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## Practice and Outcome of Exercise Intervention on Breast Cancer-Specific Quality of Life of Breast Cancer Survivors in Nigeria

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### ABSTRACT

**Background:** Lifestyle modification like exercise is an essential rehabilitation measure that improves the quality of life (QoL) of women with breast cancer and helps in preventing cancer related complications. This study assessed the practice and outcome of exercise interventions on breast cancer-specific quality of life of survivors in Delta State, Nigeria.

**Methods:** Experimental design was applied with intervention (47) and control (47) groups. This design involved a pre-test, an intervention, and a post-test. Exercise intervention (aerobic, resistance and flexibility exercises, including warm-up with Swiss ball and dance, climbing of stairs, treadmill, stationary exercise bicycle, shoulder, and arm exercises) was administered to the intervention group for twelve weeks. The assessment of breast cancer survivors' specific quality of life in the two groups was done with the English version of The European Organization for Research and Treatment of Cancer Breast Cancer-Specific Quality of Life Questionnaire (QLQ- EORTC-BR23) before and after the exercise intervention.

**Results:** The overall pre and post-intervention breast cancer-specific functional quality of life was 65.4±22.7 (intervention group); 71.3±23.4 (control group) and 75.05±10.4 (intervention group); 58.65±12.9 (control group) while the pre and post breast cancer-specific symptoms QoL was 22.2±6.2 (intervention group); 24.1±9.6 (control group) and 11.8±13.0 (intervention group); 30.9±21.2 (control group), respectively. All the women in the intervention group practiced exercise only at mild/moderate intensity and no notable side effects were observed during the practice by many of them (n=39). Significant differences existed in the overall post-intervention breast cancer-specific functional and symptoms QoL between the two groups (p<0.001) and no significant differences were observed among most of the specific QoL scales in relation to age, duration of diagnosis, and stage of the cancer diagnosis.

**Conclusion:** Exercise remains beneficial to women with breast cancer and has proven to be one of the necessary means to improve their overall well-being. Therefore, healthcare providers that manage these patients in different hospitals should always counsel and support them to initiate the recommended exercises for cancer survivors to enhance their survival.

### Introduction

Breast cancer is responsible for about 19.5% of all cancer cases and 16% of all cancer-related deaths in Nigeria with a severe negative effect on the women's breast cancer-specific quality of life issues.<sup>1</sup> With the improvements in early detection and treatment, the number of cancer survivors has continued to increase,

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with women with breast cancer accounting for 22% of total cancer survivors globally in 2012.<sup>2</sup> One of the means to enhance this survival and rehabilitation includes lifestyle modifications like exercise. The benefits of exercise cannot be overemphasized. It is associated with the reduction of comorbid chronic diseases such as type 2 diabetes and cardiovascular diseases. Exercise equally promotes body weight management<sup>3,4</sup>, and breast cancer-specific quality of life (QoL) of survivors<sup>5</sup>

Breast cancer-specific quality of life considers the functional and symptom scales with other subscales including body image, sexual functioning, sexual enjoyment, future perspectives and other symptoms subscales that are peculiar to breast cancer patients alone and could be assessed using the European Organization for Research and Treatment of Cancer (EORTC) Breast Cancer-Specific Quality of Life Questionnaire (QLQ-BR23).<sup>6-10</sup> Thus, EORTC has developed several site-specific questionnaires including one for breast cancer (QLQ-BR23) in order to collect more relevant patient-reported outcomes in studying quality of life in this group of cancer patients.<sup>11</sup>

Few studies have measured breast cancer specific QoL<sup>12-14</sup>, and results have showed improvement in the specific QoL outcome variables of women after a breast cancer diagnosis when subjected to exercise.<sup>5,15</sup> In a meta-analysis of randomized controlled clinical trials examining physical activity in breast cancer survivors, physical activity improved QoL.<sup>15</sup> Thus, exercise is a central component and a necessary tool for specific QoL improvement.<sup>16</sup> Imran et al. assessed QoL of breast cancer patients using BR 23 and discovered functional scales in most of the domains were high, while symptom scales were moderate-to-low for most items, showing better QoL.<sup>17</sup> However, this was not the case in a study by Saleha et al.<sup>18</sup>, where the QoL index in breast cancer patients was poor, especially for body image.<sup>19</sup>

