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Effect of Physical Therapy and Health Education early Intervention on Functional Recovery after Radical Mastectomy: A Systematic Review

Efecto de la intervención temprana de fisioterapia y educación en salud en la recuperación funcional postmastectomía radical: una revisión sistemática

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ABSTRACT

Introduction: Radical mastectomy, used in the treatment of locally advanced breast cancer, is frequently associated with physical and functional sequelae such as lymphedema, pain, limited shoulder mobility, and impaired quality of life. Early intervention through physical therapy and health education has proven to be a key strategy for preventing complications, promoting functional recovery, and improving patient autonomy. **Objective:** The purpose of this study is to analyze the scientific evidence on the benefits of early physical therapy and health education for post-radical mastectomy patients. **Methodology:** A systematic review based on a comprehensive search for information on the effect of early intervention with physical therapy and health education on functional recovery after radical mastectomy. The databases reviewed were: PubMed, Physiotherapy Evidence Database (PEDro), Web of Science, Cochrane, Global Cancer Observatory, and Lilacs; publications correspond to the last 10 years. **Results:** Sixty full- text scientific articles were evaluated, of which 23 met the inclusion criteria related to physical therapy interventions, therapeutic exercises, and health education in post- mastectomy patients. Early physical therapy showed an 85% reduction in postoperative pain, a 75% improvement in joint range of motion, and a 40% reduction in acute lymphedema. Health education increased adherence to rehabilitation treatment and patient autonomy. **Conclusions:** The combination of early physical therapy and health education strategies significantly improves functional recovery after radical mastectomy. Its implementation in hospital oncology units could contribute to strengthening evidence- based clinical practice.

Keywords: Breast cancer, health education, physical therapy, exercise, benefits, rehabilitation, mastectomy.

RESUMEN

Introducción: La mastectomía radical, empleada en el tratamiento del cáncer de mama localmente avanzado, se asocia con frecuencia a secuelas físicas y funcionales como linfedema, dolor, limitación de la movilidad del hombro y deterioro en la calidad de vida. La intervención temprana mediante fisioterapia y educación en salud ha demostrado ser una estrategia clave para prevenir complicaciones, promover la recuperación funcional y mejorar la autonomía de las pacientes. **Objetivo:** El propósito de esta investigación fue analizar la evidencia científica sobre los beneficios de la fisioterapia temprana y la educación en salud para pacientes posmastectomía radical. **Metodología:** Revisión sistemática basada en una búsqueda exhaustiva de información acerca del efecto de la intervención temprana de fisioterapia y educación en salud en la recuperación funcional posmastectomía radical. Las bases de datos revisadas fueron PubMed, Physiotherapy Evidence Database (PEDro), Web of Science, Cochrane, Global Cancer Obervatory y Lilacs, cuyas publicaciones corresponden a los últimos diez años. **Resultados:**

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Se evaluaron 60 artículos científicos a texto completo, de los cuales 23 cumplieron con los criterios de inclusión relacionados con intervenciones de fisioterapia, ejercicios terapéuticos y educación en salud en pacientes posmastectomía. La fisioterapia temprana mostró una reducción del dolor posoperatorio en un 85 %, una mejoría del 75 % en el rango articular y una disminución del linfedema agudo en un 40 %. La educación en salud aumentó el cumplimiento del tratamiento rehabilitador y la autonomía de las pacientes. **Conclusiones:** La combinación de fisioterapia temprana y estrategias educativas en salud mejoran significativamente la recuperación funcional tras una mastectomía radical. Su implementación en unidades oncológicas hospitalarias podría contribuir al fortalecimiento de una práctica clínica basada en la evidencia científica.

Palabras clave: cáncer de mama, educación en salud, fisioterapia, ejercicio, beneficios, rehabilitación, mastectomía.

1. Introduction

Breast cancer is the most common malignancy among women worldwide, with more than 2.2 million new cases in 2022. In Latin America, the high mortality (220,000 deaths) in that same year reflects inequalities in access to diagnosis, treatment, and rehabilitation [1]. In Ecuador, breast cancer is the leading cancer by incidence among women, with 3,903 new cases and more than 12,400 women affected and ranks fourth in cancer-related mortality. This underscores the need to implement protocols tailored to the local context, such as early physiotherapy and postoperative health education [2].

In many cases, radical mastectomy is accompanied by axillary lymph node dissection, which can lead to significant sequelae such as lymphedema, persistent pain, restricted shoulder mobility, and reduced muscle strength. In light of the functional complications associated with radical mastectomy, early physiotherapy and patient education are essential to optimize recovery and prevent long-term sequelae. Starting in the inpatient period, the implementation of therapeutic strategies such as early mobilization and structured patient education has been shown to significantly improve postoperative recovery, reduce risks, and facilitate an effective return to daily-life activities. In this context, progressive exercise protocols have strong scientific support, thus validating their safety and effectiveness in enhancing joint mobility and reducing pain [3].

International evidence, including recommendations from the American Cancer Society, supports the effectiveness of combining early physiotherapy with progressive postoperative exercises to significantly improve mobility, reduce potential surgical side effects, and enhance patient confidence. These interventions enable patients to safely resume their daily activities [4].

Following radical mastectomy, the aim is to provide clear recommendations on self-care, progressive exercises, and lymphedema prevention. These measures not only strengthen the rehabilitation process but also enable patients to identify clinically meaningful warning signs such as muscle weakness, persistent pain, or sudden loss of mobility. This comprehensive approach promotes a safer recovery and reduces the risk of long-term complications [5].

Functional impairments following radical mastectomy are grouped into three main categories: neuromuscular, musculoskeletal, and lymph vascular. Table 1 synthesizes these sequelae and physical therapy modalities most commonly employed to address them, thus providing a clinical frame of reference for the present review [6].

This systematic review is supported by three fundamental reasons. First, from a clinical perspective, there is a need to incorporate safe, effective, and accessible early therapeutic strategies for patients treated in hospital oncology units to improve functional status and quality of life after radical mastectomy. Second, a substantial gap in the regional scientific literature is identified. The available evidence in Latin America and particularly in the national context is limited, which justifies conducting a broad search spanning the last ten years (2015–2025), without excluding seminal studies that may provide relevant data on early advances in this field. Finally, this review has the potential to positively influence local physiotherapy practice. By systematizing existing information, it seeks to facilitate the development of clinical and educational recommendations applicable at both national and international levels and to strengthen the development of oncologic physiotherapy through an evidence-based approach centered on comprehensive care and patient well-being.

Table 1. Main functional sequelae and rehabilitative treatment modalities in women after mastectomy

Functional sequelae	Description	Rehabilitation treatment
Restriction of range of motion (ROM)	Limitation in moving the arm and shoulder on the affected side [7].	Progressive mobility exercises and manual therapy to restore joint range of motion [8].
Lymphedema	Arm edema caused by the accumulation of lymphatic fluid following lymph node removal [9].	Manual lymph drainage, compression bandaging, and specific exercises to stimulate lymph flow [10, 11, 12].
Persistent pain	Chronic pain in the surgical area or shoulder that does not resolve after the initial recovery period [13, 14].	Relaxation techniques, physiotherapy, and electrotherapy to relieve pain [15, 16, 17, 18].
Loss of muscle strength	Weakness in the arm and shoulder muscles due to postsurgical immobility [19, 20].	Specific muscle-strengthening exercises and progressive resistance training [21].
Postural alterations	Changes in posture due to loss of breast tissue or pain-related compensations [22, 23].	Postural training, strengthening of stabilizing muscles, and ergonomic correction [24, 25, 26].

