RESEARCH ARTICLE

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Effect of Multi-component Exercise Program on Body Composition and Physical, Emotional and Social well being in Breast Cancer Survivors

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Abstract

Objective: The purpose of this research intended to determine the impact of an multi-component exercise program on body composition and physical, emotional and social well being (PWB, EWB,SWB) in breast cancer survivors (BCS). **Methods:** One hundred and thirty two eight women with BC were enrolled in this research based on inclusion and exclusion criteria and were randomized into group A and B. Group A received breast cancer (BC) support group therapy whereas group B received multi-component exercise program. Waist Hip ratio (WHR), Body Mass Index (BMI), Circumference measurement and Functional Assessment of Cancer Therapy Breast (FACT-B) scale were employed as outcome measures. To validate the outcomes, pre- and post-assessments of the mentioned measures were conducted. Statistical evaluation was conducted with SPSS statistical software (version 26.0). **Results:** The findings revealed considerable improvement among the group for homolateral and contralateral arm and forearm, right and left thigh and right and left leg circumference (p=0.0087,0.0162, 0.0061, 0.0048, 0.0266,0.0142,0.0364, 0.0021), FACT-B (p=0.008, 0.002, 0.007,0.01,0.001,<0.0001), conversely no significant enhancement was observed for BMI (p=0.743) and WHR (p=0.6614) of patients undergoing multi-component exercise as compared to other group. Also, significant improvement between the groups was observed for circumference(0.0478,0.0305,0.0279,0.0240,0.0374,0.0293,0.0420,0.0334,0.0449,0.0260,0.0412 ,0.0160,0.0454,0.0324,0.0375,0.0214), FACT-B (0.51, 0.045, 0.313, 0.238, 0.593, 0.049, 0.405, <0.0001, 0.190, 0.015,0.131,0.176,0.006,<0.0001), conversely no significant enhancement was observed for BMI (p=0.9634, 0.364), WHR (p=0.988, 0.915) at post treatment 6 month and 1 year. **Conclusion:** The study concluded that multi-component exercise program had shown a significant effect on body composition and PWB, EWB, SWB among BCS.

Keywords: Lymphedema- Quality of life- FACT-B Scale- Breast Cancer Survivorship- Physical health.

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Introduction

In recent years, the medical field has focused on treating a number of non-communicable diseases, often referred to as epidemics. Cancer is the second largest cause of mortality in larger economies and is among the ten in developing countries [1]. BC is the more frequently identified cancer as well as the main cause of cancer-related mortality among women worldwide [2]. According to BC statistics, 2.3 million women had been diagnosed with BC worldwide in 2020, with one woman being diagnosed every 14 seconds at the conclusion of this year. Since 2008, the prevalence of BC has grown by 20%. According to data from the National Cancer Registry Programme (NCRP), the estimated number of cancer incidents in India for 2022 is 1,461,427 (crude rate: 100.4 per 100,000). In India, one out of every nine people is likely to develop cancer over their lifetime. Lung and breast cancers were the major locations of cancer in men and women, respectively [3].

Early detection and screening are critical in preventing BC progression. Prominent risk components comprise age over 40-50, younger age at menarche, menopausal status, older age at first childbirth, higher incidence of abortion, childbirth before 33 weeks of gestation, use of contraceptive pills, hereditary factors, family history, consumption of alcohol, cigarette smoking, lifestyle habits such as poor diet and lack of physical activity, and sleep-wake cycle disruptions. Further risk factors include air pollution and socioeconomic level can also

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impact the likelihood of developing BC [3]. BC patients can be treated with various surgical procedures, including radical mastectomy (RM), modified radical mastectomy (MRM), and breast-conserving surgery. The modified radical mastectomy is a fairly common procedure for BC, regardless of the disease stage [2, 4].