Few Nigeria-based studies among breast cancer patients have considered exercise, and breast cancer-specific QoL among the breast cancer population. Hence, the current study is needed, especially in Nigeria, where the major care give to breast cancer patients is limited to only chemotherapy, radiotherapy, surgery and other therapies with little attention to exercise which is an important rehabilitation measure to enhance the breast cancer patient's survival. With the poor health-related quality of life seen in breast cancer patients, there is a need for exercise, especially in rehabilitation and aftercare. Thus, focus should be on reducing and improving cancer and treatment-related side effects that do not subside even after the end of the therapy.<sup>20</sup> Therefore, this study focused on the practice and outcome of an exercise intervention in breast cancer-specific QoL.

## Methods

### *Research design*

The study adopted an experimental design involving an intervention and a control group. This design involved two-phase work using pre-test and post-test. The pre-test collected baseline information on breast cancer-specific quality of life of women with breast cancer in Delta State. It was taken before implementing the exercise intervention. After twelve weeks, there was a post-test to assess the effect of exercise uptake on the specific quality of life among women who participated in the study.

### *Study setting*

The study area was included two tertiary hospitals, Federal Medical Centre (FMC), Asaba and Delta State University Teaching Hospital (DELSUTH) Oghara that manage breast cancer patients in Delta State. The sample for the study was selected out of the 128 women recruited and consisted of breast cancer survivors in the control (n=47) and intervention (n=47) groups. Purposive sampling technique was used to select the women with breast cancer who completed their primary treatments and still maintained follow up with the two hospitals. Purposive sampling was applied purely based on the judgment of the researchers.<sup>21</sup> No randomization was done.

### *Inclusion criteria*

- Breast cancer patients who completed their primary treatments.
- Willingness to participate in the study by the women.

### *Exclusion criteria*

- Women who had breast reconstruction and those not willing to participate were excluded from the study.

### *Instrument for data collection*

The instrument for data collection in the study included a questionnaire which has two sections. Section A contains six items used to elicit information on the respondents' demographic data. Section B contains 23 items of EORTC-BR23 used to elicit information on the women's breast cancer-specific quality of life before and after exercise intervention. EORTC BR23 was developed in 1996 to assess specifically QoL of breast cancer patients.<sup>5</sup> The breast cancer disease-specific section starts from the functional scales. Items 9-12 elicited information on body image; items 14 and 15 elicit information on sexual enjoyment; item 16 is related to sexual functioning and 13 elicit information on future perspectives. For the symptoms scales, items 1-4, 6, and 7 elicit information on systemic therapy side effects; items 20-23 elicit information on breast symptoms; items 17, 18, and 19 elicit information on



arm symptoms, while item 5 elicits information on an upset by hair loss in breast cancer clients. The QoL instrument is designed on a four-point scale with Not at all = 1, Little = 2, Quite a bit = 3, and very much = 4. A checklist for exercise uptake designed by the researcher to observe patients' exercise was also used in the study. It guided the recording of exercise by women with breast cancer. It contained items on weeks/days of exercise, type of exercise, exercise intensity, time covered during the exercise (in minutes), and notable side effects on the patients.

*Validity and reliability of instrument*

The EORTC-BR23 is a standardized instrument and, therefore, was not validated. However, the researchers did a reliability test to ascertain its usability in our environment since it is an international instrument. A reliability coefficient of 0.80 was obtained, which showed that the instrument is reliable.

*Ethical consideration*

Health Research Ethics Committee of FMC Asaba and DELSUTH Oghara respectively gave ethical approval for the study. Informed consent was also obtained from the patients before data collection.

*Data collection techniques*

The pre-test data collection and recruitment of participants lasted for three months. The exercise for the intervention group for 12 weeks was with the fitness professional's assistance. The fitness professional also acted as a physiotherapist who was knowledgeable on the recommended exercise

guidelines for cancer survivors. The exercises included aerobic, resistance and flexibility exercises including warm-up with Swiss ball and dance, climbing stairs, treadmill, stationary exercise bicycle, shoulder, and arm exercises. After the exercise uptake, the researcher collected post-test data on the two groups' breast cancer-specific QoL.

