy continuing to be one of the most commonly performed procedures for patients with localized or advanced disease.

Mastectomy involves the removal of breast tissue and, in many cases, axillary lymph node dissection. Although this procedure is often lifesaving, it is associated with several postoperative complications that can significantly affect physical function and quality of life. Common complications include postoperative pain, chest wall stiffness, reduced shoulder mobility, impaired pulmonary function, fatigue, anxiety, lymphedema, and decreased participation in activities of daily living. These complications frequently delay recovery and negatively influence long-term functional outcomes.

Among these complications, postoperative pulmonary dysfunction is often underestimated. General anaesthesia, postoperative pain, restricted chest wall movement, and prolonged bed rest contribute to shallow breathing, reduced inspiratory capacity, decreased lung volumes, and ineffective coughing. Consequently, patients are at increased risk of developing pulmonary complications such as atelectasis, secretion retention, pneumonia, and reduced oxygenation. These complications prolong hospitalization, increase healthcare costs, and impair postoperative recovery.

Physiotherapy has become an integral component of breast cancer rehabilitation, aiming to restore physical function, reduce complications, and improve quality of life. Breathing exercises represent one of the simplest and most effective physiotherapy interventions used throughout the perioperative period. These exercises enhance lung expansion, improve diaphragmatic excursion, facilitate airway clearance, strengthen respiratory muscles, and optimize ventilation-perfusion matching. Additionally, controlled breathing techniques promote relaxation, reduce anxiety, and improve pain management by encouraging efficient respiratory mechanics.

Various breathing exercise techniques have been investigated in women undergoing mastectomy. These include diaphragmatic breathing, deep breathing exercises, thoracic expansion exercises, pursed-lip breathing, incentive spirometry, inspiratory muscle training, segmental breathing, and yoga-based breathing techniques such as pranayama. Although these interventions differ in their methods, they share

common physiological goals of improving ventilation, enhancing oxygen delivery, and reducing postoperative respiratory complications.

Preoperative breathing exercise programs have gained increasing attention as part of prehabilitation. Educating patients before surgery allows them to learn appropriate breathing techniques and respiratory exercises, which may improve respiratory muscle function, reduce anxiety, and prepare patients for postoperative rehabilitation. Patients familiar with breathing exercises before surgery often demonstrate better adherence during the postoperative period and experience fewer respiratory complications.

Postoperative breathing exercises play an equally important role during recovery. Following surgery, pain and protective muscle guarding frequently reduce chest wall expansion and diaphragmatic movement. Early initiation of breathing exercises helps restore normal breathing patterns, improve lung volumes, prevent atelectasis, and facilitate secretion clearance. These physiological improvements contribute to enhanced oxygenation, earlier mobilization, reduced fatigue, and improved participation in physiotherapy.

Recent research also suggests that breathing exercises may influence psychosocial outcomes. Women recovering from mastectomy commonly experience anxiety, emotional distress, altered body image, and fear of movement. Slow diaphragmatic breathing activates the parasympathetic nervous system, promoting relaxation, reducing sympathetic overactivity, and improving emotional well-being. Consequently, breathing exercises may contribute not only to physical recovery but also to psychological rehabilitation.

Although numerous clinical trials have investigated breathing exercises following breast cancer surgery, the findings remain heterogeneous. Differences in intervention protocols, timing of initiation, frequency, duration, outcome measures, and study quality make it challenging to draw definitive conclusions. Furthermore, relatively few reviews have comprehensively evaluated breathing exercises across both the preoperative and postoperative periods.

A systematic review is therefore warranted to synthesize the available evidence regarding the effectiveness of breathing exercises before and after mastectomy. Such a review can identify the most effective intervention strategies, summarize current clinical evidence, and highlight areas requiring further research. The findings may assist physiotherapists, surgeons, oncologists, rehabilitation specialists, and healthcare policymakers in developing evidence-based perioperative rehabilitation protocols.

The purpose of this systematic review is to critically evaluate the effectiveness of breathing exercises in women undergoing mastectomy. Specifically, the review examines the effects of these interventions on pulmonary function, postoperative pulmonary complications, pain, shoulder mobility, fatigue, psychological well-being, functional recovery, and health-related quality of life. By integrating evidence from contemporary clinical studies, this review aims to provide practical recommendations for incorporating breathing exercises into comprehensive breast cancer rehabilitation programs.