Even though oncology has seen tremendous advancements in medicine, the anti-cancer treatments currently available chemotherapy, radiotherapy, endocrine therapy, and surgery often have a variety of adverse effects that adversely affect patients' daily activities and overall quality of life (QOL). These adverse effects include nausea, pain, fatigue, impaired cognition, declines in physical fitness, poor body composition outcomes, and impaired social and work reintegration [5]. As a result, developing non-pharmacological preventative techniques and new therapies with no side effects is critical.

Exercise is a proven, non-pharmacological, and safe strategy that should be recommended to all cancer patients, as it has numerous health and QOL benefits. Furthermore, patients who engage in higher levels of exercise have a much lower relative risk of cancer mortality and recurrence. Specifically, aerobic training (AT), resistance training (RT), and combination training have repeatedly shown positive impacts on numerous health-related outcomes, including physical fitness, cancer-related fatigue, and QOL [5]. Furthermore, exercise reduces physical deterioration caused by therapy, which frequently results in loss of independence and mobility, increased effort to perform everyday activities, and a lower QOL. Exercise may mitigate the cytotoxic effects of therapies by improving cardiorespiratory fitness (CRF) and body composition, preventing cardiotoxicity, severe sarcopenia, and cachexia, leading to better post-treatment and survival outcomes [6].

Furthermore, exercise therapies reduce anxiety, PTSD, and depression while improving overall health-related quality of life. Exercise also reduces stress and anxiety levels by familiarizing people with stimuli and conditions previously seen as hazardous, while improving self-efficacy and serving as a distraction from stressful occurrences [7]. Nonetheless, a significant proportion of BCS do not participate in structured physical activity or exercise programs, either because they are unaware of the exercise-induced health benefits or because exercise training facilities are difficult to access.

In India, the majority of women lives in rural regions and face perceived challenges such as low motivation, lack of time, limited access to fitness facilities, and inadequate social support [8]. Furthermore, due to a lack of awareness about these appearance changes can bother and might feel stressful to patients for social acceptance and suffers from poor mental and physical health. To achieve a better QOL, they require cost-effective and easy-to-implement self-treatment options [3]. To address these challenges, home-based exercise methods have multiplied and emerged as a potential tool for increasing long-term commitment to exercise practice.

Researchers have proven that home-based exercise programs may improve or, at least, attenuate the negative effects of anticancer medicines on various components of fitness levels, including the composition of the body [6]. However, it must be acknowledged that the a dearth of data on the benefits of multi-component exercise programs incorporating aerobic, resistance, mobility, self-help conservation strategies, and recreational therapy is still limited. More research is required to understand the impact and effectiveness of these programs on body composition and QOL components during this period. A few investigations have incorporated follow-up after intervention due to the difficulty in contacting patients. Furthermore, by emphasizing outcomes like emotional and social well being, this study tackles QOL elements that are frequently disregarded in conventional cancer rehabilitation studies. The objective of this research was to examine how a multi-component exercise program affected BCS body composition, as well as their physical, mental, and social well-being.

Materials and Methods

Study design and setting

A randomized clinical research was undertaken at a tertiary care facility for a BC 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.

Study Population and Sample

The research sample size was computed using the formula [$N = (SD1^2 + SD2^2) (Z1-\alpha/2 + Z1-\beta) / (\bar{x}1 - \bar{x}2)^2$]. In total, 132 women confirmed as BCS (stages 1 to 3A), with histologically proven BC, aged between 35 and 60, who had underwent chemotherapy, radiotherapy, surgery and either completed or were not actively undergoing hormone therapy, and who received medical approval from both an oncologist and a gynecologist, were included in the study.

Participants with male gender, haematogenous metastases (M1), recent pregnancy (<1 year), BCS with severe shoulder stiffness and lymphedema 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, prolonged heparin therapy), serious illnesses or medical problems that may contraindicate exercise, and patients not capable of participating in exercise training due to severe knee arthritis or significant ligament or cartilage injuries in the lower extremities were excluded from the research.