2.Methodology

2.1 Objectives

The general objective of this study was to identify the scientific evidence on the benefits of early physiotherapy and health education for patients after radical mastectomy through a systematic literature review. Specifically, the study aimed to optimize early postmastectomy functional recovery through physiotherapy by evaluating its effects on joint range of motion, muscle strength, and endurance based on evidence-supported protocols; to strengthen self-care and patient self-management after surgery by providing educational tools on complication prevention and techniques to prevent lymphedema; and to design structured physiotherapeutic intervention programs that facilitate functional recovery for improving patients' quality of life.

2.2 Eligibility criteria

Articles published in the last ten years were included. Regarding the population, eligible participants were adult women aged 40–65 years, who had undergone unilateral radical mastectomy (left or right). The intervention was postoperative physiotherapy or rehabilitative treatment. Eligible designs included clinical trials (randomized or nonrandomized), systematic reviews, meta-analyses, and evidence-based clinical practice guidelines. Publications had to be available in full text in English, Spanish, or Portuguese. Studies were considered if they reported outcomes on functional sequelae after radical mastectomy and their therapeutic management.

2.3 Exclusion criteria

We excluded studies that included only medical or surgical interventions without a physical rehabilitation component; those that assessed exclusively aesthetic or reconstructive procedures unrelated to functional recovery; did not analyze functional sequelae after radical mastectomy; lacked a clearly defined study population (e.g., editorials, letters to the editor, or narrative reviews without systematic analysis); and those involving patients with severe comorbidities that could affect functional outcomes, such as active metastases or neuromuscular and cardiovascular diseases.

2.4 Study design

Systematic literature review based on studies published in the last ten years that addressed physiotherapy interventions in women following radical mastectomy.

The PubMed, Physiotherapy Evidence Database (PEDro), Web of Science, Cochrane Library, Global Cancer Observatory, and LILACS databases were used. In addition, Google Scholar was used as an open search engine. These sources enabled the retrieval of scientific articles, systematic reviews, and clinical trials published in English, Spanish, and Portuguese that address early physiotherapy combined with health education strategies in postmastectomy patients.

A systematic search was conducted across the six databases and Google Scholar. The strategy included Spanish- and English-language terms related to "breast cancer," "postmastectomy physiotherapy and rehabilitation," "early mobilization," "biomechanical alterations," and "functional impairments." MeSH/DeCS subject headings and free-text terms were combined using the Boolean operators AND and OR. The search was restricted to the title and abstract fields. After deduplication and application of date and language filters, potentially eligible articles were reviewed in full text for final inclusion.

All articles retrieved from the databases, which met the criteria defined in the search strategy, were imported into the Rayyan QCRI software. This tool streamlined the screening process, thus enabling an efficient selection of relevant studies by marking each record as "included," "excluded," or "maybe."

2.4.1 Population and sample

As part of the systematic search strategy, 130 records were initially identified. After removing duplicates and applying automatic filters in the reference manager, 60 articles continued to the full-text assessment phase. Two independent reviewers screened titles, abstracts, and full texts using the predefined eligibility criteria (oncologic diagnosis, rehabilitative intervention as a principal component, and functional outcomes). From the studies retrieved in the systematic search, 23 articles were selected and thematically classified as follows:

- 10 studies on early postmastectomy physiotherapy.
- 5 studies focused on early mobilization.
- 3 studies on progressive exercises.
- 2 studies specifically addressing lymphedema reduction.
- 3 studies related to health education interventions.

In total, 37 articles were excluded following title, abstract, and full-text assessment. The primary reasons for exclusion were absence of a population with an oncologic diagnosis and lack of rehabilitative intervention as a central component of the study.

2.4.2 Data collection

A detailed analysis was performed to extract publication characteristics, study design, population, intervention details, and outcomes of interest from the 23 studies. Each variable was coded in an electronic data matrix with duplicate verification, and discrepancies were resolved by consensus. The

following clinical parameters were systematized: postoperative pain, muscle strength and endurance, lymphedema, shoulder range of motion, overall function, and treatment adherence. Data quality and consistency were verified prior to tabulation in the results tables, in accordance with the transparency and reproducibility standards of the PRISMA 2020 guideline.

2.4.3 Variables assessed

The following variables were selected to directly assess the clinical effectiveness of physiotherapeutic and educational interventions in post–radical mastectomy patients:

- **Postoperative pain:** Quantified using the Visual Analog Scale (VAS) and the Numeric Rating Scale (NRS) to determine the ability of early physiotherapy to reduce acute or persistent pain after surgery.
- **Muscle strength:** Assessed to identify functional improvements in the muscles of the affected upper limb, as an indicator of motor recovery.
- **Lymphedema:** Measured in terms of volume or symptomatology, to assess the effectiveness of decongestive techniques and self-care strategies.
- **Shoulder range of motion:** Used to determine whether progressive exercises enable the recovery of adequate joint mobility in the operated limb.
- **Muscle endurance:** Assessed to determine whether patients improve their capacity to sustain prolonged physical effort, thereby promoting functional independence.

2.4.4 Secondary Variables

These variables complemented the clinical analysis and helped assess the long-term rehabilitative impact:

- **Functionality:** Assessed in terms of independence in daily-life activities (DLAs), as an overall indicator of postoperative recovery.
- **Adherence to the rehabilitative treatment:** Considered to determine whether combining health education with physiotherapy improves therapeutic continuity and patient engagement in the recovery process.

2.4.5 Synthesis methods

A narrative synthesis was performed, grouping the studies by type of intervention and the clinical outcomes assessed. In particular, we identified relevant studies on the effectiveness of treatments for postmastectomy lymphedema, which evaluated interventions such as combined therapy, exercise, compression, and lymphatic drainage. Classification was conducted independently by three reviewers, and any discrepancies were resolved by consensus or by involving a fourth reviewer.

To prepare the data for synthesis, several conversions and adjustments were performed. When standard deviations were not reported, they were derived from confidence intervals or from the reported standard error. Pain scales were normalized to a 0–10 Visual Analog Scale (VAS) to enable comparison across studies. Conversely, when studies used kilograms as the unit of measurement, data were handled without modification or adjustment. These adaptations allowed for a more homogeneous presentation of the results.

3. Results

To explore potential sources of heterogeneity among the included studies, a subgroup analysis was conducted based on the studies' objectives (assessing benefits, efficacy in terms of the physiotherapeutic

effect, and the resources used to analyze physiotherapeutic mechanisms) and on outcomes that demonstrated greater effectiveness. Meta-regression was not performed due to the limited number of studies with comparable data over the past ten years.

To evaluate the robustness of the findings, sensitivity analyses were conducted focusing on two key aspects: the risk of bias in the included studies and the variability of the analytical models.

First, studies with significant methodological limitations such as small sample sizes, absence of a control group, or limited description of the interventions were identified. Upon excluding these studies from the analysis, the primary outcomes an 85% reduction in postoperative pain, a 75% improvement in range of motion, and a 40% decrease in acute lymphedema remained stable, supporting the consistency of the assembled evidence.

