RESEARCH ARTICLE

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Effect of Multi-component Exercise Program on Functional Performance in Breast Cancer Survivors

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Abstract

Background: Breast surgery, radiation, chemotherapy and modified radical mastectomy (MRM) may cause long-term side effects such as decreased muscle strength, pulmonary function, cardio-respiratory fitness (CRF), altered body fat distribution and poor sleep quality. These short- and long-term repercussions have an enormous effect on physical functioning in this population. The goal of this research was to determine the effect of a multi-component exercise program on functional performance in breast cancer survivors. **Methods:** In this research, 132 women with breast cancer were selected based on specific inclusion criteria. Participants were separated in a pair of two groups: the control group, which participated in breast cancer support group therapy, and the experimental group, which engaged in a multi-component exercise program. Each group consisted of 66 participants. The study assessed functional performance using a 12-minute walk test and a sit-to-stand test. Over a year, the breast cancer support group and the multi-component fitness program were implemented. Pre- and post-assessments were used to determine the effectiveness of the multi-component workout program. Statistical evaluation was executed utilizing SPSS statistical software (version 26.0 for Windows; SPSS, Inc., Chicago, USA) to obtain the results. **Results:** The study findings indicate significant improvements in functional performance for the experimental group. Specifically, the sit-to-stand test showed extremely significant results (p-value of 0.0002), and the 12-minute walk test also demonstrated significance (p-value of 0.008). These positive outcomes highlight the effect of the multi-component exercise program in enhancing physical performance in breast cancer survivors. **Conclusion:** The study revealed that both of the control group as well as the experimental group exhibited impaired functional performance in measures of outcome including 12-minute walk tests well as sit-to-stand test before the intervention. However, the multi-component exercise program had a notable positive impact on muscle performance among breast cancer survivors.

Keywords: Physical health- lymphedema- 12-minute walk test- sit-to-stand test

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Introduction

Cancer encompasses a group of diseases characterized by uncontrolled cell growth and dissemination, left unchecked, cancer can be fatal [1]. Among women, carcinoma of is the most prevalent form. Global breast cancer statistics from 2020 indicate that 2.3 million of them have been confirmed to have breast cancer, with a new diagnosis occurring approximately every 14 seconds [2]. Since 2008, breast carcinoma prevalence has risen by 20 per cent. In India, the estimated number of incident cancer cases in 2022 was 1,461,427 (crude rate: 100.4 per 100,000 population), emphasizing the significant impact of cancer in the country. Approximately one in nine individuals in India is at possibility of experiencing cancer over their entire life [3].

Breast carcinoma is a prevalent malignancy affecting women worldwide. Fortunately, approximately 70-80% of patients with early-stage, non-metastatic cancer of the breast may be effectively treated. However, breast cancer is a complex illness with various forms and subtypes. While most breast cancers respond well to endocrine therapy and have a favorable prognosis, a significant proportion falls into the category of triple-negative cancer of the breast. This subtype lacks targeted biomarkers such as estrogen and progesterone receptors, as well as human epidermal growth factor receptors (HER-2). Triple-negative cancer of the breast is defined by aggressive clinical behaviour, poor prognosis, higher recurrence rates, and lower survival rates. Despite advancements in

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screening mammography and mortality reduction efforts, cancer of the breast prevalence seem to rise globally [4]. Common risk variables consist early menarche, hereditary factors, family history, alcohol usage, smoking, lifestyle habits (such as diet and physical activity), and disruptions in sleep-wake cycles.

Additionally, further variables such as polluted air and socioeconomic status can impact cancer development [5]. Surgical treatment options regarding breast cancer include breast-conserving surgery, modified radical mastectomy, and radical mastectomy. The modified radical mastectomy is a very frequently performed surgery for breast cancer, regardless of the disease stage [4, 6, 7]. Despite significant medical advancements, the available anti-cancer treatments—such as radiotherapy, chemotherapy, endocrine therapy, and surgery—often include negative consequences that might significantly impact a patient's daily life. During chemotherapy, physical fitness may decline, affecting muscle strength, pulmonary function, and cardio-respiratory fitness (CRF), ultimately limiting patients' functionality and independence. Additionally, endocrine medications can lead to negative effects on physical functioning, including fatigue, pain, an increased risk of osteoporosis, altered body fat distribution, and impaired sleep and cognitive performance [8].