Procedure

Subjects were chosen based on precise eligibility and exclusion parameters. Each subject was approached and given a thorough explanation of the research. Each patient provided written and verbal informed consent. Before the research began, detailed demographic information on the patients was collected. Using computer-generated SPSS software, 132 individuals were assigned at random into

two groups of 66 each, using a basic random selection approach. Group A received BC support group therapy, whereas Group B received a multi-component exercise program.

BC support group therapy is a survivorship program that consists of a multidisciplinary team and includes activities such as health education, individual problem-solving for survivors, emphasizing the importance of follow-up, providing diet and activity advice, psychological counseling, and participating in recreational activities and celebrations. These categories sessions were conducted once every six months and lasted around two hours each. The multi-component exercise program is detailed in Table 1 [3, 9-15]. Participants in this group were instructed to exercise at home five times a week and aerobic training for 3 times a weekfor about a year. Patient teaching materials and workout booklets facilitated adherence to home exercise routines. Telephonic discussions were used to track patient progress, provide motivation, and address any challenges that arose. Both groups followed their respective routines for approximately a year.

Pre-assessment of the patients was done utilizing data gathering tools in both groups. Post-assessment took place at the end of six months and one year, using the same outcome measures, and the results were evaluated.

Data Collection Tools

Anthropometric Measurements

To calculate BMI (kg/m^2), participants' height and weight were assessed using a calibrated stadiometer. Waist and hip circumferences were measured to the closest 0.1 cm at the midpoint between the iliac crests and the lower ribs, as well as at the level of the buttocks' greatest protrusion. These measures were conducted twice, with the average of each used to determine the WHR. The circumference of both the upper and lower extremities on the two sides was obtained utilizing an anthropometric tape [16-18].

FACT B scale

The FACT-B was utilized to evaluate quality of life. It consists of 37 items representing five subscales: PWB, SWB, EWB, functional well-being (FWB) (which includes the Functional Assessment of Cancer Therapy - General (FACT-G) scale with 26 items), and breast cancer-related well-being. The FACT-B score (35 items) was calculated by summing the five subscales. Patients responded on a 5-point scale varying from 0 (not at all) to 4 (very much), with greater scores suggesting higher QOL. The FACT-B scoring template was used to calculate subscale and total scores. At baseline, the FACT-B showed good-to-excellent internal consistency for PWB($\alpha = 0.85$), SWB($\alpha = 0.87$), EWB ($\alpha = 0.77$), and FWB [19].

Statistical analysis

The statistical analyses were carried out using the statistical software SPSS (version 26.0), which included calculating the average and standard deviations of the BMI, WHR, and FACT-B scales. Information collected were analyzed utilizing descriptive statistical approaches such as proportion, mean, and standard deviation. A one-way ANOVA test was used to evaluate pre- and post-intervention within the group, and an unpaired t-test was performed to evaluate pre- and post-intervention between the groups. The outcome measures were analyzed at the start and end of the six-month and one-year treatment periods, respectively.

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 randomly divided into two groups, of 66 each. Six individuals from the control group withdrew out owing 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 experimental 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 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 2.

Anthropometric Measurements

Table 3 represents the assessment of BMI and WHR for groups A and B. Groups A and B demonstrated no significant difference within the groups, with p-values of 0.937, 0.743, 0.849, and 0.6614 for BMI and WHR. Additionally, Group B showed no discernible variation between both the groups for BMI ($p = 0.9634, 0.364$) and WHR ($p = 0.988, 0.915$) at post-treatment 6 months and 1 year.

Table 4 represents the assessment of circumference for groups A and B. Group B showed a very significant difference within the group, with p-values of 0.0087, 0.0061, 0.0048, and 0.0021 for homolateral arm and forearm, contralateral forearm, and left leg circumference. In contrast, the contralateral arm, right and left thigh, and right leg circumference showed significant improvement with p-values of 0.0162, 0.0266, 0.0142, and 0.0364, respectively, compared to Group A (0.9614, 0.9376, 0.8948, 0.9321, 0.9583, 0.9622, 0.8900, 0.9286). Additionally, there appeared to be considerable difference between the groups after 6 months and 1 year post-treatment.