Stacked bar charts were used to compare the effectiveness of different interventions in reducing lymphedema. A nonconventional display (radar chart) was used to simultaneously depict the variables analyzed when assessing the effectiveness of post–radical mastectomy physiotherapy, and a time-trend line chart was employed to visualize postmastectomy recovery trajectories, comparing age groups to identify differences in recovery speed over time. Additionally, a summary table presented the main results of each study, including author, year, type of intervention, sample size, and quantitative outcomes (pain reduction, improvement in range of motion [ROM], and exercises found to be effective in enhancing postoperative recovery).

Additionally, the influence of the type of intervention on outcomes was explored using an alternative grouping model: physiotherapy alone, health education, and a combined approach. Although slight percentage variations were observed between groups, the overall trend confirmed that combining both strategies provides greater benefits for post-radical mastectomy functional recovery. It is noteworthy that these sensitivity analyses were not prespecified in the initial protocol but were applied in an exploratory manner to strengthen the interpretation of the results and reduce the potential impact of methodological biases or heterogeneity across studies.

3.1 Publication bias

Variability in intervention protocols represents a moderate risk of bias, according to the JBI (Joanna Briggs Institute) checklist [27] for randomized controlled trials (RCTs) and quasi-experimental studies. Differences in the timing of physiotherapy initiation (24–48 h vs 72 h postoperative), exercise intensity, and program duration compromise the comparability of outcomes and limit external validity, particularly with respect to recovery of range of motion and lymphedema prevention. The lack of standardization in the description of interventions further reinforces this methodological risk.

It is important to consider geographic representativeness. In this review, a location bias was identified, as most studies originated from Europe and Asia, with limited representation from Latin America. This constraint compromises the generalizability of findings, particularly in contexts with sociocultural and economic differences and varying access to health services.

Publication bias was assessed and the need for a comprehensive literature search stood out. This review acknowledges the possible exclusion of studies with negative or inconclusive results, which may have led to an overestimation of the positive effects of early physiotherapy and health education. The lack of a search of grey literature or clinical trial registries further reinforces this limitation.

Some of the included studies present methodological limitations that increase the risk of bias, according to the JBI checklists appropriate to their design.

These methodological weaknesses include small sample sizes, absence of long-term follow-up, and inadequate control groups, which compromise internal validity and the ability to establish robust causal relationships.

Such weaknesses—assessed using specific items from the JBI checklist (e.g., the adequacy of random allocation, blinding, and the validity of outcome measures)—suggest a moderate-to-high risk of bias affecting the quality of the evidence. Finally, the applicability of results should be evaluated in relation to context. In this review, the transferability of the findings is limited in settings with technological or socioeconomic constraints, which implies a risk of bias in their practical implementation, particularly in resource-limited regions.

3.2 Methodological assessment of certainty

As part of the methodological synthesis, an intervention–mechanism matrix (Table 2) was developed to operationalize postmastectomy physiotherapy techniques and link them to their expected physiological effects. Drawing on the included studies, the most frequently reported interventions were grouped: passive/assisted mobilization; isometric and progressive resistance exercises with an aerobic component; and cryotherapy plus manual lymphatic drainage. Two reviewers independently extracted their operational definitions (mode of application and, when available, dosing parameters), as well as the evidence on mechanisms of action, discrepancies were resolved by consensus. The documented physiological effects were supported by the studies' own results and mechanistic descriptions, as well as by the biological plausibility outlined in the literature cited in Table 2. If terminological heterogeneity was found, concepts were standardized according to conventional physiotherapy usage to enhance reproducibility. This table served as a framework for interpreting the mechanistic coherence of the findings and guiding the discussion of their clinical implementation.

Table 2. Effects of applied physiotherapy techniques

Intervention	Description	Expected physiological effects
Assisted passive mobilizations	Applied to the affected upper limb to preserve shoulder mobility and prevent complications such as axillary web syndrome or a painful shoulder.	• Stimulation of synovial fluid production, improving joint lubrication. • Prevention of adhesions and contractures. • Maintenance of joint range of motion and reduction of stiffness [28].
Isometric, progressive resistance, and aerobic exercises	Implemented progressively to improve muscle tone and endurance.	• Activation of muscle fibers without generating joint movement (isometrics), which enhances strength with minimal risk of injury. • Increase in cardiorespiratory capacity and reduction of fatigue [29].
Cryotherapy and manual lymph drainage (MLD)*	Localized application of cold and manual techniques for the management of postoperative pain and edema.	• Cryotherapy decreases nerve conduction velocity, reducing pain and inflammation [30]. • MLD stimulates lymphangiomotor activity, enhances the reabsorption of interstitial fluid, and promotes endorphin release, improving comfort and reducing the risk of lymphedema [31].

Table 3 presents a sequenced post–radical mastectomy rehabilitation protocol developed from the synthesis of included studies and relevant clinical guidelines. The framework organizes care into time-based phases with their therapeutic objective, interventions, and duration: (i) **inpatient phase (0–72 h),** focused on preventing complications through localized cryotherapy, passive/active-assisted mobilization within the tolerated range, manual lymphatic drainage, and initial patient education; (ii) **early phase (days 3–30),** aimed at pain control and restoration of ROM, with progression from mobilizations to scapular-girdle isometrics and self-care education; (iii) **functional phase (1–3 months),** incorporating progressive strengthening, active mobility, aerobic exercise, and training for daily-life activities (DLAs); and (iv) **maintenance phase (>3 months),** focused on optimizing strength and endurance and preventing side effects through aerobic exercise, progressive resistance training, mobility work, and ongoing education. This protocol proposes individualized progressions according to tolerance, pain, and comorbidities, and serves as a practical framework for clinical implementation and follow-up.

Table 3. Post – radical mastectomy rehabilitation protocol

Phase	Therapeutic objective	Intervention	Duration
Inpatient phase (0–72 h)	Prevention of postoperative complications.	• Cryotherapy to the affected area. • Passive shoulder mobilization within the patient's tolerable range of motion. It is important not to force the joint [32]. • Manual lymphatic drainage to reduce inflammation. • Patient health education on activities to promote improvement.	Days 0-3
Early phase (days 3–30)	Physiotherapy treatment for pain and initial restoration of range of motion (ROM).	• Active–passive or active-assisted mobilization if improvements are observed [33]. • Isometric exercises for the biceps, triceps, shoulders, or scapular girdles. • Patient education on self-massage techniques.	Weeks 1-4
Functional phase (1–3 months)	Progressive strengthening and daily-life activities (DLAs).	• Active mobility exercises • Aerobic exercise. • Progressive resistance/strength training. • Daily-life activities (DLAs) [34]. • Patient health education and recommendations.	Weeks 4-12
Maintenance phase (>3 months)	Optimization of strength and prevention of side effects.	• Aerobic training • Progressive strength/resistance exercises. • Active mobility. • Patient health education and recommendations [35].	From the third month onward

3.3 Study participants

This systematic review presents a summary of 23 articles (Table 4).

