



IMPACT OF POST RADICAL MASTECTOMY ON FUNCTIONAL CAPACITY AND QUALITY OF LIFE IN BREAST CANCER PATIENTS - A NARRATIVE REVIEW

Tannu¹, Dimple Choudhry*², Rakesh Dhankhar³, Dhruva Chaudhry⁴, Bhawna Saini¹

¹MPT Scholar, College of Physiotherapy, PT BDS PGIMS Rohtak Haryana,

²Associate Professor, College of Physiotherapy, Pt BDS PGIMS Rohtak, Haryana,

³Professor, Department of Radiation Oncology, Pt BDS PGIMS Rohtak

⁴Professor, Department of PCCM, Pt BDS PGIMS Rohtak

Corresponding author

Dr Dimple Choudhry, Associate Professor,
College of Physiotherapy, Pt BDS PGIMS Rohtak

Abstract : This narrative review aims to summarize and evaluate the impact of post-radical mastectomy and the effectiveness of various interventions in improving pulmonary function, reducing pain, and enhancing the quality of life in post-mastectomy breast cancer survivors and patients undergoing similar oncological treatments. This narrative review is conducted on databases from PubMed, Google Scholar, Scopus, Web of Knowledge, Virtual Health Library, Research Gate, and Cochrane Library. A comprehensive review of 10 studies was conducted, encompassing randomized controlled trials and observational studies published between 2001 and 2024. These studies examined interventions such as respiratory exercises, pulmonary rehabilitation, preoperative and postoperative pain management techniques, and physical activity programs. Pulmonary complications, reduced chest wall movement, shoulder dysfunction, post-mastectomy pain syndrome, posture deviation, and reduced functional capacity are commonly observed outcomes in postoperative breast cancer patients. Early and comprehensive rehabilitation interventions are critical for optimizing pulmonary function, alleviating pain, and enhancing the overall recovery and quality of life in breast cancer survivor's post-mastectomy.

Key words: Radical Mastectomy, Breast Cancer, Pulmonary Function, Functional Capacity, Radiotherapy, Pain Management, Quality of Life, Thoracic Mobility, Aerobic Exercise, Radiation Induced Fibrosis.

INTRODUCTION

The most frequent cancer among women worldwide is breast cancer (BC). As the primary contributor to cancer incidence worldwide in 2020, accounting for 11.7% of all cancer cases, it has already surpassed lung cancer.¹ Diseases where aberrant cells divide uncontrollably and can spread to other tissues are referred to as cancer. Lobular carcinomas are cancers that originate from lobules, while ductal carcinomas are cancers that originate from ducts. Nearly 80,000 Indian women are afflicted with breast cancer annually, making it one of the most prevalent cancers in women. It is a potentially fatal illness that affects women all over the world. It

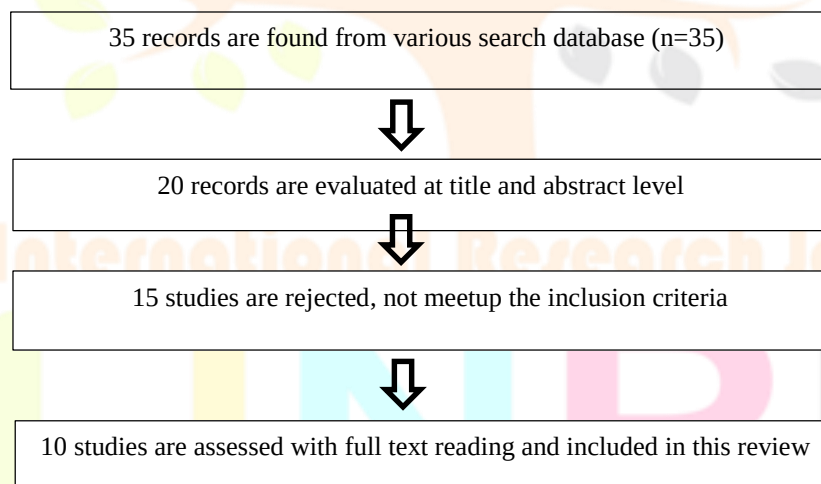
is the second most prevalent after cervical cancer in women. Breast cancer accounts for 16% of all female cancers and 22.9% of invasive malignancies in women. In India, an estimated 100,000 new cases of breast cancer are diagnosed each year. According to ICMR-PBCR data, breast cancer accounts for more than 30% of all female cancers in urban registries in Delhi, Mumbai, Ahmadabad, Kolkata, and Trivandrum, making it the most frequent cancer among women.²