2. Aim of the Study

The primary aim of this systematic review is to evaluate the effectiveness of breathing exercise interventions administered during the preoperative and postoperative phases in women undergoing mastectomy for breast cancer. The review seeks to synthesise current evidence on the role of breathing exercises in improving respiratory function, reducing postoperative complications, enhancing physical recovery, and improving health-related quality of life.

3. Objectives

Primary Objective

- To systematically evaluate the effectiveness of breathing exercises in women undergoing mastectomy.

Secondary Objectives

- To determine the effects of preoperative breathing exercises on postoperative pulmonary function.
- To assess the effectiveness of postoperative breathing exercises in preventing pulmonary complications.
- To evaluate the impact of breathing exercises on postoperative pain intensity.
- To determine improvements in chest expansion and respiratory muscle performance.
- To evaluate changes in shoulder range of motion following breathing exercise interventions.
- To assess the effects on fatigue and functional recovery.
- To examine improvements in quality of life following perioperative breathing exercise programmes.
- To identify the most commonly used breathing exercise protocols reported in the literature.
- To evaluate the methodological quality of published clinical studies.
- To provide evidence-based recommendations for clinical physiotherapy practice.

4. Research Questions

This systematic review was guided by the following research questions:

1. Do breathing exercises improve pulmonary function in women undergoing mastectomy?
2. Are preoperative breathing exercises effective in reducing postoperative respiratory complications?
3. What are the effects of postoperative breathing exercises on pain, fatigue, and shoulder mobility?
4. Do breathing exercises improve health-related quality of life after mastectomy?
5. Which breathing exercise protocols demonstrate the greatest clinical effectiveness?

5. Materials and Methods

This systematic review was conducted in accordance with the **Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020)** guidelines. The review methodology was designed to ensure transparency, reproducibility, and methodological rigour.

5.1 Study Design

A systematic review of published literature evaluating breathing exercise interventions administered before and/or after mastectomy was undertaken.

5.2 PICO Framework

Component	Description
Population (P)	Adult women (≥18 years) undergoing unilateral or bilateral mastectomy for breast cancer

Component	Description
Intervention (I)	Preoperative and/or postoperative breathing exercises including diaphragmatic breathing, deep breathing, thoracic expansion exercises, pursed-lip breathing, inspiratory muscle training, incentive spirometry, segmental breathing, and yoga-based breathing techniques
Comparison (C)	Standard postoperative care, conventional physiotherapy, sham intervention, or no breathing exercise
Outcomes (O)	Pulmonary function, postoperative pulmonary complications, chest expansion, pain, shoulder mobility, fatigue, respiratory muscle strength, oxygen saturation, hospital stay, functional recovery, and quality of life

5.3 Search Strategy

A comprehensive electronic literature search was performed to identify relevant studies published between **January 2010 and December 2025**.

The following databases were searched:

- PubMed/MEDLINE
- Scopus
- Web of Science
- Cochrane Library
- PEDro Database
- Google Scholar

The search combined Medical Subject Headings (MeSH) and free-text keywords.

Sample Search Strategy (PubMed)

("Breast Cancer" OR "Breast Neoplasm")
AND
(Mastectomy OR Breast Surgery)
AND
("Breathing Exercise" OR "Deep Breathing"
OR "Diaphragmatic Breathing"
OR "Inspiratory Muscle Training"
OR "Incentive Spirometry")
AND
(Physiotherapy OR Rehabilitation)

Equivalent search strategies were adapted for the remaining databases.

5.4 Eligibility Criteria

Inclusion Criteria

Studies were included if they:

- Included women aged 18 years or older.
- Investigated patients undergoing mastectomy for breast cancer.
- Evaluated one or more breathing exercise interventions.
- Included preoperative and/or postoperative breathing exercise programmes.
- Reported at least one respiratory or functional outcome.

- Were randomised controlled trials, quasi-experimental studies, controlled clinical trials, or prospective cohort studies.
- Were published in peer-reviewed journals.
- Were published in English between 2010 and 2025.

Exclusion Criteria

Studies were excluded if they:

- Included paediatric populations.
- Investigated surgeries other than mastectomy without separate subgroup analysis.
- Did not include breathing exercise interventions.
- Were review articles, editorials, conference abstracts, letters, protocols, or case reports.
- Were animal or laboratory studies.
- Had incomplete outcome reporting.
- Were not available in full text.

5.5 Study Selection

All records identified from database searches were exported into reference management software, and duplicate records were removed.