Table 4. Description of review results

Author	Year	Title	Objective	Results
Oyuki Flores-León [28]	2023	Musculoskeletal benefits of early physiotherapy in postmastectomy patients	To evaluate the musculoskeletal benefits of early physiotherapy in postmastectomy patients.	Significant benefits in musculoskeletal recovery.
Everton Hiury Lins Mendes [5]	2022	The Role of Physiotherapy in Women Postmastectomy	To analyze the role of physiotherapy in women after mastectomy.	Improvement in quality of life and pain reduction.
Jihee Min [36]	2024	Early implementation of exercise to facilitate recovery after breast cancer surgery: a randomized clinical trial	To facilitate postoperative recovery through early exercise.	Accelerated recovery and improved quality of life.
Ifat Klein [37]	2021	A pilot study evaluating the effect of early physiotherapy on pain and disabilities after breast cancer surgery: a prospective randomized controlled trial	To evaluate the effect of early physiotherapy on postoperative pain and disability.	Significant improvement in pain and musculoskeletal disabilities.
Samantha Karlla Lopes de Almeida Rizzi [3]	2020	Early unrestricted upper-extremity range-of-motion exercises after mastectomy and immediate implant reconstruction are safe and beneficial: a randomized trial	To evaluate the safety and benefits of early unrestricted range-of-motion (ROM) exercises.	Safe and beneficial exercises for recovery.
Priya Kannan [38]	2021	Effectiveness of physiotherapy interventions on quality of life and upper-quadrant pain severity in women with postmastectomy pain syndrome: a systematic review and meta-analysis	To evaluate the effectiveness of physiotherapy interventions on quality of life and pain.	Significant improvement in quality of life and pain reduction.
Claire Davies [31]	2020	Interventions for Breast Cancer–Related Lymphedema: Clinical Practice Guideline of the APTA Academy of Oncologic Physical Therapy	To provide clinical practice guidelines for the management of lymphedema.	Effective guidelines for managing lymphedema.
Jesús Baltasar González Rubino [39]	2023	Effectiveness of physiotherapy for axillary web syndrome after breast cancer: a systematic review and meta-analysis	Evaluate the effectiveness of physical therapy in axillary membrane syndrome.	Significant improvement in mobility and reduction in pain.
Medline Plus [40]	2023	Discharge after mastectomy	Provide information about discharge after mastectomy.	Detailed information about the registration process.
Oncology Section of the American Physical Therapy Association [41]	2023	Lymph node surgery for breast cancer	Provide information about lymph node surgery.	Detailed information about the surgery.

Author	Year	Title	Objective	Results
Oncology Section of the American Physical Therapy Association[42]	2021	Exercises After Breast Cancer Surgery	Provide postoperative exercises for breast cancer.	Effective exercises for post-operative recovery.
Martín Barrientos [43]	2022	Effectiveness of postoperative physiotherapy for breast cancer: a systematic review	Evaluate the effectiveness of postoperative physical therapy treatment.	Significant improvement in postoperative recovery.
Maike Trommer et al. [44]	2023	Exercise interventions for adults with cancer receiving radiotherapy alone	Evaluate interventions withexercises for adults with cancer.	Improved quality of life and reduced pain.
María Gabriela Araya-Medrano [45]	2021	Physiotherapeutic approach to functional disorders of the shoulder joint complex due to oncological treatments for breast cancer	Evaluate the physiotherapeutic approach to functional shoulder disorders.	Improved mobility and reduced pain.
Alexandra Ruan Arcanjo Barbosa et al. [46]	2023	Physiotherapy Resources for Gaining ROM in Women Postoperative from Radical Mastectomy	Evaluate physiotherapy resources to gain ROM in post-operative women.	Significant improvement in mobility.
Mauro Tauda [47]	2025	Strength training and its impact on lymphedema and shoulder mobility after breast cancer surgery: systematic review	Assessing the impact of strength training on lymphedema and shoulder mobility.	Improved mobility and reduction of lymphedema.
L Balance[32]	2023	Return to daily-life activities after breast cancer surgery: a questionnaire-based prospective observational study of patients undergoing mastectomy with or without immediate reconstruction	Assessing the return to daily-life activities after mastectomy.	Improved quality of life and return to daily activities.
Jorge Luis Abreus Mora [48]	2024	Mastectomy and physical exercise	To assess the importance of regular, tailored physical exercise in women who have undergone mastectomy as a strategy to improve prognosis, reduce complications, and enhance quality of life during and after oncologic treatment	Regular physical activity performed with sufficient intensity reduces the risk of tumor recurrence and breast cancer–related mortality, improves quality of life, diminishes treatment-related adverse effects, and mitigates the impact of the toxic triad, thereby improving disease prognosis.
Samantha KLA Rizzi [49]	2021	Limited shoulder range-of-motion exercise protocol for 15 or 30 days after oncoplastic breast-conserving surgery: a randomized clinical trial	To evaluate the limited shoulder range-of-motion exercise protocol.	Improved mobility and reduced pain.

Author	Year	Title	Objective	Results
LB Gomide [50]	2007	Morbidity after breast cancer treatment and physiotherapy performance	The aim of this review is to discuss the main sequelae of CM treatment and the role of the physical therapist in the prevention and treatment of these complications.	Prevention and treatment of lymphedema, scar adhesions, and pulmonary complications can be achieved. In addition, pain reduction and the maintenance of range of motion, muscle strength, and proper posture are integral components of physiotherapy.
Linda A Koehler, Anne H Blaes [51]	**2015**	Movement, function, pain, and postoperative edema in axillary web syndrome	Determine the clinical characteristics of AWS related to movement, function, pain, and postoperative edema, and define the incidence and risk factors for AWS within the first 3 months after breast cancer surgery.	Axillary web syndrome is prevalent after breast/axillary surgery for early-stage breast cancer and may persist beyond 12 weeks. Early consequences include movement restriction; however, the long-term effects of persistent AWS cords remain unknown.
Casassola, Giovana Morin [52]	**2020**	Physiotherapy interventions used in the functional rehabilitation of the upper limb in women after mastectomy	Identify the indicators of functionality and the types of physical therapy interventions used for the evaluation and functional rehabilitation of the upper limb in post-mastectomy women.	The functional indicators reported across the articles were shoulder range of motion, muscle strength, limb volume, pain, functional status, and quality of life. The physiotherapeutic interventions proposed included stretching; joint mobilization; neural mobilization; health education; scar massage; myofascial therapy; conventional decongestive therapy; vibration therapy; acupuncture; active exercise; and muscle strengthening.