Exercise has emerged as a safe and non-pharmacological treatment option for cancer patients. Its benefits include improving muscular function, weight management, cardio-respiratory health, and fatigue levels. Regular exercise induces both short-term and long-term physiological changes. Notably, people who have greater levels of activity experience a significantly reduced relative risk of cancer-related mortality and recurrence. Among exercise modalities, aerobic training (AT), resistance training (RT), and combination training have repeatedly proven beneficial effects on various health-related outcomes. These include quality of life, cancer-related fatigue, and overall physical fitness. Additionally, exercise interventions effectively address psychological and emotional challenges such as depression, PTSD, and anxiety, contributing to an improved overall quality of life [8, 9]. Several women with breast cancer patients face challenges in accessing organized exercise programs because of an absence of awareness or difficulties related to facility access [9]. Considering rehabilitation, distance-based guidance is a practical alternative to on-site counselling. It eliminates location and transportation barriers and reduces financial strain on patients [8]. By incorporating home-based exercise, physical activity programs can be extended to reach more survivors and overcome distance-related obstacles [9].

In India, rural women frequently experience both poor mental and physical health as a result of an abundance of awareness about breast cancer. Many must stay in urban areas for primary treatment and travel long distances for oncology-related care, leading to stress and feelings of isolation. It is crucial to increase access to cancer-related health information and provide coping mechanisms for rural women. Long-term survivorship in breast cancer requires maintaining physical fitness, eating nutritiously, and socializing with other survivors. Addressing misconceptions and providing useful information about coping mechanisms is essential for improving survivorship and psychological adjustment [10]. Despite the importance of exercise, there have been little research regarding the effects of different types of exercise on functional performance in breast cancer survivors. While exercise is beneficial, there are several barriers to participation, and it may not encompass all the components needed for a successful rehabilitation from cancer. However, because it is so difficult to contact patients following an intervention, there aren't many studies that include follow-up.

This research intended to determine the long-term effects of multi-component exercise programs on postoperative breast cancer patients. Traditionally, single-component interventions have been used, but this study integrates multiple types of exercises into a single program. Additionally, it sought to provide new insights into rehabilitation techniques and approaches specifically tailored for breast cancer survivors. Given the challenges posed by large populations, limited diagnostic capacity, high treatment costs, and low survival rates, context-specific therapies are crucial. The scarcity of research on exercise-based therapy for cancer survivors underscores the need for context-specific approaches, particularly in countries with unique societal dynamics. Therefore, the study aimed to evaluate the effect of multi-component exercise programs on functional performance in breast cancer survivors.

Materials and Methods

Study participants and sampling

A randomised clinical study was carried out at a tertiary care center for survivors with breast cancer support group, specifically involving patients who received all of their treatment at Krishna Hospital and Medical Research Centre Karad between August 2018 and May 2023. The study sample size was calculated following a formula [N= (SD12 + SD22) (Z1-α/2 + Z1-β)/($\bar{x}$1-$\bar{x}$2)2]. In total, 132 women confirmed with histologically proven breast cancer, aged between 35 and 60, and who had gone through undergone chemotherapy, surgery, radiotherapy, and either completed or weren't actively undergoing hormone therapy, were included as breast cancer survivors (stages 1 to 3A). All individuals received medical approval from both an oncologist and a gynecologist.