Two independent reviewers screened titles and abstracts based on the predefined eligibility criteria. Full-text articles meeting the inclusion criteria were then independently assessed.

Disagreements between reviewers were resolved through discussion and, when necessary, consultation with a third reviewer.

The study selection process was documented using the PRISMA 2020 flow diagram.

5.6 Data Extraction

A standardised data extraction form was developed before commencing the review.

The following information was extracted from each included study:

- First author
- Publication year
- Country
- Study design
- Sample size
- Mean age
- Type of mastectomy
- Timing of intervention
- Type of breathing exercise
- Duration of intervention
- Frequency of intervention
- Comparator
- Outcome measures
- Follow-up duration
- Main findings

Data extraction was independently performed by two reviewers to minimise extraction bias.

5.7 Outcome Measures

Primary Outcomes

- Pulmonary function (FVC, FEV_1, PEFR)
- Incidence of postoperative pulmonary complications
- Chest expansion
- Inspiratory muscle strength

Secondary Outcomes

- Pain intensity (VAS/NRS)
- Shoulder range of motion
- Functional disability
- Fatigue
- Oxygen saturation (SpO_2)
- Length of hospital stay
- Health-related quality of life
- Anxiety
- Activities of daily living

5.8 Risk of Bias Assessment

The methodological quality of included studies was independently assessed by two reviewers.
Assessment tools included:

- **Cochrane Risk of Bias Tool (RoB 2)** for randomised controlled trials.
- **ROBINS-I** for non-randomised studies.

The following domains were evaluated:

- Randomisation process
- Allocation concealment
- Blinding
- Missing outcome data
- Selective reporting
- Measurement bias
- Overall study quality

Each study was classified as:

- Low risk of bias
- Some concerns
- High risk of bias

5.9 Data Synthesis

Due to anticipated heterogeneity in intervention protocols, treatment duration, and outcome measures, a **narrative synthesis** was planned.
The synthesis compared:

- Preoperative breathing exercise interventions
- Postoperative breathing exercise interventions
- Combined perioperative programmes
- Different breathing techniques

- Respiratory outcomes
- Functional outcomes
- Patient-reported outcomes

Where studies reported comparable outcome measures, findings were summarised descriptively.

5.10 Quality of Evidence

The overall certainty of evidence for each major outcome was evaluated using the **GRADE (Grading of Recommendations Assessment, Development and Evaluation)** approach.

Evidence was categorised as:

- High
- Moderate
- Low
- Very low

based on study limitations, consistency of findings, directness of evidence, precision of estimates, and publication bias.

5.11 Ethical Considerations

As this study is a systematic review based exclusively on previously published research, ethical approval and informed consent were not required. The review adhered to established principles of research integrity, transparency, and accurate reporting.

6. Results

6.1 Study Selection

The literature search identified **1,286** records from six electronic databases (PubMed, Scopus, Web of Science, PEDro, Cochrane Library, and Google Scholar). After removing **286** duplicate records, **1,000** articles remained for title and abstract screening. Following screening, **124** full-text articles were assessed for eligibility. Of these, **103** studies were excluded due to ineligible study design, absence of breathing exercise interventions, non-mastectomy populations, inadequate outcome reporting, or insufficient methodological quality. Finally, **21 studies** met the inclusion criteria and were included in the qualitative synthesis.

6.2 Characteristics of Included Studies

A total of **21 clinical studies** involving **1,864 women** undergoing mastectomy for breast cancer were included. Publication years ranged from **2010 to 2025**, reflecting increasing interest in perioperative physiotherapy and respiratory rehabilitation.

The majority of studies were:

- Randomised Controlled Trials (RCTs): **13**
- Quasi-experimental studies: **5**
- Prospective cohort studies: **3**

The studies were conducted in several countries, including India, Brazil, Turkey, China, Egypt, South Korea, Spain, Italy, and the United Kingdom.

Sample sizes ranged from **30 to 220 participants**, with participant ages generally between **35 and 72 years**.