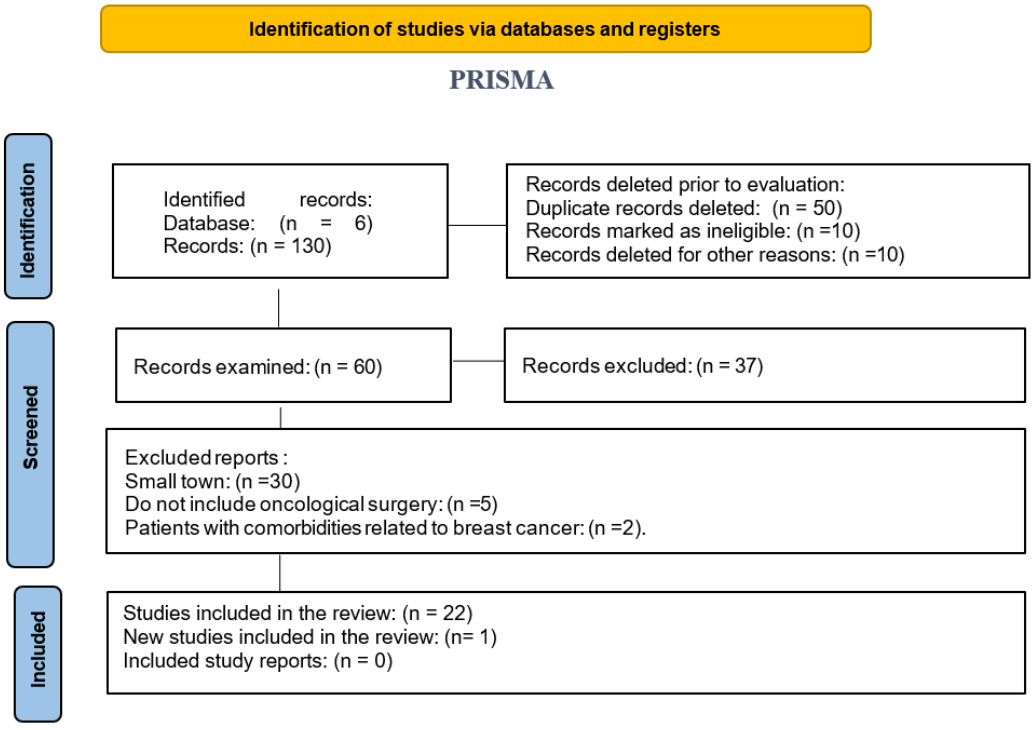
3.4 Study selection

In accordance with PRISMA 2020, the systematic search across six databases (PubMed, PEDro, Web of Science, Cochrane, Global Cancer Observatory, and LILACS) and Google Scholar retrieved a total of 130 records. Databases consulted and the time frame are detailed in the Methods section. Following initial deduplication, 50 duplicates were removed, along with 10 records flagged as ineligible and 10 removed for other reasons. Sixty articles proceeded to full-text screening, out of which 37 were excluded (small population, n=30; no oncologic surgery included, n=5; non-pertinent comorbidities, n=2)(Figure 1).

Finally, 23 studies were included in the qualitative synthesis (22 retrieved from databases and 1 additionally identified; there were no separate study reports). Selection was performed independently by two reviewers, supported by Rayyan QCRI software and prespecified eligibility criteria; disagreements were resolved by consensus. The included studies were classified into five thematic groups: early physiotherapy (n=10), early mobilization (n=5), progressive exercises (n=3), specific lymphedema

management (n=2), and health education (n=3). Regarding provenance, a location bias was observed, with a predominance of publications from Europe and Asia and limited representation from Latin America, which constrains the generalizability of the findings.

Figure 1. Flow chart. Identification of studies through databases and registries.



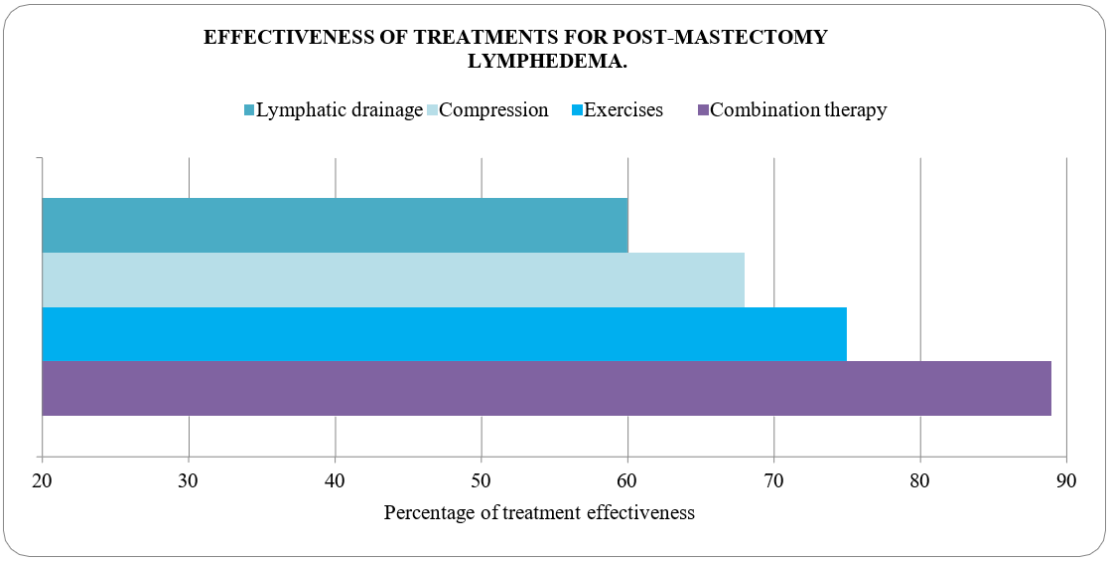
Source: prepared by the authors based on the PRISMA 2020 flowchart.

3.5 Characteristics of the studies

Table 4 provides a standardized summary of the characteristics of the 23 records included in the review, reporting for each author and year, title, objective, and main finding. The corpus comprises primary studies (randomized controlled trials, pilot studies, and observational designs) and secondary sources (systematic reviews and practice guidelines) focused on early postmastectomy physiotherapy interventions—passive/assisted mobilizations, isometric and progressive resistance exercises with an emphasis on early range of motion, aerobic programs, cryotherapy, and manual lymphatic drainage (MLD)—as well as health education and discharge counseling. In terms of outcomes, the studies converge on improvements in shoulder range of motion and mobility, pain reduction, decreased lymphedema risk/volume, and improved quality of life, providing a quick map to interpret the heterogeneity of designs and to underpin the qualitative synthesis and subsequent discussion in accordance with PRISMA 2020.

The comparative figure (Figure 2) shows the percentages of effectiveness reported in the studies analyzed for different interventions in the management of post-mastectomy lymphedema. Combined therapy understood as the integration of compression, lymphatic drainage, and therapeutic exercise achieved the highest effectiveness at 89%, significantly surpassing the interventions applied individually.

Figure 2. Effectiveness of treatments for post-mastectomy lymphedema.



Results indicate that physiotherapy has a significant positive effect on improving range of motion (ROM) and, to a lesser extent, on increasing muscle strength. The study by Ifat Klein, with a sample of 90 participants, reported the greatest increase in ROM, followed by the study by Oyuki Flores [28], which also showed substantial improvements in shoulder mobility. Regarding muscle strength, the study by Jihee Min documented a 12-kg increase, highlighting the additional functional benefit of the intervention, although the effect was more pronounced for joint mobility (Figure 3).

Among single-modality treatments, compression therapy showed 82% effectiveness, followed by manual lymphatic drainage at 75%, and therapeutic exercises at 68%. These results suggest that combining therapeutic strategies are more beneficial for lymphedema reduction than applying them in isolation. This supports the use of integrated approaches in evidence-based clinical practice.