Participants who fulfilled any of the subsequent categories were dismissed from this study: haematogenous metastases (M1), recent pregnancy or lactation (<1 year), breast cancer survivors having lymphedema and severe shoulder stiffness, severe cardiac disease (New York Heart Association class III or greater), myocardial infarction within the past 12 months, uncontrolled hypertension, concomitant use of medications affecting calcium and bone metabolism (such as bisphosphonates, calcitonin, parathormone (PTH), oral corticosteroids for over 6 months, anticonvulsants like fenytoin and carbamazepine), and prolonged heparin therapy. Additionally, individuals with other serious illnesses or medical problem that may contraindicate exercise, and patients not capable of participating in exercise training due to severe knee

arthritis or significant ligament or cartilage injuries at the lower extremities, were also excluded. Using computer-generated SPSS software and a simple randomized sampling technique, these participants were subsequently randomized into two groups.

Procedure

The criteria for participant inclusion and exclusion were carefully applied. All patients provided written and verbal consent before participating in the current trial, having been informed about the benefits and methodology of the intervention. The Institutional Ethical Committee authorized this research, and the research described in this publication adhered to the ethical guidelines outlined in the Helsinki Declaration. Detailed documentation of patient demographic information was completed before the trial commenced. Participants were informed of the study's purpose. Using computer-generated SPSS software, 132 participants were allocated at random into two groups, with 66 individuals in each group, using a simple random sampling method (Figure 1). Pre-assessment involved both groups undergoing the sit-to-stand test and a 12-minute walk test.

Group A served as the control group, receiving breast cancer support group therapy. This therapy included activities such as health education, individual problem-solving for survivors, emphasizing the importance of follow-up, providing diet and activity advice, psychological counseling, and engaging in recreational activities and celebrations. The support group comprised a multidisciplinary team, including an oncologist, gynecologist, psychiatrist, clinical psychologist, physiotherapist, medical social worker, staff nurse, and dietitian. These support group sessions occurred once every six months and lasted approximately two hours. Group B, on the other hand, constituted the experimental or multi-component exercise program group. The exercise program for this group is detailed in Tables 1 and 2 [10, 11-19]. Participants in Group B were instructed to perform exercises at home for approximately one year, five times per week. Patient-centered approach was conducted and so variety of methods like patient education materials, exercise booklets telephonic conversations, demo sessions were conducted to monitor patient progress, provide motivation, and address any obstacles they encountered. Both groups followed their respective protocols for approximately one year. Post-assessment occurred at the end of six months and one year, using the same outcome measures as described above. Data collection and statistical analysis were completed.

Data Collection Tools

Sit and Stand Test

The patient was instructed to sit in the centre of a chair, with hands crossed on opposing shoulders at the wrists, feet level on the floor, and maintaining a straight back with arms against the chest. Once positioned, the patient was directed to rise to a full standing position upon the command "Go," and then sit back down within 30 seconds. The timing began precisely with the word "Go." If the patient relied on their arms to stand, the test was terminated, and a score of "0" was assigned. We counted how many times the patient achieved a complete standing position within the allotted time. A patient was considered to have completed a stand if they were standing at the conclusion of the 30 seconds. Ultimately, we tallied the total instances in which the individual had the ability to stand during the test. The Intraclass Coefficient of Correlation (ICC) of 0.70 indicated satisfactory test-retest reliability, demonstrating consistent performance across multiple assessments [20, 21].

12-minute walk test

Walking endurance is measured with the 12-minute walk test (12MWT). This test measures oxygen intake, cardio-respiratory function, and vital capacity of the patient while performing activities. In this test, the patient was instructed to walk continuously for 12 minutes in the corridor without stopping, and the distance covered by the end of 12 minutes was recorded [22, 23].

Statistical analysis

The statistical software SPSS (version 26.0) was utilized to perform all statistical evaluations, including the computation of the average as well as standard deviation of the sit-to-stand and 12-minute walk tests. Descriptive statistical methods such as proportion, mean, and standard deviation were utilized to summarize data. The sit-to-stand assessment evaluated functional muscle performance. Utilizing a 12-minute walk test, the average as well as standard deviation was utilized to examine aerobic fitness and estimate VO2 max. One ANOVA test was used for the statistical evaluation of the pre- and post-intervention within the group, and an unpaired t-test was used for the statistical evaluation of the pre- and post-intervention between the groups. The outcome metrics were evaluated both at the beginning and the end of the six-month and 1 year period of the treatment.