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

	Type of Exercises	Exercises	Repetitions/ Intensity/ Rate of Perceived Exertion (RPE)	Sets/ Duration
Phase 1: Reconditioning programme (0- 4 Months)	Aerobic Training	Warm up- low intensity callisthenic type & stretching exercises, repetitive motions at slow speeds gradually increasing the effort.	-	5 – 10 minutes
		Exercise- Increase pace of repetitive activities: Static Cycle, walking/running, stair climbing.	moderate; 50-70% age predicted maximal heart rate. (RPE 13–16)	20-30 minutes
		Cool down- slowly reducing the intensity of the endurance activity- Slow, total body, repetitive motions & stretching activities	-	5 minutes
	Strength training (Manual resistance is applied)	Shoulder flexion-extension, adduction-abduction, medial & lateral rotation, elbow flexion – extension, wrist flexion-extension, radial –ulnar deviation	5-10 reps	6 seconds
		Namaskar position	5-10 reps	6 seconds
		Lumbar Spine-drawing in maneuver	5-10 reps	6 seconds
		Wall slides, Hamstring curls	5-10 reps	6 seconds
		Hamstring and gluteal muscle setting exercises	5-10 reps	6 seconds
		Multiple angle Isometric exercises	5-10 reps	6 seconds
		Short arc terminal extension exercises	5-10 reps	6 seconds
	Mobility Training	Relaxed deep breathing exercise	3-5 minutes	2 sets
		Leg slides alternate knees flexion – extension, hip adduction –abduction, Straight leg raising, ankle plantar flexion, dorsiflexion, inversion & eversion, 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, elbow flexion-extension, pronation - supination of radio-ulnar joints, ROM exercises of wrist joint MCP joint, PIP & DIP joints.	10 reps	4 sets
		Flexor and extensor tendon gliding exercises	10-30 second hold 3-5 times	4 sets
		Flexor tendon Blocking exercises	10 reps	4 sets
		Spinal Exercises: in lying position- Spinal Flexor-Extensor regime of exercises.	10 reps	4 sets
		Cervical flexion-extension, side flexion, rotation to right and left, thoracic flexion-extension.	10 reps	4 sets
	Self-help and energy conservation strategies	Plan the task, Eliminate Extra Trips, Use Good posture & Body Mechanics, Don't Fight Gravity, Pace Yourself, use energy – Saving Devices, regular dietary intake, attending social gathering and attending meeting	-	-
	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, vocational rehabilitation, pranayama, to improve emotional support by informative lectures and videos.	-	-
Phase II: Regaining required level of normative level of Physical Performance (5- 8 Months)	Aerobic Training	Warm up- moderate intensity callisthenic type & stretching exercises, repetitive motions by increasing the effort.	-	5 – 10 minutes
		Exercise- Increase pace of repetitive activities: Static Cycle, walking/running, stair climbing.	moderate; 50-70% age predicted maximal heart rate. (RPE-13-16)	20-30 minutes
		Cool down- slowly reducing the intensity of the endurance activity	-	5 minutes
	Progressive Resistance Training (Dumbbells and weight cuffs are used as resistance)	Shoulder flexion-extension, adduction-abduction, medial & lateral rotation, elbow flexion – extension, wrist flexion-extension, radial –ulnar deviation	5-10 reps 70–80% of their estimated one repetition maximum (1-RM)	6 seconds

