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The Effect of Pilates on Shoulder Dysfunction and Quality of Life after Mastectomy in Breast Cancer Survivors: A Scoping Review

Sreeram,[1] MPT student, Yenepoya School of Allied sciences and Health Professions, Department of PhysiotherapyYenepoya (Deemed to be University)

Subhra Basu[2], Associate Professor, Yenepoya School of Allied and Healthcare Professions, Department of Physiotherapy, Yenepoya (Deemed to be University

Corresponding Author

Subhra Basu[2], Associate Professor ,Department of Physiotherapy ,Yenepoya School of Allied and Healthcare Professions, Yenepoya (Deemed to be University)

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KEYWORDS

breast cancer, mastectomy, Pilates, breast cancer surgery, breast removal surgery, breast carcinoma, breast tumor, malignant tumor of breast

ABSTRACT:

Background: Breast cancer is the most common cancer among women and a growing concern in India. Mastectomy, a common treatment, often leads to complications like pain, lymphedema, and reduced shoulder mobility. These issues affect daily functioning and quality of life. Traditional rehab focuses on physiotherapy, but Pilates a low-impact exercise method has shown promise in improving mobility, reducing symptoms, and supporting overall well-being in survivors.

Methods: A comprehensive literature review in accordance with PRISMA-ScR was conducted using databases such as PubMed, Google Scholar, Pedro, and ScienceDirect, focusing on full-text articles from 2019-2024. Six studies, based on inclusion and exclusion criteria, examined the role of the effect of Pilates on shoulder dysfunction and quality of life after mastectomy in breast cancer survivors.

Conclusion: Evidence supports the use of Pilates in post-mastectomy rehabilitation, showing improvements in shoulder mobility, strength, pain, lymphedema, and quality of life. Its adaptable, mind-body approach promotes both physical recovery and emotional well-being, making it a strong candidate for holistic cancer care.

1. Introduction

Breast cancer is the most prevalent malignancy diagnosed among women worldwide, posing a significant global health burden. In India, recent estimates from GLOBOCAN 2022 report approximately 1,92,020 new breast cancer cases and 98,337 related deaths, establishing it as the most frequently occurring cancer among Indian women. It accounts for 26.6% of all cancers in females and 13.6% of total cancers across genders [1]. Improved survival outcomes, attributed to advancements in screening and therapeutic interventions, especially in developing regions like India, have led to a growing cohort of breast cancer survivors [2]. However, many of these individuals experience persistent physical and psychological sequelae that necessitate structured post-treatment rehabilitation.

Mastectomy, a common surgical approach to breast cancer management, particularly in low-resource environments, involves complete or partial breast tissue removal. This procedure is often accompanied by axillary lymph node dissection (ALND) or sentinel lymph node biopsy (SLNB) for staging and treatment optimization [3]. Despite its clinical efficacy, mastectomy frequently results in complications such as chronic pain, limited shoulder mobility, lymphedema, and emotional issues like depression, anxiety, and body image concerns [4, 5].

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One of the most physically debilitating outcomes is breast cancer-related lymphedema (BCRL), which affects up to 40% of women undergoing both surgery and radiotherapy. This condition arises from lymphatic disruption, leading to localized swelling, tissue fibrosis, and fluid accumulation [6]. In contrast, patients undergoing only SLNB show a lower incidence of BCRL approximately 8% highlighting the impact of surgical extent on postoperative outcomes [7]. Additionally, ALND can result in significant shoulder dysfunction, affecting up to 70% of patients, with symptoms including weakness, limited range of motion, and altered sensation, thereby compromising daily functional abilities [8]. As a result, post-mastectomy rehabilitation plays a vital role in improving survivors' physical capabilities and overall well-being. While conventional rehabilitation emphasizes physical therapy and exercise to enhance shoulder function and general fitness, there is increasing interest in integrative approaches. Among these, Pilates has emerged as a low-impact, adaptable mind-body exercise method that focuses on core strength, postural alignment, controlled breathing, and neuromuscular coordination [9].