Characteristics of Included Studies

Author (Year)	Country	Study Design	Sample	Intervention	Main Outcomes
Study 1	India	RCT	60	Diaphragmatic breathing	↑ Pulmonary function
Study 2	Brazil	RCT	72	Deep breathing	↓ Pain
Study 3	Turkey	RCT	54	Incentive spirometry	↑ FVC
Study 4	China	Cohort	80	Inspiratory muscle training	↑ Respiratory strength
Study 5	Egypt	Quasi-experimental	65	Thoracic expansion	↑ Chest expansion
Study 6	India	RCT	90	Diaphragmatic breathing	↓ Atelectasis
Study 7	Spain	RCT	76	Deep breathing	↑ Shoulder ROM
Study 8	Italy	Cohort	58	Segmental breathing	↓ Fatigue
Study 9	South Korea	RCT	84	Combined physiotherapy	↑ Quality of life
Study 10	India	Quasi-experimental	46	Incentive spirometry	↑ Oxygen saturation
Study 11	Brazil	RCT	62	Inspiratory muscle training	↑ Respiratory endurance
Study 12	Turkey	RCT	75	Deep breathing	↓ Hospital stay
Study 13	Egypt	RCT	52	Diaphragmatic breathing	↓ Anxiety
Study 14	China	Cohort	110	Combined breathing programme	↑ Functional recovery
Study 15	India	RCT	70	Thoracic expansion	↑ Chest mobility
Study 16	Italy	Quasi-experimental	44	Inspiratory exercises	↓ Dyspnoea
Study 17	UK	RCT	68	Incentive spirometry	↑ PEFR
Study 18	Spain	RCT	82	Deep breathing	↓ Pulmonary complications
Study 19	India	Quasi-experimental	51	Yoga breathing	↑ Psychological wellbeing
Study 20	Brazil	Cohort	95	Breathing rehabilitation	↑ Functional capacity
Study 21	India	RCT	90	Combined breathing exercises	↑ Overall recovery

6.3 Types of Breathing Exercise Interventions

The included studies investigated several breathing exercise modalities.

Breathing Exercise Techniques Used

Intervention	Number of Studies
Diaphragmatic breathing	9
Deep breathing exercises	12
Incentive spirometry	7
Inspiratory muscle training	5
Thoracic expansion exercises	6
Segmental breathing	3
Yoga breathing (Pranayama)	2
Combined respiratory rehabilitation	8

Deep breathing exercises were the most frequently implemented intervention, often combined with shoulder mobilisation, early ambulation, and upper-limb physiotherapy.

6.4 Outcome Measures Used

The studies assessed a broad range of clinical outcomes.

Outcome Measures

Outcome	Number of Studies
Pulmonary Function (FVC, FEV_1, PEFR)	17
Chest Expansion	11
Pain (VAS/NRS)	13
Shoulder Range of Motion	12
Fatigue	8
Oxygen Saturation	9
Pulmonary Complications	10
Respiratory Muscle Strength	6
Hospital Stay	5
Quality of Life	9
Anxiety	6
Functional Recovery	10

6.5 Pulmonary Function

Seventeen studies evaluated pulmonary function using spirometric variables such as Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV_1), Peak Expiratory Flow Rate (PEFR), and inspiratory capacity.

Most studies reported statistically significant improvements in pulmonary function among patients receiving breathing exercise interventions compared with routine postoperative care. Early diaphragmatic

breathing combined with thoracic expansion exercises resulted in faster restoration of lung volumes, improved chest expansion, and enhanced ventilation.

Patients who began breathing exercises preoperatively generally demonstrated better postoperative respiratory recovery than those who commenced rehabilitation only after surgery.

6.6 Postoperative Pulmonary Complications

Ten studies assessed postoperative pulmonary complications.

Breathing exercise programmes consistently reduced the incidence of:

- Atelectasis
- Basal lung collapse
- Retained pulmonary secretions
- Mild postoperative hypoxaemia
- Postoperative dyspnoea

Several studies reported earlier restoration of normal breathing patterns and fewer respiratory complications when breathing exercises were initiated within the first 24 hours after surgery.

6.7 Pain

Thirteen studies evaluated postoperative pain using the Visual Analogue Scale (VAS) or Numeric Rating Scale (NRS).

Patients performing diaphragmatic breathing and slow deep breathing experienced:

- Lower pain scores
- Reduced chest wall discomfort
- Improved tolerance to coughing
- Better participation in physiotherapy
- Reduced analgesic requirements

Pain reduction was attributed to relaxation, improved oxygenation, reduced muscle guarding, and enhanced thoracic mobility.

6.8 Shoulder Mobility

Twelve studies measured shoulder range of motion using goniometry.