Results

Participants' Socio-demographic and Clinical Characteristics

An aggregate of 150 patients were evaluated, and only 132 fulfilled the eligibility criteria and were accepted into the study. These 132 participants were allocated at random into two groups, with 66 in each. Six individuals from the control group dropped out due to scheduling restrictions and family issues. Two participants left the interventional group due to scheduling constraints and cancer-related problems. Finally, 60 and 64 participants in the control and intervention groups, respectively, completed the interventions and follow-up examinations (Figure 1).

Participants from Groups A as well as B had mean ages of 49.71±8.04 and 50.87±8.36, respectively. Right-handed dominance and literacy comprised the majority of participants, with 64 (96.96%) in Group A and 65 (98.4%) in Group B. Just a small percentage of participants 68.18% and 66.66% in Groups A and B, respectively had a tobacco addiction, whereas the majority of participants 13.63% and 15.15% were sedentary and free of addiction. Of the individuals in groups A as well as B, considerably over half

Table 1. Treatment Protocol for Breast Cancer Survivors Undergoing Multi-Component Exercise Program

Phase 1: Reconditioning programme (0-4 Months)	Type of Exercises	Exercises	Repetitions	Sets/Duration
	Mobility Training	Hot Moist Pack	Once/Day	
		Relaxed deep breathing exercise	3-5 minutes	2 sets
		Leg slides alternate knees flexion – extension	10 reps	4 sets
		Hip adduction –abduction	10 reps	4 sets
		Straight leg raising	10 reps	4 sets
		Ankle plantar flexion, Dorsiflexion, inversion & eversion	10 reps	4 sets
		Toes flexion extension adduction, abduction	10 reps	4 sets
		Cycling movements of both lower limbs	10 reps	4 sets
		Wand exercises of Shoulder	10 reps	4 sets
		Shoulder adduction abduction exercises	10 reps	4 sets
		Elbow flexion extension exercises.	10 reps	4 sets
		Pronation - supination of Radio-Ulnar joints	10 reps	4 sets
		ROM exercises of wrist joint MCP joint, PIP & DIP joints.	10 reps	4 sets
		Flexor and extensor tendon gliding exercises	10 reps	4 sets
		Flexor tendon Blocking exercises	10 reps	4 sets
		Extensor tendon gliding exercises	10-30 second hold 3-5 times	4 sets
		Spinal Exercises: in lying position	10 reps	4 sets
		Spinal Flexor and Extensor regime of exercises.		
		Cervical flexion and extension, side flexion, rotation to right and left	10 reps	4 sets
		Thoracic flexion and extension	10 reps	4 sets
	Resistance Training (Manual resistance is applied)	Shoulder flexion-extension, adduction-abduction, medial & lateral rotation	5-10 reps	6 seconds
		Scapular protraction-retraction, elevation-depression	5-10 reps	6 seconds
		Elbow flexion – extension	5-10 reps	6 seconds
		Radio-ulnar joints- pronation, supination.	5-10 reps	6 seconds
		Wrist flexion-extension, radial –ulnar deviation	5-10 reps	6 seconds
		Fingers flexion-extension, adduction- abduction	5-10 reps	6 seconds
		Namaskar position	5-10 reps	6 seconds
		Cervical flexion-extension, rotation	5-10 reps	6 seconds
		Lumbar Spine-drawing in maneuver	5-10 reps	6 seconds
		Wall slides	5-10 reps	6 seconds
		Hamstring setting exercises	5-10 reps	6 seconds
		Gluteal muscle setting	5-10 reps	6 seconds
		Multiple angle Isometric exercises	5-10 reps	6 seconds
		Short arc terminal extension exercises	5-10 reps	6 seconds
		Hamstring curls.	5-10 reps	6 seconds
	Aerobic Training	Warm up- low intensity callisthenic type & stretching exercises, repetitive motions at slow speeds	-	5 – 10 minutes
		Exercise- Increase pace of repetitive activities: Static Cycle	-	20-30 minutes
		Cool down- slowly reducing the intensity of the endurance activity	-	5 minutes
	Stretching (Gentle stretching, static or PNF technique)	Upper fibers of trapezius, Sternocleido-mastoid, Scapular protractors, Scalens, Levator scapulae, Quadrates lumborum, Erector spinae Shoulder adductors and flexors, Elbow flexors, Piriformis, Tensor fascia lata, Iliopsoas, Rectus femoris and hamstrings	3-4 repetitions	Hold position for 10-30 seconds; 6 second contraction followed by 10-30 second assisted stretch for PNF
	Self-help and energy conservation strategies	Plan the task, Eliminate Extra Trips, Use Good posture & Body Mechanics, Don't Fight Gravity,	-	-
		Pace Yourself and Use Energy – Saving Devices		
	Recreational Therapy	Pain and stress management, Relaxation techniques, mindfulness training, individual leisure education, and group activities such as ropes challenge courses, expressive arts, and group leisure education	-	-