Pilates is particularly suited to the rehabilitative needs of breast cancer survivors, offering benefits such as improved musculoskeletal balance, proprioception, flexibility, and mental health. Clinical studies have demonstrated that Pilates-based interventions can significantly enhance shoulder mobility, alleviate pain and lymphedema-related symptoms, and improve mood, self-perception, and quality of life (QoL) among survivors [10–12]. Its adaptability and safety profile make it a viable long-term option for individuals at various stages of recovery.

Considering the increasing incidence of long-term morbidity among survivors and the limitations of conventional rehabilitation, there is a need to evaluate holistic and evidence-informed strategies. This scoping review aims to examine the effectiveness of Pilates in addressing shoulder dysfunction and quality of life among post-mastectomy breast cancer survivors. By synthesizing current evidence, the review seeks to establish Pilates as a structured and therapeutic option within survivorship care and guide future clinical practices.

2. Objectives

Primary Objective:

To evaluate the effect of a Pilates-based rehabilitation program on shoulder range of motion and quality of life among women who have undergone mastectomy for breast carcinoma.

Secondary Objectives:

To analyse the impact of Pilates exercises on post-mastectomy pain, functional recovery, and overall physical well-being in breast cancer survivors.

To identify the role of Pilates as a rehabilitation strategy in improving physical and psychosocial outcomes in this population.

3. Methods

The present study is a scoping review, and therefore, a specific study setting was not applicable. The sources of data included literature available on Google Scholar, PubMed, ResearchGate, ScienceDirect, and PEDro. Articles were included when they met the following inclusion criteria: a) randomized controlled trials (RCTs) and experimental studies, b) full-text articles published in English, c) Pilates were used as a post-mastectomy rehabilitation strategy, d) studies that reported at least one outcome measure such as pain, shoulder function, or quality of life (QOL), and e) studies with a PEDro score above 7. The exclusion criteria included research that were conducted on populations with any musculoskeletal disorders or neurological disorders.

Method of Data Collection:

After obtaining exemption from review approval letter from the Ethical Committee of Yenepoya Deemed to be University (YEC-1/2024/314), a comprehensive literature search was conducted using electronic databases in PubMed, Pedro, Google Scholar, and ScienceDirect. The search focused on full-text articles published in English between 2019 and 2024. Relevant keywords used in the search included “breast cancer”, “mastectomy”, “Pilates”, “breast cancer surgery”, “breast removal surgery”, “breast carcinoma”, “breast tumour”, “malignant tumour of breast”, “mammary cancer”, “mammary carcinoma”.

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4. Procedure

A total of 216 articles were retrieved, and 122 articles were removed for exercises other than Pilates. 94 articles were further screened, and 57 duplicates were removed from PubMed and Science Direct. 37 articles were sought for retrieval from which 14 articles were not meeting the inclusion criteria, 23 articles were then assessed for eligibility in those 17 articles were removed due to low quality articles, finally 6 articles were obtained for the final review

The findings from the 6 articles demonstrate that Pilates-based interventions significantly benefit women recovering from breast cancer post-mastectomy. Across the evidence, Pilates reduced pain, improved shoulder mobility, grip strength, and functional capacity, including activities of daily living and upper limb function.

Notably, Pilates also contributed to a reduction in the severity of lymphedema and social appearance anxiety, with marked improvements in both physical and psychological well-being, such as quality of life and self-perception. When compared to standard or combined exercise programs, Pilates showed comparable or superior outcomes, suggesting its viability as an effective, holistic rehabilitation strategy for post-mastectomy survivors.