Breast cancer is one of the most prevalent malignancies among women globally, with radical mastectomy (RM) remaining a primary treatment option for many patients. While this surgical intervention effectively removes cancerous tissue, it is associated with a range of postoperative complications that impact both physical and psychological health. Women who undergo RM often experience impaired pulmonary function, reduced functional capacity, decreased quality of life (QoL), restricted chest expansion, and heightened kinesiophobia. These complications can significantly hinder recovery and limit daily functioning, necessitating comprehensive evaluation and targeted rehabilitation strategies to improve postoperative outcomes.³ Pulmonary function is frequently compromised following RM due to surgical trauma, pain, and postural adaptations. Studies have shown that women post-mastectomy exhibit reduced lung volumes and capacities, including forced vital capacity (FVC) and forced expiratory volume in one second (FEV1), which may be attributed to chest wall restriction and respiratory muscle weakness.⁴ The six-minute walk test (6MWT) and cardiopulmonary exercise testing (CPET) are commonly used to evaluate functional capacity in this population, providing insight into physical limitations and guiding rehabilitation efforts. Improving functional capacity through structured exercise programs and physiotherapy can enhance overall recovery and promote long-term health. QoL is significantly impacted in women following RM, as the procedure not only affects physical functioning but also has profound psychological and social consequences. Many women experience body image concerns, chronic pain, fatigue, anxiety, and depression, all of which contribute to diminished well-being.⁵ The loss of a breast can lead to emotional distress, affecting self-esteem, intimate relationships, and overall mental health. Furthermore, limitations in physical activities and persistent pain can further reduce QOL. Addressing these issues through psychosocial support, rehabilitation, and counseling is essential to improving overall well-being in breast cancer survivors.⁶ The removal of breast tissue, along with potential lymph node dissection, can lead to thoracic stiffness and reduced mobility of the chest wall. Additionally, radiation therapy may contribute to fibrosis, further limiting chest wall compliance. Restricted chest expansion can lead to compensatory breathing patterns, increasing the risk of musculoskeletal complications such as postural imbalances and chronic pain. Measuring chest expansion through standardized techniques can help identify limitations early and guide physiotherapy interventions aimed at restoring respiratory mechanics and improving thoracic mobility. Kinesiophobia, or the fear of movement due to pain or the belief that movement may cause harm, is a common psychological barrier in post-mastectomy patients. Many women develop avoidance behaviors, restricting physical activity to prevent perceived injury, which can lead to muscle stiffness, deconditioning, and prolonged functional impairments. Kinesiophobia is associated with higher levels of disability and reduced participation in rehabilitation programs, ultimately affecting recovery outcomes.⁶ Reduced pulmonary function in post-mastectomy patients results from this biomechanical malfunction as well as adverse effects of adjuvant treatments like radiation-induced fibrosis.⁸

Furthermore, linked to negative effects on lung tissue has been radiation, usually used as a locoregional treatment after mastectomy. Well-documented effects aggravating respiratory deterioration include radiation pneumonitis, fibrosis, and chronic pulmonary limitation. Declines in forced vital capacity (FVC), forced expiratory volume in one second (FEV1), and diffusion capacity for carbon monoxide (DLCO) are routinely seen in individuals receiving post-mastectomy radiation. These alterations have major effects on patients' exercise tolerance and physical endurance, which typically results in lower daily activity levels and worse QoL. The importance of pulmonary function has been underlined even further during the COVID-19 epidemic. Patients recuperating from breast cancer surgery who developed COVID-19 had combined respiratory difficulties, which emphasize the importance of careful respiratory treatment and rehabilitation. Under these circumstances, virtual exercise regimens, tele-rehabilitation, and remote monitoring turned into useful instruments to preserve lung health and QoL.⁹ Ultimately, a significant but understudied area of clinical practice is the junction between pulmonary function and breast cancer survival. Dealing with the long-term functional consequences of therapy becomes very essential as survival rates keep raising.