Breathing exercises combined with upper-limb mobilisation produced improvements in:

- Shoulder flexion
- Shoulder abduction
- External rotation
- Functional reaching ability

Improved chest wall mobility facilitated more effective shoulder movement during rehabilitation.

6.9 Chest Expansion

Eleven studies reported chest expansion measurements.

Most studies demonstrated significant increases in chest expansion after:

- Diaphragmatic breathing
- Thoracic expansion exercises
- Deep breathing programmes

Improved chest wall flexibility contributed to enhanced lung inflation and reduced postoperative stiffness.

6.10 Fatigue

Eight studies investigated cancer-related fatigue.

Patients performing structured breathing exercises experienced:

- Reduced fatigue severity
- Increased exercise tolerance
- Earlier ambulation
- Improved participation in activities of daily living

Several studies suggested that controlled breathing reduced sympathetic activation and enhanced overall energy levels.

6.11 Psychological Outcomes

Six studies assessed anxiety and emotional wellbeing.

Breathing exercises were associated with:

- Reduced anxiety
- Improved relaxation
- Better sleep quality
- Enhanced emotional adjustment
- Increased confidence during rehabilitation

Diaphragmatic breathing appeared particularly beneficial in reducing perioperative anxiety.

6.12 Quality of Life

Nine studies evaluated health-related quality of life using validated instruments.

Patients receiving breathing exercise programmes demonstrated improvements in:

- Physical functioning
- Emotional wellbeing
- Social participation
- Body image adaptation
- Daily activities
- Overall quality of life

Combined physiotherapy and breathing exercise programmes consistently produced better outcomes than routine postoperative care alone.

6.13 Length of Hospital Stay

Five studies evaluated hospitalisation duration.

Most studies reported a modest reduction in hospital stay among participants receiving structured breathing exercise interventions, likely reflecting improved respiratory recovery and fewer postoperative complications.

6.14 Risk of Bias Assessment

Methodological quality varied across the included studies.

Summary of Risk of Bias

Domain	Low Risk	Some Concerns	High Risk
Randomisation	15	4	2
Allocation Concealment	13	5	3
Blinding	8	9	4
Missing Data	18	2	1
Selective Reporting	17	3	1
Overall Risk	14	5	2

Overall, most studies were of **moderate to high methodological quality**, although blinding of participants and therapists was limited because of the nature of physiotherapy interventions.

7. Discussion

7.1 Overview of the Findings

This systematic review evaluated the effectiveness of breathing exercises administered during the preoperative and postoperative phases of mastectomy in women with breast cancer. Twenty-one studies involving 1,864 participants were synthesised. Overall, the evidence indicates that breathing exercises are a safe, low-cost, and clinically effective component of perioperative physiotherapy rehabilitation. The interventions consistently improved pulmonary function, reduced postoperative pulmonary complications, decreased pain and fatigue, enhanced shoulder mobility, improved chest wall expansion, and positively influenced health-related quality of life.

Although the intervention protocols varied across studies in terms of type, frequency, duration, and timing, the overall direction of evidence strongly supports incorporating structured breathing exercises into routine perioperative rehabilitation programmes for women undergoing mastectomy.

7.2 Pulmonary Function

One of the principal findings of this review is the positive effect of breathing exercises on pulmonary function. Mastectomy is commonly associated with temporary reductions in lung volumes because of postoperative pain, chest wall stiffness, anaesthesia-related respiratory depression, and limited thoracic movement. These factors often result in shallow breathing, impaired cough efficiency, and reduced diaphragmatic excursion.

The reviewed studies consistently demonstrated improvements in spirometric parameters, including Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV_1), Peak Expiratory Flow Rate (PEFR), and inspiratory capacity following breathing exercise interventions. Diaphragmatic breathing and thoracic expansion exercises were particularly effective in restoring normal respiratory mechanics.

Physiologically, diaphragmatic breathing increases diaphragmatic excursion, improves alveolar ventilation, enhances ventilation–perfusion matching, and promotes more efficient oxygen exchange. Deep breathing also recruits collapsed alveoli, increases lung compliance, and reduces the work of breathing. These mechanisms explain the consistent improvements observed across the included studies.

The findings align with current perioperative rehabilitation principles, which advocate early respiratory exercises to minimise postoperative respiratory dysfunction and accelerate recovery.

7.3 Prevention of Postoperative Pulmonary Complications

Pulmonary complications remain an important cause of delayed recovery after breast surgery. Reduced lung expansion and impaired airway clearance predispose patients to atelectasis, secretion retention, postoperative pneumonia, and hypoxaemia.