Table 1. Continued

	Type of Exercises	Exercises	Repetitions/ Intensity/ Rate of Perceived Exertion (RPE)	Sets/ Duration
Phase II: Regaining required level of normative level of Physical Performance (5-8 Months)		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, Hamstring curls	5-10 reps	6 seconds
		Hamstring and gluteal muscle setting exercises	5-10 reps	6 seconds
		Multiple angle Isometric exercises	5-10 reps	6 seconds
		Short arc terminal extension exercises	5-10 reps	6 seconds
		Ankle & foot movements –Dorsiflexion-Plantar flexion, eversion-inversion, toes flexion – extension ,adduction -abduction .	5-10 reps	6 seconds
	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, vocational rehabilitation, pranayama and to improve emotional support by informative lectures and videos.	-	-
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 70–80% of their estimated one repetition maximum (1-RM)	-
	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, vocational rehabilitation, pranayama to improve emotional support by informative lectures and videos.	-	-

FACT-B

Table 5 displays the assessment of QOL in groups A and B. Group A showed no significant improvement in PWB, SWB, EWB, BCS, or overall FACT-B (p = 0.902, 0.855, 0.752, 0.886, 0.659). However, functional well-being showed substantial improvement (p = 0.09) and FACT-G showed considerable improvement (p = 0.02). Group B demonstrated considerable improvement in

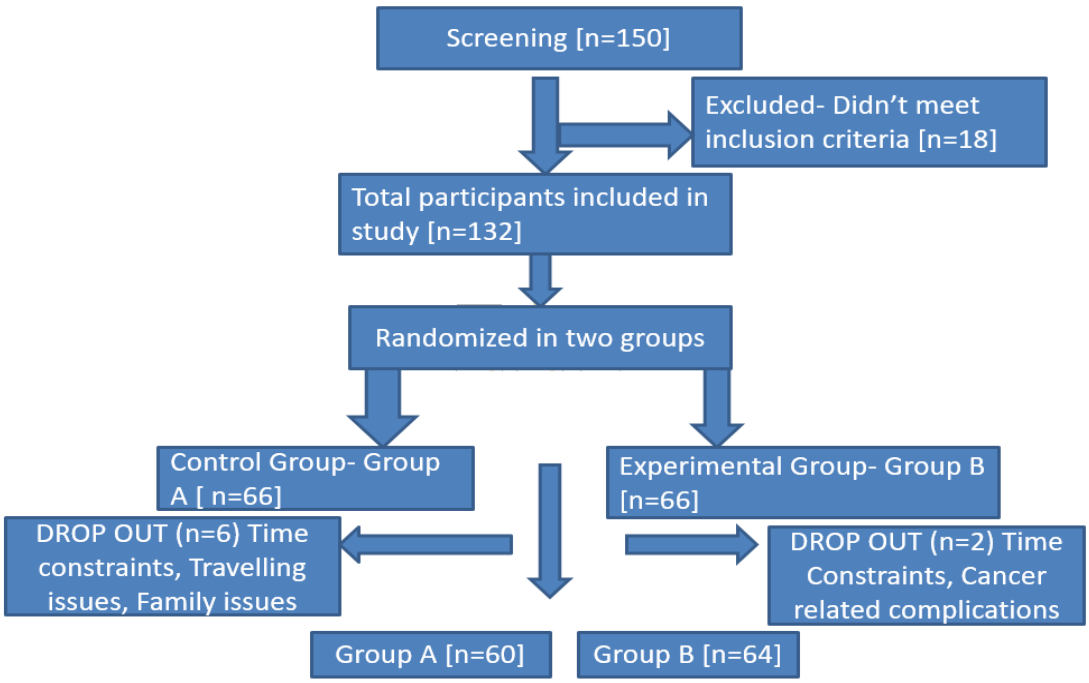

Figure 1. Participants Flow Diagram

Table 2. Socio- Demographic and Clinical Characteristics of Patients 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%)

PWB, SWB, EWB and BCS (p = 0.008, 0.002, 0.007, 0.01), while FWB and overall FACT-B and FACT-G showed extremely significant improvement (p = 0.001, <0.0001). Additionally, both groups had considerable improvements in PWB, SWB, EWB, BCS, and FACT-G, as well as significant and extremely significant increases in FWB and FACT-B scores at 6 months and 1 year after the treatment.