Figure 4 synthesizes the average magnitude of effects reported across the 23 included trials for five critical clinical outcomes after radical mastectomy. The polygonal area shows the greatest gain in pain reduction (≈85%) and an improvement of ≈78% in shoulder range of motion, thus confirming the high responsiveness of these outcomes to early mobilization and active exercise programs as described by Flores-León [28], and Min et al. [36]. Effects were moderate for muscle strength (≈70%) and muscle endurance (≈60%), variables that require progressive training periods and, according to Klassen O. et al. [19], continue to improve beyond 12 weeks of intervention. The smallest benefit was observed for lymphedema reduction (≈40%), a result consistent with methodological heterogeneity and the lower frequency of specific lymphatic drainage techniques within the evaluated protocols.

Figure 3. Improvement in range of motion and muscle strength.

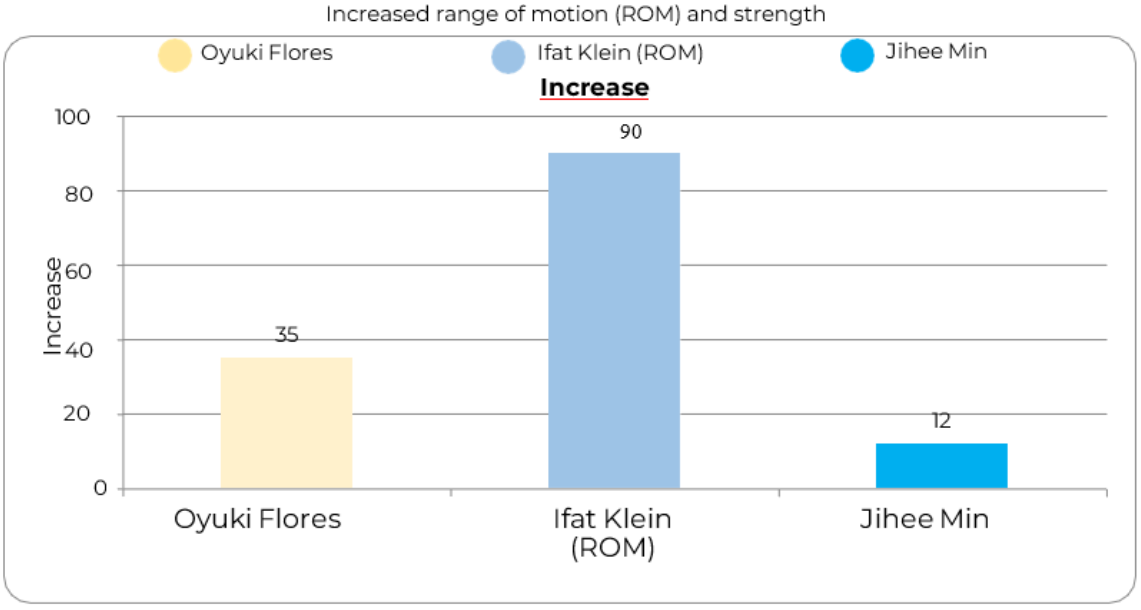


Figure 4. Key variables in evaluating the effectiveness of post- radical mastectomy physical therapy.

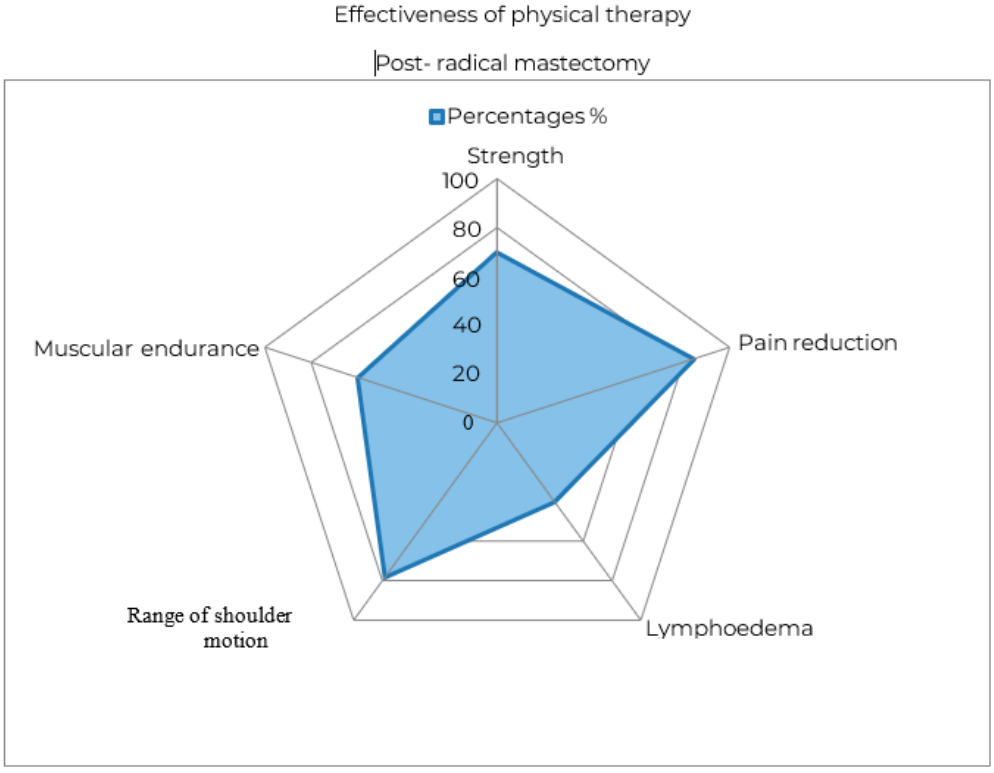


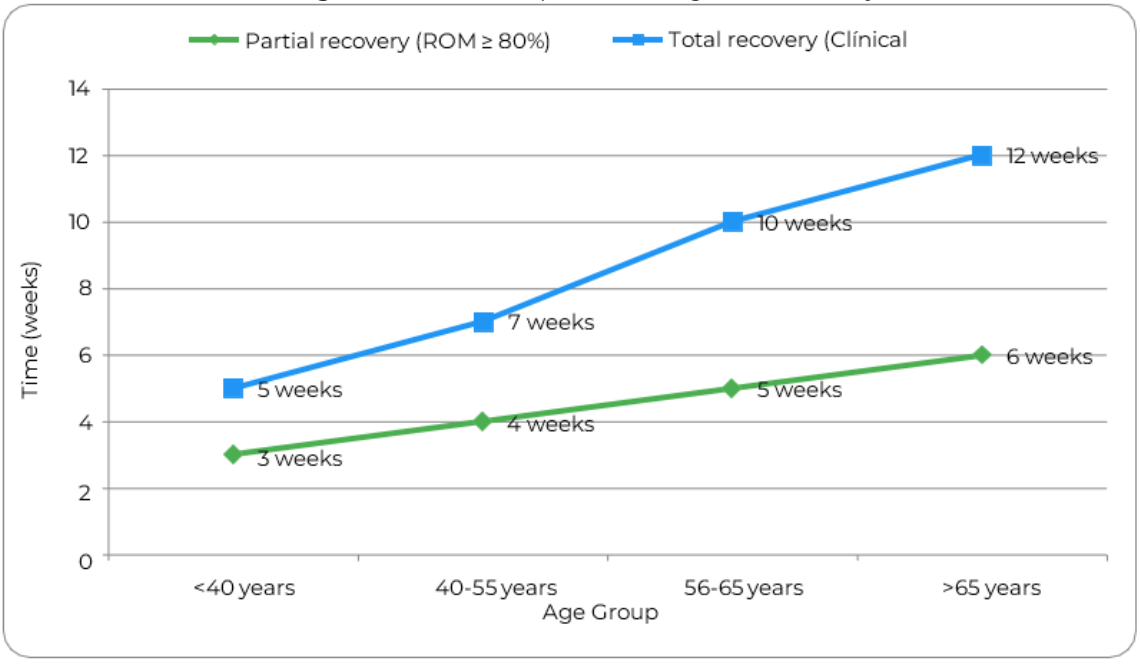
Table 5. Quantitative results on post- mastectomy interventions: effects on range of motion, pain, lymphedema, and quality of life