Table 2. Treatment Protocol for Breast Cancer Survivors Undergoing Multi-Component Exercise Program

Phase II: Regaining required level of normative level of Physical Performance (5- 8 Months)	Type of Exercises	Exercises	Repetitions	Sets/Duration
	Progressive Resistance Training (Dumbbells and weight cuffs are used as resistance)	Shoulder flexion-extension, adduction-abduction, medial & lateral rotation	5-10 reps	6 seconds
		Scapular protraction-retraction, elevation-depression	5-10 reps	6 seconds
		Elbow flexion – extension	5-10 reps	6 seconds
		Radio-ulnar joints- pronation, supination.	5-10 reps	6 seconds
		Wrist flexion-extension, radial –ulnar deviation	5-10 reps	6 seconds
		Fingers flexion-extension, adduction- abduction-by using disc weights	5-10 reps	6 seconds
		Lumbar Spine- drawing in maneuver by the use of exercise ball	5-10 reps	6 seconds
		Leg lifts while bending forward	5-10 reps	6 seconds
		Wall slides	5-10 reps	6 seconds
		Multiple angle Isometric exercises	5-10 reps	6 seconds
		Short arc terminal extension exercises	5-10 reps	6 seconds
		Hamstring curls.	5-10 reps	6 seconds
		Ankle & foot movements –Dorsiflexion-Plantar flexion, eversion-inversion, toes flexion – extension ,adduction -abduction .	5-10 reps	6 seconds
	Aerobic Training	Warm up- moderate intensity callisthenic type & stretching exercises, repetitive motions at slow speeds		5 – 10 minutes
		Exercise- Increase pace of activity- Static Cycle		20-30 minutes
		Cool down- slowly reducing the intensity of the endurance activity		5 minutes
	Manual Lymphatic Drainage	Compression, elevation, free exercises, stretching	-	Twice per week
	Recreational Therapy	Pain and stress management, Relaxation techniques, mindfulness training, individual leisure education, and group activities such as ropes challenge courses, expressive arts, and group leisure education	-	-
Phase III: Improving to advance level of Physical Performance (9- 12 Months)	Muscular strength, endurance and power	Dynamic, resisted exercise for major muscle groups in well equipped therapeutic gymnasium	5-10 repetitions	-
	Recreational Therapy	Pain and stress management, Relaxation techniques, mindfulness training, individual leisure education, and group activities such as ropes challenge courses, expressive arts, and group leisure education	-	-

underwent modified radical surgery (53.03%, 51.51%), while only a small percentage underwent lumpectomy (46.96%, 48.48%). In Groups A and B, the most of the women's were non-workers (87.87%, 86.36%) and were from rural areas (83.33%, 81.81%), with just a minority of the participants being workers (12.12%, 13.63%) and from urban areas (16.66%, 18.18%), as shown in Table 3.