Discussion

The purpose of this research intended to compare the impact of a multi-component fitness program with breast cancer support group treatment on body composition and physical, emotional and social well-being in BCS. Risk factors for BC include lifestyle choices, menopausal state, diet, physical activity, and socioeconomic status. A study on breast cancer survivorship among Indian women discovered that both urban and rural women are affected. However, in rural regions, there is a delay in diagnosis, treatment, and care. To achieve a higher QOL, there exists an urgent desire for cost-effective self-help therapy options that are easy to conduct independently [3].

Treatments such as surgery (mastectomy), chemotherapy, radiation, and drugs impact survivors' health by altering metabolic processes may affect how the body responds to exercise. Furthermore, the intrinsic hormonal imbalances caused by cancer itself may contribute to metabolic alterations that affect factors such as BMI and weight [20]. In this research, we found no significant variations in BMI or WHR between the multi-component and standard exercise groups. This data correlates with the findings of the pilot research conducted by Reis AD et al. (2018), which found that combined training didn't drastically change the BMI of BC patients. According to these data, neither BMI nor WHR was significantly different as a consequence of the exercise regimens employed in these trials [16].

Nonetheless, the evidence demonstrates the broad diversity of responses to exercise regimens. Nuri R et al. [17] conducted research on postmenopausal women with BC which included both walking and physical training. A 15-week fitness program resulted in a substantial difference ($p<0.05$) in BMI and WHR. In contrast, no significant changes in body composition were detected in 301 BC patients who participated in a multicenter randomized trial by Courneya KS et al. (2013), which included both aerobic and resistance training [21]. Similar findings were reported in Murtezani A et al.'s [22] study, which investigated the advantages of moderate-intensity aerobic activity for BCS and found no detectable differences in BMI across the groups. Another study examined the effect on upper limb (UL) circumferences and total body extracellular water of 10 weeks of Nordic Walking (NW) and Walking (Wg), both alone and combined with a variety of exercises (ISAg) created for BCS. The study found a significant reduction in UL circumference with the usage of NW and Wg combined with ISAg [18]. Our research discovered that multi-component exercise resulted in a considerable reduction in circumference when compared to the conventional group.

Table 3. BMI and WHR Affected Pre and Post Intervention of Group A and B

	Pretest	Post test 6 Month	Post test 1 Year	p-value	F value
Body Mass Index (BMI)					
Group A	28.15±6.21	28.06±6.19	28±6.18	0.937	1.006
Group B	28.36±6.10	28.01±5.93	27.20±3.24	0.743	0.329
p value	0.8523	0.9634	0.364		
Waist Hip Ratio (WHR)					
Group A	0.962±0.425	0.958±0.472	0.951±0.467	0.849	0.049
Group B	0.978±0.278	0.957±0.263	0.944±0.226	0.6614	0.439
p value	0.8033	0.988	0.915		

Table 4. Circumference Measurement affected Pre and Post Intervention of Group A and B