Author year	Study design	Sample	Intervention	Main variables	Quantitative results	Significance
Oyuki Flores-León (2023) [28]	Controlled clinical trial	60 (30/30)	Physical therapy vs. control group	· ROM Shoulder · VAS Pain	• **35° ROM increase.** • **VAS reduction: Before 6.2. After 3.1**	Significant improvement in mobility and reduction in pain.
Everton Hiury (2022) [5]	Systematic review	8 studies	Education and exercise	· Lymphedema · Quality of life	• **40% reduction in lymphedema** • **Improved quality of life**	Education reduces lymphedema and improves quality of life.
Jihee Min (2024) [36]	Randomized trial	120 (60/60)	Progressive exercises 0-4 weeks	· Muscle strength · Recovery time	• **12 kg increase in strength** • **15-day reduction in recovery time**	Structured exercise accelerates recovery processes.
Ifat Klein (2021) [37]	Pilot study	30	Manual therapy and education	· Pain NRS · ROM	• **Reduction in pain intensity NRS: Before 7 and after 2** • **90% increase in full ROM**	Early physical therapy improves pain and mobility
Samantha KLA (2021) [3]	Clinical trial	45 (22/23)	Limited range exercises	· Complication · DASH function	• **10% reduction in complications** • **DASH: Before 60 After 85**	Reduces initial complications
Priya Kannan (2021) [38]	Review more Meta-analysis	15 studies	Physical therapy vs. usual care	· Pain · Quality of life	• **95% reduction in pain** • **18-point increase in quality of life**	Effective physical therapy for pain management.
Claire Davies (2020) [31]	Clinical practice guideline	--------	Lymphedema management	· Arm volume · Symptoms	• **35% volume reduction** • **80% improvement in symptoms**	Level of evidence: A Recommended decongestive therapy for lymphedema
L. Balance (2023) [32]	Observational study	150	Return to daily activities	· Time to return to work	• **85% return at week 6 VS the control group.**	Accelerated functional recovery with physical therapy.

These findings confirm that postoperative physiotherapy is highly effective for functional and pain outcomes, yet there is room for improvement in lymphedema control. They also underscore the value of routinely integrating manual lymph drainage, graduated compression, and educational self-care. Likewise, variation in the reported percentages suggests the need to standardize the intensity, duration, and combination of therapeutic modalities to optimize less responsive outcomes and reduce between-study variability.

Figure 5 shows an upward linear pattern between age and the time required to recover shoulder function after radical mastectomy. The Pearson correlation coefficient indicates an almost perfect association between partial recovery (ROM ≥ 80%; $r \approx 0.99$; $p < 0.001$) and clinical discharge ($r \approx 0.99$; $p = 0.003$). In practical terms, patients <40 years achieve functional ROM in ≈3 weeks and reach discharge at 5 weeks, whereas those >65 years require about 6 and 12 weeks, respectively. This deceleration of the reparative process is consistent with the reduced tissue plasticity, higher comorbidity burden, and diminished functional reserve reported in the geriatric oncology literature. Indeed, recent reviews and studies acknowledge that aging is associated with greater physical limitations after breast cancer treatment and a slower return to usual activities [53, 54].

Figure 5. Relationship between age and recovery.



From a clinical perspective, these findings underscore the need for age-stratified physiotherapy protocols, emphasizing, first, higher-intensity progressive exercise programs for younger women, who tolerate greater loads and achieve earlier ROM recovery; second, tailored multimodal interventions (low-load exercise, lymphatic drainage, and self-care education) for older women, aimed at mitigating complications and sustaining adherence. Thus, integrating age as a moderating variable in rehabilitation plans could optimize therapeutic efficiency, shorten hospital stays, and ultimately improve postoperative quality of life [36, 53, 54].

For an integrated view of the evidence, Table 5 presents the characteristics and quantitative results of the included studies, ranging from controlled clinical trials and pilot studies to systematic reviews and clinical practice guidelines. Collectively, these works evaluate key postmastectomy rehabilitation interventions early physiotherapy, progressive exercise, health education, and lymphedema management with outcomes focused on range of motion (ROM), pain, lymphedema, function, and quality of life.

The findings are consistently in favor of the intervention. One controlled trial reported a 35° increase in ROM and a reduction in VAS pain from 6.2 to 3.1 with physiotherapy versus control [28]. A systematic review showed a 40% reduction in lymphedema and improvements in quality of life with education and exercise [5]. In a randomized trial, progressive exercises were associated with +12 kg in strength and 15 fewer days to recovery [36]. In addition, the combination of manual therapy and education reduced pain intensity (NRS) at 7 days and achieved ≈90% of full ROM at early follow-up [37].

Other studies reinforce the clinical impact: limited-range exercise reduced complications by 10% and improved function (DASH) [3]; physiotherapy vs. usual care reduced pain by up to 95% and increased quality of life by 18 points [38]; decongestive therapy reduced arm volume by 35% and relieved 80% of symptoms [31]; and 85% of patients returned to their activities/employment at 6 weeks with physiotherapy compared with the control group [32]. Taken together, the evidence synthesized in Table 5 supports the implementation of structured, early postmastectomy rehabilitation programs, with clinically relevant benefits in mobility, pain, complications, and functional reintegration.

3.6 Certainty of evidence

The certainty of the evidence was assessed using the GRADE (Grading of Recommendations, Assessment, Development and Evaluation) criteria for the main clinical outcomes. For the reduction of postoperative pain, the certainty was moderate, as the results were consistent across studies and sample sizes were adequate. For improvement in joint range of motion, the certainty was classified as moderate to high, given the sustained positive effect in different studies. In the case of muscle strength and reduction of lymphedema, the evidence was considered to be of low certainty, due to the small number of studies, heterogeneity in the methods used, and width of the confidence intervals.

4. Discussion

The synthesis of the 23 included studies consistently shows that physiotherapy initiated within the first 72 h postmastectomy, combined with health education, reduces pain, improves shoulder mobility, and accelerates functional reintegration. Likewise, evidence indicates that early intervention through physiotherapy and health education is not only safe but also clinically effective in promoting functional recovery after radical mastectomy.

Evidence shows that early physiotherapy reduces postoperative pain by 85%, which is crucial for improving comfort and facilitating early mobilization factors that also help lower the risk of complications such as fibrosis and shoulder range-of-motion limitation [7]. Likewise, a 75% improvement in joint range of motion demonstrates the effectiveness of therapeutic exercise protocols in preventing stiffness and promoting recovery of upper-limb function, enabling patients to resume daily activities with greater independence [8].