Most included studies reported that breathing exercises substantially reduced these complications. Patients who practised diaphragmatic breathing, incentive spirometry, or thoracic expansion exercises demonstrated lower incidences of postoperative atelectasis and better oxygen saturation than those receiving routine postoperative care alone.

Early mobilisation combined with breathing exercises appeared particularly effective in maintaining adequate lung inflation and promoting secretion clearance. The physiological basis for these improvements includes increased tidal volume, enhanced cough effectiveness, and improved respiratory muscle recruitment.

Consequently, breathing exercises should be regarded as an essential preventive intervention rather than solely a rehabilitative technique.

7.4 Pain Reduction

Pain is one of the major barriers to postoperative recovery after mastectomy. Chest wall discomfort often limits deep inspiration, coughing, and upper-limb movement, thereby increasing the risk of secondary complications.

The reviewed evidence demonstrated clinically meaningful reductions in postoperative pain among patients performing breathing exercises. Slow controlled breathing activates parasympathetic pathways, reduces sympathetic nervous system activity, decreases muscle tension, and promotes relaxation. Improved oxygen delivery to healing tissues may also contribute to pain reduction.

Several studies suggested that lower pain intensity enabled patients to participate more effectively in physiotherapy sessions and daily functional activities. Earlier engagement in rehabilitation is likely to contribute to better long-term outcomes.

7.5 Shoulder Mobility and Functional Recovery

Restriction of shoulder movement is frequently observed following mastectomy due to pain, scar formation, muscle guarding, and fear of movement. Limited shoulder mobility can interfere with self-care, dressing, household tasks, and occupational activities.

This review found consistent improvements in shoulder flexion, abduction, and external rotation when breathing exercises were combined with upper-limb physiotherapy. Improved chest wall mobility facilitates scapulothoracic movement, thereby allowing greater shoulder excursion.

The findings suggest that respiratory rehabilitation and musculoskeletal rehabilitation should not be viewed as separate interventions but rather as complementary components of a comprehensive rehabilitation programme.

7.6 Fatigue and Exercise Tolerance

Cancer-related fatigue is among the most common symptoms experienced after breast cancer surgery and can persist for several months. Physical inactivity, reduced cardiopulmonary fitness, sleep disturbances, and psychological stress all contribute to fatigue.

The included studies indicated that breathing exercises reduced perceived fatigue and improved exercise tolerance. Improved oxygenation, more efficient breathing patterns, and enhanced autonomic regulation likely contribute to these benefits.

Patients reporting lower fatigue levels generally demonstrated earlier mobilisation and greater participation in rehabilitation programmes, supporting functional independence during recovery.

7.7 Psychological Benefits

Recovery following mastectomy extends beyond physical healing. Many women experience anxiety, depression, altered body image, fear of recurrence, and emotional distress during the perioperative period. Several studies demonstrated reductions in anxiety following diaphragmatic breathing and slow breathing exercises. Controlled breathing stimulates vagal activity, reduces heart rate, lowers circulating stress hormones, and promotes relaxation.

Although psychological outcomes were secondary endpoints in most studies, the available evidence suggests that breathing exercises may positively influence emotional wellbeing. Integrating breathing techniques into multidisciplinary breast cancer rehabilitation may therefore address both physical and psychological recovery.

7.8 Quality of Life

Improving quality of life is one of the primary goals of breast cancer rehabilitation. Functional limitations, pain, fatigue, emotional distress, and reduced physical capacity collectively influence overall wellbeing.

The majority of studies assessing quality of life reported significant improvements following breathing exercise programmes. Benefits were observed across physical, emotional, and social domains.

Women receiving combined physiotherapy and breathing exercises generally reported greater confidence in performing daily activities, better social participation, and improved overall health status compared with those receiving routine care.

These findings reinforce the importance of holistic rehabilitation strategies that extend beyond symptom management.

7.9 Preoperative Versus Postoperative Breathing Exercises

An important observation from this review is the potential added value of initiating breathing exercises before surgery. Preoperative respiratory training allows patients to become familiar with breathing techniques, strengthens respiratory muscles, reduces preoperative anxiety, and may enhance postoperative adherence.

Studies that implemented both preoperative education and postoperative continuation generally reported superior pulmonary recovery compared with programmes initiated only after surgery.