Method

Studies are searched from the following search engine PubMed, Google Scholar, Scopus, Web of Knowledge, Virtual Health Library, Research Gate and Cochrane Library. Studies include that impact of pulmonary function on functional capacity after post radical mastectomy.



Authors, Journal Year	Objective	Design	Material and Methods	Outcomes Measures	Results
Murtezani A et al. 2014 ⁹	To determine the effect of moderate-intensity aerobic exercise on the quality of life (QoL) and physical functioning in breast cancer survivors.	Randomized controlled trial	62 breast cancer survivors were assigned to exercise (N = 30) or control (N = 32) groups. The exercise group trained three times per week for 10 weeks. Women in the control group were told to maintain their sedentary lifestyle for 10 weeks. Outcomes were assessed at baseline and postintervention.	The primary outcome was QoL (FACT-B scale which contains 5 subscales). Secondary outcomes included changes in QoL subscales, body composition, body weight, BMI, and 12-minute walk test performance.	The exercise group showed significant improvements in FACT-B (P<0.003), FACT-G (P<0.008), functional (P<0.010) and emotional (P<0.035) well-being subscales, and 12MWT (P<0.009)

					performance, with no significant changes in body weight or BMI.
Lowanichkiattikul C et al. 2016 ¹⁰	To determine the chest wall movement of each patient during deep inspiratory hold (DIBH) and expiratory breath hold (EBH) in postoperative breast cancer patients.	Prospective observational study	Assessed chest wall movement in 38 postoperative breast cancer patients (28–85 years) undergoing CT simulation for 3D radiotherapy using FB, DIBH, and EBH scans. Radio-opaque markers and the Eclipse® system were used, with analysis based on surgical type, BMI, lung volume, and Haller index.	Chest wall movement, BMI, Haller Index, lung volume DIBH	Chest wall movement was most pronounced in the anterior-posterior direction (median 5.1–5.4 mm), with greater displacement during DIBH than EBH. Surgery type, BMI, lung volume, and Haller index had no significant impact on movement.
Shin WK et al. 2017 ¹¹	The purpose of this study was to examine the association of physical activity following diagnosis and health-related quality of life (HRQOL) in breast cancer survivors.	Cross-sectional study	A total of 231 breast cancer survivors, aged 21–78 years, were recruited from three hospitals in Korea between 2012–2015. These women were diagnosed with stage I–III breast cancer based on AJCC criteria.	A detailed questionnaire for physical activity, Korean version of the European Organization for Research and Treatment of Cancer (EORTC), Quality of Life Questionnaire Core 30 (QLQ-C30) and Quality of Life Questionnaire Breast Cancer Module 23 (QLQ-BR23),	Breast cancer survivors in the high physical activity group reported lower fatigue and pain, and higher sexual function, with varying associations across stages I, II, and III
Fontes KP et al. 2018 ¹²	To assess the influence of different surgical treatment modalities on physical activity levels, functional capacity, and quality of life among breast cancer survivors.	Cross-sectional study	A total of 180 women (aged 30–60 years, BMI 18–30 kg/m ²) were divided into four groups: control group, breast-conserving surgery, mastectomy group, and breast reconstruction group.	IPAQ (International Physical Activity Questionnaire) for physical activity, HAQ-20 (Health Assessment Questionnaire) for functional capacity, and SF-36 (36-Item Short Form Health Survey) for quality of life.	Patients who underwent breast reconstruction showed higher physical activity and quality of life compared to those who had mastectomy alone or breast-conserving surgery.
Marazzi F et al. 2019 ¹³	To assess the link between shoulder complications and radiation dose in breast cancer patients, and propose a strategy to reduce exposure.	Prospective observational analysis	111 breast cancer patients, measuring range of motion (ROM), Disability of the Arm, Shoulder, and Hand (DASH) score, pain (Visual Analog Scale), and lymphedema. Tools used included a goniometer for ROM, DASH questionnaire for function, VAS for pain, and a tape measure for lymphedema assessment.	Range of Motion shoulder, upper limb functional impairment. Pain and Depression Levels, Lymphedema, Radiation Dose to Scapula–Humeral Articulation (SHA)	Reduced ROM abduction and higher SHA mean dose (>7 Gy) were significantly associated with worse DASH scores and shoulder dysfunction in breast cancer patients post-radiotherapy
Gong Y et al. 2020 ¹⁴	To determine the prevalence and risk factors of PMPS post-mastectomy.	Retrospective cohort study	2033 patients aged 23–82 years confirmed with breast cancer through pathology and had undergone surgical resection, with tumor	EORTC QLQ-C30, QLQ-BR23	PMPS is highly prevalent in breast cancer patients and negatively impacts quality of life. Key risk