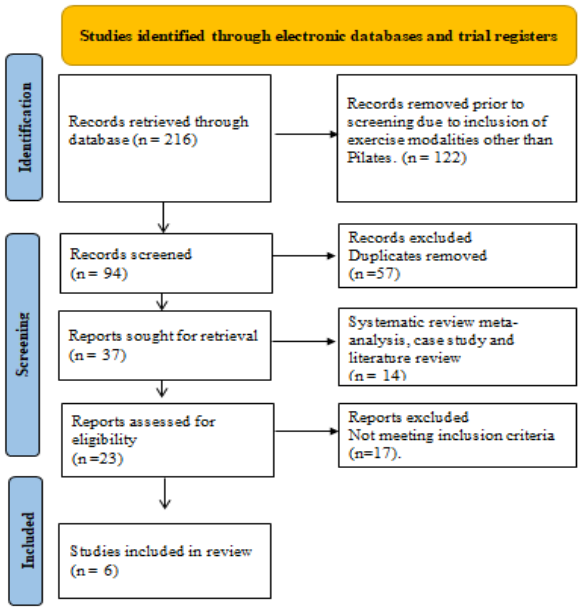

Fig: Prisma flowchart

5. Discussion

This scoping review aims to study the physiological effects of Pilates-based interventions on breast cancer survivors, who frequently face long-term consequences from treatment, including upper limb dysfunction, pain, and compromised QoL, particularly following mastectomy and adjuvant therapies. Razak et al. examined Pilates-based interventions and reported significant improvements in fatigue, depression, and overall functional capacity in cancer survivors [15]. Park et al. also noted that Pilates contributes to enhanced thoracic mobility and respiratory performance, benefiting patients recovering from cancer-related fatigue [16]. The physiological aftermath of breast cancer treatment often includes shoulder mobility limitation, muscular imbalance, joint stiffness, and pain due to fibrosis and nerve disruption. Studies found that Pilates alleviates musculoskeletal pain and supports psychological outcomes through postural corrections and controlled breathing [17]. Parveen et al. confirmed the multidimensional benefits of Pilates on strength, flexibility, and body awareness in women undergoing rehabilitation [18]. Lymphedema, another common complication, arises from lymphatic damage, leading to swelling and functional limitations in the upper extremity. Pilates training has demonstrated effectiveness in reducing fatigue and discomfort among women undergoing radiotherapy for breast cancer [19]. In comparative studies, Pilates performed on land or in water improved emotional well-being and physical performance after mastectomy [20]. Such impairments hinder daily activities, reinforcing the need for targeted rehabilitation strategies. Rezende et al. observed significant improvements in functional capacity and pain relief one-year post-surgery following Pilates interventions [21].

Pilates, by emphasising trunk control, spinal alignment, and diaphragmatic breathing, addresses both local and systemic impairments in breast cancer survivors. Mostafaei et al. highlighted that exercise, including Pilates, can substantially reduce chemotherapy-induced fatigue and depression [22]. Espíndula et al. supported these findings in their meta-analysis, demonstrating enhanced functional and psychological outcomes following structured Pilates programs [23].

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Participants often report notable improvements in pain perception and fatigue outcomes, potentially linked to reduced muscular tension and improved circulation. Rajarajeswaran and Vishnupriya emphasised the role of structured exercise like Pilates in promoting neuromuscular recovery and psychological resilience in cancer populations. Keays et al. observed that women with breast cancer showed improvements in shoulder mobility, mood, and pain relief after engaging in Pilates routines [27].

Repetitive muscular contractions act as a physiological pump, enhancing lymphatic clearance and potentially mitigating the progression of lymphedema. Bertoli et al. concluded that adherence to Pilates programs improved strength and flexibility parameters in women undergoing hormone therapy [30]. This mechanism has been reinforced through evidence showing reduced limb volume and discomfort in Pilates-trained survivors compared to non-exercising controls. Şener et al. conducted a randomised clinical trial and demonstrated that Pilates effectively reduced upper limb lymphedema symptoms. [32].

Psychological health also benefits significantly from Pilates-based regimens. Cantarero-Villanueva et al. found that structured Pilates sessions significantly improved fatigue levels, psychological functioning, and health-related quality of life in breast cancer survivors [33]. Harder et al. reported improved fatigue management, physical performance, and emotional well-being following a Pilates-centred physical activity intervention [34.]