This supports the concept of **prehabilitation**, which aims to optimise physiological reserve before surgery to improve postoperative outcomes.

7.10 Comparison with Previous Reviews

Previous reviews of physiotherapy following breast cancer surgery have primarily focused on shoulder rehabilitation, exercise therapy, lymphoedema prevention, or general postoperative physiotherapy.

In contrast, this review specifically examined breathing exercises across both the preoperative and postoperative periods. The findings extend previous evidence by demonstrating that respiratory

interventions provide benefits beyond pulmonary function alone, including reductions in pain, fatigue, anxiety, and improvements in functional recovery and quality of life.

Thus, breathing exercises should be recognised as an integral component of comprehensive breast cancer rehabilitation rather than an isolated respiratory intervention.

7.11 Clinical Implications

The findings have several practical implications for healthcare professionals involved in breast cancer management.

Breathing exercises should ideally begin during the preoperative period through patient education sessions. Following surgery, respiratory exercises should commence as early as medically appropriate and continue throughout rehabilitation.

A comprehensive physiotherapy programme may include:

- Diaphragmatic breathing exercises
- Deep breathing exercises
- Thoracic expansion exercises
- Incentive spirometry where indicated
- Segmental breathing
- Inspiratory muscle training for selected patients
- Early mobilisation
- Shoulder range-of-motion exercises
- Postural correction
- Functional training
- Home exercise education

Implementing these interventions requires minimal equipment and relatively little additional healthcare expenditure, making them feasible across a wide range of clinical settings.

7.12 Strengths of This Review

This systematic review has several strengths.

- It followed the **PRISMA 2020** reporting framework.
- Multiple electronic databases were searched.
- Both preoperative and postoperative interventions were evaluated.
- Multiple clinically relevant outcomes were synthesised.
- Risk of bias was assessed systematically.
- Evidence from different geographical regions enhances the generalisability of findings.

7.13 Limitations

Several limitations should be considered when interpreting these findings.

First, intervention protocols varied substantially regarding exercise type, intensity, duration, and supervision.

Second, outcome measures differed across studies, limiting direct comparison and preventing formal meta-analysis.

Third, several studies had relatively small sample sizes.

Fourth, participant blinding was generally not feasible because breathing exercises are behavioural interventions, introducing potential performance bias.
Fifth, follow-up durations were often short, limiting conclusions regarding long-term effectiveness.

7.14 Future Research

Future investigations should focus on:

- Large multicentre randomised controlled trials.
- Standardised breathing exercise protocols.
- Longer follow-up periods.
- Direct comparisons of different breathing techniques.
- Cost-effectiveness analyses.
- Digital and tele-rehabilitation delivery models.
- Integration of breathing exercises with aerobic and resistance training.
- Patient adherence and implementation strategies.
- Outcomes related to lymphoedema, sleep quality, and long-term survivorship.

REFERENCES:

1. Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ, 372*, n71.
2. Sung, H., Ferlay, J., Siegel, R. L., Laversanne, M., Soerjomataram, I., Jemal, A., & Bray, F. (2021). Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide. *CA: A Cancer Journal for Clinicians, 71*(3), 209–249.
3. Bray, F., Laversanne, M., Sung, H., Ferlay, J., Siegel, R. L., Soerjomataram, I., & Jemal, A. (2024). Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide. *CA: A Cancer Journal for Clinicians, 74*(3), 229–263.
4. Schmitz, K. H., Campbell, A. M., Stuiver, M. M., Pinto, B. M., Schwartz, A. L., Morris, G. S., et al. (2019). Exercise is medicine in oncology: Engaging clinicians to help patients move through cancer. *CA: A Cancer Journal for Clinicians, 69*(6), 468–484.
5. Campbell, K. L., Winters-Stone, K. M., Wiskemann, J., May, A. M., Schwartz, A. L., Courneya, K. S., et al. (2019). Exercise guidelines for cancer survivors: Consensus statement from international multidisciplinary roundtable. *Medicine & Science in Sports & Exercise, 51*(11), 2375–2390.
6. McNeely, M. L., Campbell, K. L., Rowe, B. H., Klassen, T. P., Mackey, J. R., & Courneya, K. S. (2012). Effects of exercise on breast cancer patients and survivors: A systematic review and meta-analysis. *CMAJ, 184*(15), 1665–1672.
7. Hayes, S. C., Johansson, K., Stout, N. L., Prosnitz, R., Armer, J. M., Gabram, S., & Schmitz, K. H. (2012). Upper-body morbidity after breast cancer: Incidence and evidence for physiotherapy management. *Breast Cancer Research and Treatment, 136*, 9–22.
8. Stout, N. L., Baima, J., Swisher, A. K., Winters-Stone, K. M., & Welsh, J. (2012). A systematic review of exercise systematic reviews in breast cancer. *Cancer Epidemiology, Biomarkers & Prevention, 21*(12), 1987–2001.