			stage, nodal stage, metastasis stage Tis-T3N0-3M0, were assessed using EORTC, QLQ-C30 and QLQ-BR23 (the EORTC Breast Cancer Module) Questionnaire surveys for asking about their chronic current neuropathic pain and quality of life.		factors include older age, total mastectomy, ALND, and prior chronic pain.
Aachal B et al. 2021 ¹⁵	Evaluation of Posture and Quality of Life in Females Undergone Modified Radical Mastectomy	Cross-sectional observational study	35 subjects of aged between 40-60 years were selected using convenient sampling method. Inclusion criteria: females up to 6 months post-modified radical mastectomy, and willing to participate. Exclusion criteria: presence of lymphedema, upper trunk/extremity musculoskeletal issues, or psychological/psychiatric disorders.	QoL was assessed using a self-reported questionnaire and posture deviation was measured with the REEDCO posture scale.	The results showed minimal postural changes with slight reduction in REEDCO scores and moderate quality of life in the social domain.
Malchrowicz-Moško E et al. 2023 ¹⁶	To investigate kinesiophobia levels in breast cancer patients undergoing surgery, based on socio-demographic factors, lifestyle before diagnosis, cancer stage and type of BC, and comorbidities.	Cross-sectional observational	285 women (132 breast cancer and healthy women from the control group) were assessed using the Polish adaptation of the Tampa Scale for Kinesiophobia (TSK) to assess attitudes toward physical activity and fear of movement.	Tampa Scale for Kinesiophobia (TSK)	Women with breast cancer showed high kinesiophobia, especially those with osteoporosis, obesity, or diabetes. Most were unaware of WHO PA guidelines. Physical activity decreased during treatment, and fear of movement was higher in early-stage cases and increased with age.
Wang Q et al. 2023 ¹⁷	This study aimed to examine the association between kinesiophobia and QoL postsurgical breast cancer-related lymphedema survivors, and assess the mediating roles of self-care and exercise compliance.	Cross-sectional study	274 breast cancer-related lymphedema patients between 2020 to 2022 were surveyed. The study was conducted in three hospitals using convenience sampling. Participants completed anonymous, paper-based Chinese questionnaires privately, with assistance if needed. Data collection ensured confidentiality and took 10–15 minutes.	Self-care was assessed using the ASAS-R, exercise adherence with the Postoperative Functional Exercise Adherence Scale, kinesiophobia with TSK-11, and QoL with FACT-Bv4.0.	Kinesiophobia was negatively associated with self-care, exercise compliance, and QoL (all $P < 0.001$). It indirectly impacted QoL through self-care (7.9%), exercise compliance (23.3%), and both combined (13.1%).
Bhambure et al, 2024 ¹⁸	This study aimed to determine the effectiveness of thoracic mobility exercises along with the breath stacking technique on	Randomized controlled trial	46 eligible participants were assigned into two groups (N = 23 each group) using a simple random sampling method.. Experimental group received thoracic mobility and breath stacking techniques, while the conventional	Chest expansion	Thoracic mobility exercises along with the breath stacking technique, significantly improved chest expansion in postsurgery breast cancer patients

	chest expansion in breast cancer patients.		group received thoracic mobility exercises alone. Chest expansion was measured pre- and post-intervention at the axillary and xiphisternum levels using a tape measure.		after 4 weeks of the rehabilitation program ($P < 0.05$).
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Discussion