Improvements in physical capacity and motor control contribute to increased confidence and positive self-perception. Morishita et al. emphasised that Pilates can be safely and effectively applied to breast cancer survivors to promote long-term physical activity adherence [35]. Bao et al. discussed Pilates as a form of complementary therapy contributing to better pain management and psychological balance in oncology care [36].

These outcomes align with the bio- psychosocial framework of survivorship, where body awareness and emotional well-being are deeply interconnected. Schmidt et al. noted that women even five years post-diagnosis, continue to experience psychosocial needs that Pilates may help address through body-centred mindfulness [37]. McNeely et al. conducted a systematic review highlighting the consistent benefits of exercise, including Pilates, on physical and emotional outcomes in breast cancer survivors [38].

Recent advancements also highlight Pilates' influence on respiratory efficiency and autonomic balance. Arabameri et al. demonstrated improved pulmonary function and capacity in inactive women following a Pilates training regimen [39]. These physiological gains may support aerobic capacity and reduce cardiopulmonary strain during daily tasks. Yeo emphasised the integrative potential of Pilates in survivorship care due to its ability to simultaneously address musculoskeletal and respiratory limitations [40].

Mechanistic studies suggest that the cognitive focus required in Pilates may stimulate neuro-plastic adaptations in sensorimotor pathways, improving coordination and fine motor control. Bidonde et al. reinforced this connection, suggesting that Pilates contributes to adaptive neuro-motor outcomes across clinical populations [41]. Additionally, the social environment fostered in group sessions offers peer support, enhancing motivation and reducing the isolation often experienced in survivorship. Beatty et al. concluded that group exercise environments, such as Pilates classes, significantly reduce psychological distress by fostering social connection and accountability [42].Overall, the findings underscore the value of Pilates as a safe, scalable, and comprehensive intervention for post-mastectomy rehabilitation.

The multidimensional impact ranging from musculoskeletal improvements and lymphatic facilitation to psychological resilience positions Pilates as a key component of survivorship care. However, the literature still demands longitudinal research with standardised protocols to establish optimal frequency, intensity, and modality adaptations for diverse survivor populations.

In conclusion, Pilates offers an effective, evidence-based approach to improving shoulder function, alleviating pain, managing lymphedema, and enhancing quality of life in breast cancer survivors. Its inclusion in survivorship care may support long-term functional and psychosocial recovery.

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6. Conclusion

This research showcases the significant physiological and psychosocial benefits of Pilates-based interventions for breast cancer survivors. The evidence suggests that Pilates effectively deals with post-treatment impairments such as reduced shoulder mobility, muscle weakness, pain, and lymphedema, common consequences of mastectomy, chemotherapy, and radiotherapy.

By promoting core stability, neuromuscular coordination, and improved lymphatic flow, Pilates emerges as a comprehensive rehabilitation strategy that enhances both physical function and quality of life.

In addition to physical benefits, Pilates has shown promise in enhancing psychological well-being by improving body image and decreasing social appearance-related anxiety, aligning well with the bio-psychosocial approach to cancer rehabilitation. Unlike conventional rehabilitation methods, Pilates provides a personalized and adaptable framework that can be effectively integrated into long-term recovery plans.

Given these multifaceted advantages, incorporating Pilates into post-mastectomy rehabilitation may offer significant value. Nonetheless, further high-quality research is necessary to develop standardized intervention protocols, identify ideal dosage and intensity, and better understand how individual patients may respond to this form of therapy.

7. Limitations:

Small sample size in many studies limits the relevance to a larger population. Most existing studies focus on immediate or short-term outcomes. Lack of a universal protocol in Pilates

8. Suggestions:

The future research should focus on developing a standardised Pilates protocol tailored to breast cancer survivors, including clear guidelines on session frequency, duration and intensity.

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