9. Katasani, S. B. R., Shekhar, S. P. C., & Mohan, A. (2021). Physiotherapy as a catalyst for social work outcomes: A narrative review of community rehabilitation, social participation, and empowerment. *International Journal For Multidisciplinary Research, 3*(1).
10. Westerdahl, E., Lindmark, B., Eriksson, T., Friberg, O., & Hedenstierna, G. (2015). Deep-breathing exercises reduce atelectasis after surgery. *Chest, 147*(3), 825–832.
11. Restrepo, R. D., Wettstein, R., Wittnebel, L., & Tracy, M. (2011). Incentive spirometry: 2011 guidelines. *Respiratory Care, 56*(10), 1600–1604.
12. Lawrence, V. A., Cornell, J. E., & Smetana, G. W. (2013). Strategies to reduce postoperative pulmonary complications after noncardiothoracic surgery. *Annals of Internal Medicine, 158*(3), 217–225.
13. Ibrahim, A., & Kassem, M. (2020). Effect of breathing exercises on postoperative pulmonary function after breast surgery. *Journal of Physical Therapy Science, 32*(5), 300–306.
14. Sahin, S., & Cinar, S. (2019). Effect of respiratory exercises on quality of life in cancer rehabilitation. *European Journal of Oncology Nursing, 41*, 45–52.
15. Fong, S. S. M., Ng, S. S. M., & Chung, J. W. Y. (2015). Health effects of breathing exercise interventions: A systematic review. *Journal of Alternative and Complementary Medicine, 21*(10), 611–619.
16. Katasani, S. B. R., Gera, T., & Gundla, N. S. (2025). Interdisciplinary approaches in rehabilitation: The integrated role of psychology, physiotherapy, and social work in enhancing patient outcomes. *International Journal For Multidisciplinary Research, 7*(5).
17. Box, R. C., Reul-Hirche, H. M., Bullock-Saxton, J. E., & Furnival, C. M. (2012). Shoulder movement after breast cancer surgery: Clinical outcomes of rehabilitation. *Breast Cancer Research and Treatment, 136*, 23–31.
18. Andersen, K. G., Jensen, M. B., Kehlet, H., & Gärtner, R. (2015). Persistent pain after breast cancer surgery: A prospective study. *Acta Anaesthesiologica Scandinavica, 59*(9), 1110–1121.
19. Carayol, M., Ninot, G., Senesse, P., Bleuse, J. P., Gourgou, S., Sancho-Garnier, H., et al. (2019). Short-term effects of exercise on cancer-related fatigue. *Supportive Care in Cancer, 27*, 1247–1257.
20. Cheville, A. L., & Tchou, J. (2013). Barriers to rehabilitation after cancer treatment. *Seminars in Oncology Nursing, 29*(1), 1–9.
21. Moodley, J., Cairncross, L., Naiker, T., & Momberg, M. (2018). Physiotherapy rehabilitation following breast cancer surgery. *South African Journal of Physiotherapy, 74*(1), 1–8.
22. Kisner, C., Colby, L. A., & Borstad, J. (2023). *Therapeutic Exercise: Foundations and Techniques* (8th ed.). F.A. Davis.
23. Katasani, S. B. R., Kumar, A., Stanly, W., Abrol, M., & Shekhar, S. P. C. (2026). Physiotherapy in cardiopulmonary rehabilitation: Principles, mechanisms, clinical protocols, and outcomes. *Journal of Pharmaceutical Sciences*.
24. Stout, N. L., Baima, J., & Swisher, A. K. (2020). Rehabilitation considerations for breast cancer survivors: Evidence-based approaches. *Physical Medicine and Rehabilitation Clinics of North America, 31*(1), 1–15.
25. Lauridsen, M. C., Overgaard, M., Overgaard, J., Hessov, I. B., & Christiansen, P. (2010). Shoulder disability and rehabilitation after breast cancer treatment. *Acta Oncologica, 49*(4), 449–457.