Variable	Pretest	Post test 6 Month	Post test 1 Year	p-value	F value
Homolateral Arm Circumference					
Group A	34.16±3.35	34.06±3.24	34±3.23	0.9614	0.0393
Group B	34.28±3.37	33.87±2.95	33.03±2.22	0.0087	0.4862
p value	0.85	0.0478	0.0305		
Contralateral Arm Circumference					
Group A	33.05±2.06	32.98±2.02	32.91±2.01	0.9376	0.0644
Group B	33.03±2.14	32.71±2.05	32.14±1.73	0.0162	4.213
p value	0.9618	0.0279	0.024		
Homolateral Forearm Circumference					
Group A	23.55±2.012	23.48±1.92	23.38±1.90	0.8948	0.1112
Group B	23.60±2.03	23.10±1.87	22.75±1.61	0.0061	5.234
p value	0.8706	0.0374	0.0293		
Contralateral Forearm Circumference					
Group A	23±2.05	22.96±2.01	22.86±2.01	0.9321	0.0703
Group B	23.10±2.00	22.89±2.01	22.25±1.79	0.0048	5.492
p value	0.7647	0.042	0.0334		
Right Thigh Circumference					
Group A	57.13±2.77	57.03±2.46	57±2.32	0.9583	0.0425
Group B	57.17±2.80	57±2.47	56.15±2.04	0.0266	3.698
p value	0.9389	0.0449	0.026		
Left Thigh Circumference					
Group A	57.21±2.81	57.11±2.79	57.08±2.59	0.9662	0.0385
Group B	57.18±2.71	56.98±2.49	56.12±1.97	0.0142	4.348
p value	0.9533	0.0412	0.016		
Right Leg Circumference					
Group A	35±2.18	34.91±2.07	34.81±1.97	0.89	0.1166
Group B	34.93±2.18	34.73±2.09	34.06±1.90	0.0364	3.373
p value	0.8739	0.0454	0.0324		
Left Leg Circumference					
Group A	34.9±2.20	34.81±2.15	34.75±2.04	0.9286	0.074
Group B	35.03±2.18	34.85±2.05	34.15±1.64	0.0021	6.371
p value	0.7402	0.0375	0.0214		

These disparate findings highlight the complex relationship between exercise, cancer treatments, and metabolic outcomes, emphasizing the importance of personalized cancer rehabilitation regimens. Recognizing that each patient's response to exercise varies depending on a number of factors, including genetic predispositions, overall health state, and baseline fitness, individual response variability can explain the diverse results in terms of BMI changes [23]. Therefore, it is critical to customize exercise programs according to each patient's unique needs and characteristics in order to maximize the metabolic advantages of exercise before and following cancer therapy.

The QOL tests undertaken in the current research on subjects with BC found substantial differences in the interventional group, whereas the control group showed no significant changes in quality of life. Conversely, the group that received the intervention saw a significant increase in ratings in all categories, including physical, emotional, social, and functional well-being. These findings illustrate the intervention's positive benefits on a variety of QOL variables. These findings are consistent with a 10-week moderate-intensity aerobic activity regimen for BCS, as reported by Murtezani A et al. [22]. The study found that the exercise group saw a substantial improvement in QOL ($p<0.003$), indicating the potential advantages of organized exercise regimen for improving overall health. Chen X et al. (2009) provide additional evidence for the positive link between enhanced QOL and consistent exercise in BCS. The conclusion emphasizes the advantages of regular exercise on one's overall sense of well-being [24].

However, the research conducted by Cadmus LA et al. (2009) presents a more complex viewpoint. Exercise was linked to increased social functioning, especially among post-treatment survivors who had initially low social functioning ($p<0.05$), even though their 6-month study did not find a direct correlation between exercise and QOL. This

Table 5. Quality of life affected Pre and Post Intervention of Group A and B

Variable	Pretest	Post test 6 Month	Post test 1 Year	p-value	F value
FACT-B (0-140)					
Group A	99.8±9.90	100.58±9.39	101.05±9.67	0.659	1.112
Group B	99.12±10.24	105.71±10.95	111.07±11.61	0.001	1.14
p value	0.71	0.006	<0.0001		
Components of FACT-B					
FACT-G (0-104)					
Group A	78.15±8.073	80.2±7.849	82.45±9.511	0.02	3.833
Group B	77.54±7.69	80.67±6.93	84.5±7.14	0.0001	18.45
p value	0.645	0.131	0.176		
Physical wellbeing (0-28)					
Group A	18.98±6.45	19.11±4.99	19.41±4.70	0.902	1.67
Group B	18.65±5.34	19.71±5.13	21.23±5.23	0.008	4.864
p value	0.76	0.51	0.045		
Functional well being (0-28)					
Group A	20.32±4.824	21.42±5.299	19.533±3.921	0.09	2.145
Group B	21.29±2.48	22.07±3.16	23.48±4.08	0.001	7.167
p value	0.157	0.405	<0.0001		
Emotional well being (0-24)					
Group A	17.95±4.81	18.11±4.79	19.83±4.79	0.855	1.008
Group B	17.73±4.75	19±4.98	20.98±5.91	0.002	6.248
p value	0.798	0.313	0.238		
Social well being (0-24)					
Group A	18.93±3.78	19.15±3.82	19.83±3.92	0.752	0.317
Group B	18.65±3.81	19.56±4.66	21.04±4.50	0.007	5.053
p value	0.653	0.593	0.049		
Breast Cancer Scale (0-36)					
Group A	21.83±4.22	21.71±4.89	21.96±4.93	0.886	1.343
Group B	21.65±4.29	23.04±6.21	24.84±7.63	0.01	4.328
p value	0.565	0.19	0.015		