Sit to stand test

Table 4 displays the mean ± SD scores from the

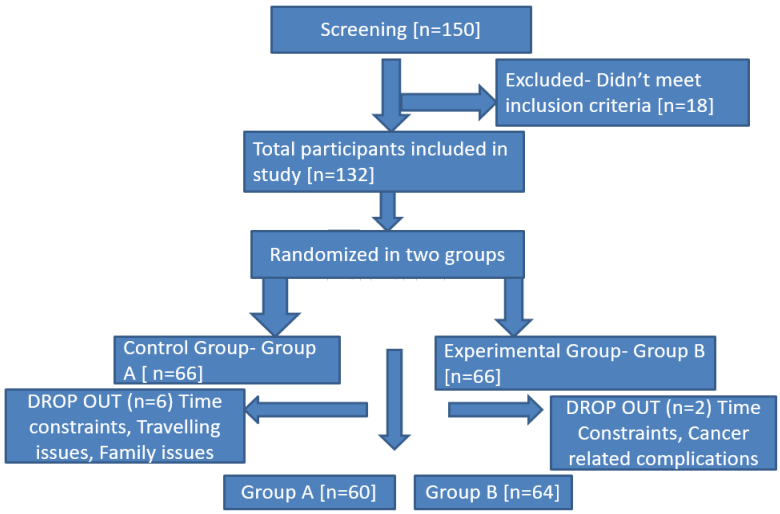

Figure 1. Participants Flow Diagram

Table 3. Socio-Demographic and Clinical Characteristics of Participants with Breast Cancer Survivors (n=132)

Parameters	Group A (CG) (Mean ± SD) (n=66)	Group B (IG) (Mean ± SD) (n=66)
Age (Years)	49.71±8.04	50.87±8.36
Dominance		
Right	64 (96.96%)	65 (98.4%)
Left	2 (3.03%)	1 (1.51%)
Education		
Literate	64 (96.96%)	65 (98.4%)
Illiterate	2 (3.03%)	1 (1.51%)
Lifestyle		
Exercising	21 (31.81%)	22(33.33%)
Sedentary	45 (68.18%)	44 (66.66)
Habits		
Misheri	13 (19.69%)	14 (21.21%)
Tobacco	9 (13.63%)	10 (15.15%)
None	44 (66.66%)	42 (63.63%)
Type of Surgery		
Modified radical mastectomy	35 (53.03%)	34 (51.51%)
Lumpectomy	31 (46.96%)	32 (48.48%)
Working status		
Workers	8 (12.12%)	9 (13.63%)
Non-workers	58 (87.87%)	57 (86.36%)
Population		
Urban population	11 (16.66%)	12 (18.18%)
Rural population	55 (83.33%)	54 (81.81%)

Table 4.Sit to Stand Test and12 Minute Walk Test Affected Pre and Post Intervention of Group A and B

	Pretest	Post test 6 Month	Post test 1 Year	p-value	F value
Sit to stand test					
Group A	13.86±4.78	14±4.61	14.2±4.59	0.922	0.08
Group B	12.96±4.24	14.42±4.76	17.12±7.39	0.0002	8.979
p-value	0.622	0.7272	0.043		
12 minute walk test					
Group A	1249.91±213.18	1252.83±184.5	1254±186.59	0.9344	1.335
Group B	1242.73±205.68	1262.42±196.40	1309.37±167.35	0.008	4.864
p-value	0.849	0.78	0.084		

sit-to-stand test. Group A demonstrates no significant difference (p=0.922) between pre-and post-intervention assessments using breast cancer support group therapy to improve functional performance in breast cancer survivors. Group B demonstrates an extremely significant difference (p=0.0002) between pre-and post-intervention with the multi-component exercise program. Group B demonstrated a significant difference (p=0.043) between the groups at the one-year post-test by implementing a multi-component exercise program.

12-minute walk test

Table 4 displays the mean ± SD scores from the 12-minute walk test. Group A demonstrates no significant difference (p=0.9344) between pre-and post-intervention assessments using breast cancer support group treatment to improve functional performance in breast cancer survivors. Group B demonstrates a significant difference (p=0.008) between pre-and post-intervention with the multi-component exercise program. Group B demonstrated a significant difference (p=0.084) between the groups at the one-year post-test by implementing a multi-component exercise program.