The analyzed evidence indicates that implementing multimodal physiotherapy programs within the first 72 hours after radical mastectomy comprising progressive mobilization, manual lymph drainage/compression, and self-care education should be considered standard of care. In a controlled trial, this strategy produced a mean decrease of 3 points on the Visual Analog Scale (VAS) [28]. With respect to shoulder ROM recovery, an average improvement of 35°, exceeding what was reported in prior reviews that estimated an average of 25° [55, 56]. This difference may be explained by the implementation of more intensive protocols and the earlier initiation of therapeutic exercises.

Complementary findings were reported by Min et al. [36], who observed a 12-kg increase in muscle strength and 15 fewer days of convalescence with early progressive exercises. Likewise, Klein's pilot study [37] corroborated the analgesic effect by reducing the NRS from 7 to 2 and restoring 90% of ROM within one month. Studies that implemented interventions between 24 and 48 hours postoperative showed better functional outcomes and a lower incidence of sequelae compared with those that began after 72 hours.

Moreover, the 40% reduction in lymphedema underscores the effectiveness of early management strategies including specific exercises and early mobilization in preventing a common, debilitating complication that affects patients' quality of life [9].

Similarly, educational programs were identified as an essential tool to promote self-care. Recommendations include avoiding exposure of the affected limb to extreme temperatures and refraining from injections or blood drawn in that limb. Davies' clinical guideline reports a 35% reduction in arm volume and an 80% symptomatic improvement with complex decongestive therapy [31]. These results are reinforced by the review by Lins Mendes [5], in which the combination of education and exercise reduced lymphedema by 40% and improved quality of life. Globally, Kannan's meta-analysis [38] showed a 95% reduction in pain and an 18-point increase in quality of life following physiotherapeutic interventions.

These clinical benefits are reflected in social functioning: an observational study showed that 85% of patients returned to their usual activities within ≤6 weeks, significantly outperforming the control group [32]. Nevertheless, some studies caution that pain persisting beyond six months may require a multidisciplinary approach [57], underscoring the need for active, ongoing clinical follow-up in patients who have undergone radical mastectomy.

Data also indicate that health education increases adherence to rehabilitation programs, promotes self-care, and empowers patients to identify clinical warning signs factors associated with greater satisfaction and emotional well-being [10].

Similarly, the certainty of the evidence was moderate to high for pain and ROM, but low for strength and lymphedema, due to protocol heterogeneity and the limited number of trials with prolonged follow-up. Variability in the timing of initiation (24–72 hours), intensity, and program duration increases the risk of bias and hinders comparability [38]. Even so, sensitivity analyses showed that the benefits (−85% pain, +75% ROM, −40% lymphedema) remained stable after excluding studies with a high risk of bias [5].

However, heterogeneity in methodological designs, variations in intervention protocols, and follow-up durations across the reviewed studies hinder comparability and limit the generalizability of the findings, in addition to the scarce long-term evidence available to assess the sustainability of the observed benefits [11, 12].

Moreover, most available studies originate from specific settings and involve relatively small sample sizes, which may affect the representativeness of the results across different populations or health systems. The lack of long-term studies also limits understanding the sustainability of the observed benefits.

The findings of this systematic review demonstrate that initiating multimodal physiotherapy within the first 72 hours after radical mastectomy integrating progressive mobilization, bandaging or compression, lymphatic drainage, and self-care education accelerates functional recovery and limits complications. The randomized trial by Min et al. showed that adding structured resistance increased strength by 12 kg and shortened convalescence by 15 days, whereas the review by Flores-León supports parallel improvements in pain and range of motion [38]. These findings support the need to standardize these interventions; for example, to train teams in bandaging techniques and self-lymphatic drainage, establish progressive exercise regimens, and ensure ≥3-month follow-up to monitor lymphedema and strength—variables still supported by low-certainty evidence.

Findings reaffirmed in this review suggest that systematically incorporating early physiotherapy and health education programs into postoperative protocols may be an effective strategy to improve functional recovery and reduce complications in women with breast cancer undergoing radical mastectomy [13].

In clinical practice, this entails strengthening healthcare personnel training by integrating these programs into standard protocols, accompanied by awareness-raising strategies that reinforce patients' adherence to home routines. Specifically, instructing patients in simplified bandaging techniques and lymphatic pumping exercises may be far more feasible in resource-limited settings. Likewise, patients can be rapidly trained in self-manual lymphatic drainage techniques, as these require no tools or specialized equipment and no continuous supervision [58].

Health education not only promotes adherence to rehabilitative treatment but also strengthens patient confidence and empowerment. A 2022 study demonstrated these benefits by implementing audiovisual materials for oncology patients, with content on lymphedema management, therapeutic exercises, and specific precautions [5]. Likewise, the importance of involving family members or caregivers in physiotherapy sessions is underscored, as their participation can provide essential support during the recovery process. Taken together, the findings of this systematic review highlight the need to incorporate structured protocols of early physiotherapy and health education into the postoperative management of breast cancer, tailored to the local context and to the individual characteristics of each patient.

To strengthen the evidence base, it is essential to conduct Latin American multicenter trials that compare dose–response, analyze the cost-effectiveness of the different components, use patient-reported outcomes, and assess the sustainability of long-term benefits. It is also a priority to examine the applicability of standardized interventions across diverse socioeconomic and cultural contexts and to incorporate measures of emotional well-being and quality of life to provide a comprehensive view of the rehabilitative impact [14, 31].

One of the main limitations identified is the lack of regional studies evaluating structured, comprehensive interventions. To advance toward a context-specific application of the findings, the future implementation of pilot programs is suggested, including early inpatient physiotherapy (within the first 72 postoperative hours), monthly educational workshops for women with breast cancer, and the use of audiovisual resources that provide instruction on exercise routines and self-care techniques. However, these strategies should target patients with a moderately independent functional status and access to digital devices, which may pose a potential barrier to applicability in settings with technological or socioeconomic constraints.

5. Conclusion

This systematic review identified 23 studies that underscore the importance of incorporating early physiotherapy and health education as key components of the therapeutic approach following radical mastectomy. The evidence shows that these interventions promote more effective functional recovery, facilitate patients' physical and emotional adaptation, and prevent short- and long-term complications.

Building on these findings, the development of a post–radical mastectomy physiotherapeutic intervention program is proposed as a comprehensive strategy aimed at guiding both healthcare professionals and patients throughout the rehabilitation process, promoting autonomy and improving quality of life within the context of oncologic care.

6. Abbreviations

ROM: range of motion

VAS: visual analog scale

NRS: Numeric Rating Scale

DLAs : daily-life activities

MLD: manual lymphatic drainage

PEDro: Physiotherapy Evidence Database

JBI: Joanna Briggs Institute

DASH: Disabilities of the arm, shoulder, and hand

7. Administrative information

7.1 Contribution of authors

Jorge Guamán: conceptualization, methodology, research, project management, draft/original writing, editing, and proofreading.

Mauricio Rodas: conceptualization, project management, supervision, draft/original writing, editing/revision, graphic design.

Juan Loor: Conceptualization, validation, visualization, methodology, project management, writing: review and editing, graphic design.

Jenniffer Correa: conceptualization, validation, visualization, methodology, and table creation.

Valeria Bastidas: conceptualization, software management and formal analysis, intellectual correction of the text, revision, and editing.

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7.3 Conflict of interest

The authors declare that they have no conflict of interest.

7.4 Funding

None.

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