result highlights the significance of considering individual characteristics, indicating that exercise programs might have varying impacts on different dimensions of QOL [25]. The beneficial effects of exercise on neuro-chemical regulation can explain the physiological mechanisms underlying the observed improvements in QOL. Exercise causes the release of endorphins, which help improve mood, lower pain perception, and ease the symptoms of anxiety and depression that cancer patients frequently face. The influence on neurotransmitter levels—such as serotonin, dopamine, and nor-epinephrine—affects mood control, stress reduction, and overall mental health [26]. Furthermore, fatigue and a lower QOL can be attributed to persistent inflammation linked to cancer. Exercise has recently been shown to enhance vitality and alleviate such symptoms by lowering systemic inflammation. Regular exercise also improves sleep patterns, which enhances mood, lessens fatigue, and improves overall QOL [19, 27].

According to our findings, patients encountered numerous obstacles during survivorship due to a lack of specific healthcare services nearby, resulting in the neglect of symptoms and deterioration in their health. The findings were intended to promote a strategic focus on breast cancer survivorship, eliminate gaps in access to multidisciplinary healthcare, and contribute to the standardization of survivorship care plans. Multi-component exercise is an effective therapeutic technique. Treatments that are simple to administer, inexpensive, and reversible should be prioritized. We created a multi-component workout program to address the patients' daily obstacles, such as physical, mental, and social functioning issues, as well as a lack of proper healthcare facilities. The model incorporated self-management measures, exercises, and recreational therapy to help with body composition and QOL. By bridging this information gap, our study has added to the body of evidence supporting the notion that a multi-component exercise program can help BCS function better.

The research has some major strength that enhances its dependability and scientific rigor. Primarily, the low loss to follow-up demonstrates the study's solid methodology, ensuring an extensive dataset. Furthermore, the high response rate contributes to the study's internal validity by demonstrating participant engagement. The study

also shows how participants' high levels of compliance, diet stability, and consistent weight and exercise levels contribute to its robustness and reliability. However, our research is limited by its reliance on self-reported information to assess the subjects' psychological well-being. Self-report assessments 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.

Considering these drawbacks, our findings provide important insights regarding the participants' emotional aspects, underlining the necessity for additional investigations using a variety of approaches to strengthen the evidence base in this area. Further study may also determine the impact of a multi-component exercise program on the integration of existing treatments, potentially leading to recommendations for incorporating exercise as an integral part of survivorship care regimens. A multi-component fitness program shows promise for satisfying the diverse demands of BCS. Its potential to transform survivors' lives is underscored by its positive effects on treatment-related side effects and overall QOL. Furthermore, the study's findings have greater consequences for medical professionals, policymakers, and community-based organizations involved in cancer care. Healthcare practitioners may significantly improve the outcomes and overall well-being of BCS in India and throughout the world by using this comprehensive approach and tailoring therapies to their specific requirements.

The study found that a multi-component exercise regimen comprised aerobic, mobility, and resistance exercises and self-help and energy conservation techniques, and recreational therapy, had a significant positive effect on body composition and improved physical, emotional, and social well-being in BCS.

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

None.

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