Discussion

The objective of this research intended to investigate the impact of a multi-component exercise program in

comparison with other conservative techniques like breast cancer support therapy on survivors of functional performance. Following breast surgery, radiation therapy, a modified radical mastectomy and chemotherapy, breast cancer survivors may experience long-term adverse consequences that impair their physical functioning and overall health. These adverse consequences consist of reduced decreased cardio-respiratory fitness (CRF), pulmonary function, muscle strength, cancer-related fatigue, pain, elevated risk of osteoporosis, changes in body fat distribution, impaired cognition, and poor sleep quality. Our results indicate that a year of multi-component exercise training was sufficient and effective for improving muscle performance and cardiopulmonary endurance in breast cancer survivors.

This training included resisted exercise training, posture and flexibility training, self-help and energy conservation strategies, aerobic training, manual lymphatic drainage along with simple lymphatic drainage, and recreational therapy. The relevance of exercise during and after therapy for these patients is becoming more obvious, and it is critical that specialists in the field of physical exercise devise techniques to remove barriers to practice and promote compliance. The study showed a 93.9% adherence rate. This study utilized exercise booklets and patient instruction via a telephone conversation, allowing exercise specialists to show and guide activity in individual or group settings.

The study evaluated functional muscle performance using the sit-to-stand test; the findings demonstrated that there several significant differences in upper and lower limb strength between the experimental and control groups and that the experimental group's participants improved significantly. These findings are by previous research by Santagello SB et al. (2020), which found that a 12-week resistance training regimen significantly improved sit-to-stand performance ($p=0.007$). These positive findings demonstrate how well-structured resistance training can enhance lower limb strength and functional movements such as the sit-to-stand exercise for the participant [20].

Huges DC et al. (2015) used a different methodology to compare the effects of yoga-based exercise with traditional exercise and customized exercise programs over six months. Repetitions testing leg strength from a six-to-stand posture revealed significant increases in the yoga group ($p=0.003$). The study found that yoga-based exercise programs, which incorporate elements of flexibility, resistance, and aerobic training, can be beneficial post-treatment and offer an alternative yet effective means of improving lower limb strength and functional performance [24]. Strengthening and resistance exercise results in the synthesis of actin and myosin, which is responsible for reduced muscular weakness, increased muscle mass, and enhanced muscle strength [25]. A significant improvement in trunk and leg strength was observed in breast cancer women who undertook combined aerobic and resistance training. Muscle growth and neuromuscular adaptations amplify the muscles' potential for force production, increasing muscle strength [26].

A major predictor of cardiovascular events and mortality is cardiopulmonary function. Cardiopulmonary function is reduced as a result of breast cancer treatment; however, regular physical activity might prevent this reduction and potentially enhance cardiopulmonary function [27]. The study's results demonstrated that there was still notable disparities in 12-minute walk test (12MWT) distance between the experimental and control groups, with the experimental group's individuals showing the most improvement. These findings evaluated that the suggested exercises enhanced physical functioning, particularly about the 12MWT, and emphasize the potential advantages of the interventions.

The reported increase in 12MWT distance is in line with research published in 2014 by Murtezani A et al. (2014), which looked at how moderate-intensity aerobic exercise affected breast cancer patients' quality of life and ability to perform physically. The exercise group demonstrated a significant difference in 12MWT ($p<0.009$) when compared with the control group. Improved performance on the 12-minute walk test suggests that moderate-intensity aerobic exercise may improve physical functioning, according to consistent data [28]. Furthermore, a study by Mutrie N et al. [29] found that women with early-stage breast cancer significantly improved on the 12-week walking test ($p<0.0001$) after engaging in a 12-week supervised group exercise program. The findings of multiple research are consistently in accordance with each other, confirming the notion that structured exercise regimens, especially ones which incorporate aerobic activities, enhance functional outcomes—as seen by improved performance on the 12MWT [29].