This narrative review examined 10 studies exploring the impact of various interventions on pulmonary function, chest mobility, physical activity, and quality of life in patients who underwent mastectomy and other cancer-related treatments. This review highlights the effects of various therapeutic interventions on pulmonary function, functional capacity, and quality of life in breast cancer patients following radical mastectomy.

Respiratory and chest wall mechanics play a crucial role postoperatively, particularly following radiotherapy and mastectomy. A study by Lowanichkiattikul C et al. (2016)¹⁰ found reduced chest wall movement during breathing, addressing anatomical and biomechanical limitations after mastectomy, indicating a potential impact on respiratory function. Aachal B et al. (2021)¹⁵ found postural deviations and reduction in QoL in the social domain among females within six months post-modified radical mastectomy, highlighting the need for early comprehensive rehabilitation. Functional results are significantly hampered by complications such as radiation-induced shoulder dysfunction and post-mastectomy pain syndrome (PMPS). According to Gong Y et al. (2020) axillary lymph node dissection and complete mastectomy are important risk factors for PMPS that have a negative effect on quality of life. Additionally, Marazzi F et al. (2019) noted that lower DASH scores and less range of motion were linked to greater radiation doses to the scapulohumeral area. According to research by Malchrowicz-Mosko E et al. (2023)¹⁶, participants in rehabilitation are limited by high levels of kinesiophobia, especially in elderly patients and those with comorbid diseases. Wang Q et al. (2024)¹⁷ expanded on this by showing that kinesiophobia negatively influenced QoL, with self-care and exercise adherence acting as mediators, highlighting the need for psychological support in recovery plans.

Murtezani A et al. (2014)⁹ demonstrated that moderate-intensity aerobic exercise significantly enhances both physical functioning and overall quality of life in survivors, emphasizing the importance of integrating structured physical activity into post-treatment care. Similarly, findings from Shin WK et al. (2017)¹¹ revealed that higher levels of physical activity were linked to reduced fatigue and pain, alongside improved psychosocial outcomes, underscoring exercise as a vital component in rehabilitation. Bhambure MV et al. (2024)¹⁸ further supported this by showing that combining thoracic mobility exercises with breath-stacking techniques improved chest expansion, suggesting a beneficial strategy to restore thoracic mechanics.

Furthermore, there is little information on the long-term durability of intervention effects because the majority of research concentrated on short- to medium-term results. In post-mastectomy and cancer-treated populations, the reviewed literature emphasizes the significance of early, multidisciplinary therapies to address pulmonary dysfunction, pain, and quality of life. In order to maximize recovery and survivorship care for patients with breast cancer, future studies should standardize intervention methods, include bigger and more varied populations, and investigate the long-term impact of these tactics.

Conclusion

The review highlights the significant impact that breast cancer treatments, particularly mastectomy and radiotherapy, have on pulmonary function, physical capacity, posture, and overall quality of life in patients. Pulmonary complications, reduced chest wall movement, shoulder dysfunction, post-mastectomy pain syndrome, posture deviation, reduced functional capacity are commonly observed outcomes in postoperative breast cancer patients. However, the findings demonstrate that early implementation of integrative rehabilitation strategies, such as respiratory muscle training, pulmonary rehabilitation programs, structured physical exercise, and effective pain management techniques, can significantly improve pulmonary function, decrease the incidence and severity of postoperative complications, and enhance patient's physical and psychological well-being. To provide the best possible recovery and quality of life for breast cancer survivors, future research should concentrate on bigger, longer-term randomized controlled trials to create standardized rehabilitation regimens.

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