Aerobic exercise is widely recognized to increase the efficiency of the cardiovascular and respiratory systems. Improved heart performance, a larger stroke volume, and better muscle oxygen consumption are linked to better physical functioning and endurance. These heart and lung adaptations brought on by aerobic exercise could be the reason behind the intervention group's gains in 12MWT distance. It is commonly recognized that aerobic exercise improves the respiratory and cardiovascular systems' efficiency. Better physical functioning as well as endurance are linked with improved heart function, a greater stroke volume, and better muscle oxygen consumption [30]. The improvements in 12MWT distance observed in the intervention group may be explained by these modifications to the heart and lungs brought on by aerobic exercise.

According to our research, patients faced many physical challenges due to long-term side effects following surgery. Patients faced challenges during survivorship owing to the lack of special healthcare facilities nearby, leading to neglect of the symptoms and deterioration in their health. The findings were expected to support a strategic focus on breast cancer survivorship, reduce disparities in access to multidisciplinary healthcare, and help standardize survivorship care plans. Exercise with multiple components is a useful therapeutic approach. Priority should be given to treatments that are easily accessible, affordable and reversible. We designed a

multi-component exercise program that addressed the challenges faced by the patients in their daily lives such as challenges with physical functioning, reduced cardiopulmonary endurance and a lack of adequate healthcare facilities. The model included self-help and energy conservation strategies, Manual lymphatic drainage paired with Simple lymphatic drainage, for these issues, along with exercises and recreational therapy to improve overall functional performance. After implementing this exercise program, we found that the patient's physical capacity improved significantly. By filling in this knowledge vacuum, our study has strengthened the body of evidence supporting the idea that the multi-component fitness program can help breast cancer survivors function better.

The study's strengths include its robust approach, large dataset, high response rate, inclusion of in-clinic measurements for body mass, cardiorespiratory fitness, and muscle strength, and constant control of the usual care group throughout the follow-up period. The study also emphasizes the significance of adherence, diet stability, and consistent maintenance of activity and weight levels in supporting the findings. These strengths contribute to the study's internal validity and overall scientific rigour and reliability.

Our research investigation is constrained by its reliance on self-reported information to determine the subjects' psychological well-being. Self-report indicators are commonly used because of their simplicity of use; nonetheless, they are prone to recall bias and social desirability bias. The validity of our findings could be jeopardized if individuals did not honestly recall or relate their emotional experiences. Furthermore, we acknowledge the possible impact of confounded factors which was not properly controlled for, and the study's cross-sectional design limits our capacity to determine causal associations. Future research can concentrate on customizing the curriculum to fit certain survivor profiles, thereby increasing its effectiveness. Further study can determine how a multicomponent exercise program integrates with current treatments; this could result in recommendations for making exercise a crucial component of care regimens for survivors.

The findings can also benefit medical professionals, policymakers, and community-based organizations involved in cancer treatment. Integrating exercise interventions into cancer treatment and survivorship programs can lead to better long-term outcomes and higher patient care standards. Healthcare providers can enhance the well-being of breast cancer survivors globally by tailoring interventions to their specific needs.

In conclusion, the findings of this research demonstrated that persons who had survived breast cancer face a number of obstacles in their lives, including decreased cardiopulmonary endurance and functional muscle performance. A multi-component exercise program comprising regular exercise, energy-saving and self-help techniques, and recreational therapy were incorporated into the study to improve functional performance and lessen problems among breast cancer survivors.

Author Contribution Statement

The authors confirm their contribution to the paper as follows: study conceptualization and design, SB Shinde and PP Jain; organization and collection of data, PP Jain; analysis and interpretation of results, PP Jain, SB Shinde; draft manuscript preparation, SB Shinde and PP Jain; and proofreading and editing of the manuscript, SB Shinde and PP Jain. All authors reviewed, agreed, and accepted the finalized draft of the article.

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Scientific Approval

The study protocol was approved by protocol committee of Krishna Vishwa Vidyapeeth (Deemed to be University).

Ethics Committee Approval

The study protocol was approved by Institutional Ethics Committee of Krishna Vishwa Vidyapeeth (Deemed to be University), Karad (Protocol Number-187/2017-2018).

Conflicts of interests

Nil.

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