*Data analysis*

Data analysis was done with the Statistical Package for Social Sciences (SPSS), version 17. The average of the items contributing to the scale, the raw score, was calculated for the data collected with EORTC BR23 QoL before using the linear transformation to standardize the raw score. The researchers did this to make scores range from 0 to 100 before coding them for analysis. The scores for each of the scale in the domains were added and divided to get the mean score for each domain's subscales. A high functional scale score signified a high level of functioning, while a high symptom scale score directly related to a significant increase in symptomatology and problems. The scores obtained were compared to the standard reference point/values of the EORTC BR23 QLQ. Descriptive statistics of mean and standard deviation were used and the results are presented in tables. Test of the hypotheses was done by using an independent sample t-test and linear regression.

**Results**

Table 1 shows that the minimum and maximum ages of the respondents from control group were 19

**Table 1.** Socio-demographic characteristics of participants

Variables	Intervention group(%)	Control group(%)
Age		
Maximum	64	63
Minimum	30	19
Mean±SD	44±8.0	45.0±9.0
Marital status		
Married	33(70.2)	31(66.0)
Single	6(12.8)	8(17.0)
Widow	5(10.6)	4(8.5)
Divorced/separated	3(6.4)	4(8.5)
Level of education		
No formal	3(6.4)	4(8.5)
Had primary	2(4.3)	6(12.8)
Secondary	15(31.9)	15(31.9)
Bachelors/Masters/Doctorate	27(57.4)	22(46.8)
Religion	42(89.4)	45(95.7)
Christian religion	5(10.6)	1(2.1)
Islamic religion	0(0.0)	1(2.1)
Traditional religion		
Occupation		6(12.7)
Unemployed	0(0.0)	17(36.2)
Self-employed	14(29.8)	24(51.1)
Employed	33(70.2)	
Stage of being diagnosed with breast cancer		
Stage 1	27(57.4)	20(42.6)
Stage 2	5(10.6)	12(25.5)
Stage 3	1(2.1)	0(0.0)
Stage 4	11(23.4)	13(27.7)
Not sure	3(6.4)	2(4.3)

**Table 2.** Pre and post-intervention breast cancer-specific QoL of cancer survivors

Domain/scales	Intervention M±SD		Control M±SD		Reference point
	Pre	Post	Pre	Post	
Functional domain					
Body image	64.3±26.4	89.5±16.9*	63.1±20.0	56.2±24.7	≥ 66.7
Sexual functioning	69.1±33.5	71.0±12.1	78.4±29.6	60.6±16.1	0-33.3
Sexual enjoyment	68.1±34.7	72.3±24.3*	76.8±30.5	66.7±29.5	33.3-66.7
Future perspective	53.2±40.3	67.4±23.5	63.8±41.6	51.1±23.9*	≥66.7
Overall functional domain score	65.4±22.7	75.05 ±10.4	71.3±23.4	58.65±12.9	-
Symptom domain					
Systemic therapy side effects	22.1±13.8	10.2±13.8*	23.0±12.0	28.1±18.7	4.8-23.8
Breast symptoms	36.6±16.2	7.6±10.2*	40.9±40.9	31.7±23.0	0-25
Arm symptoms	17.0±20.6	17.7±15.1*	22.2±23.8	33.1±22.0	0-33.3
Upset by hair loss	5.2±12.4	5.5±5.9	9.3±24.5	33.3±21.8	0-0
Overall symptom domain score	22.2±6.2	11.8±13.0	24.1±9.6	30.9±21.2	-

Body image Q9-12, sexual functioning Q14, 15, sexual enjoyment Q16, future perspective Q13, systemic therapy side effects Q1-4, 6-8, breast symptoms Q20-23, arm symptoms Q17-19, upset by hair loss Q5. reference points adapted from EORTC reference point for BR23

years and 63 years, respectively, while those of the intervention group were 30 years and 64 years. Both groups were mostly Christians [Intervention (89.4%); Control (95.7%)], and were married [intervention (70.2%); control (66.0%)]. Most of the patients had tertiary education [intervention (57.4%), control (46.8%)], and were employed [intervention (70.2%); control (51.1%)]. The more common stage of disease at diagnosis was stage I [intervention group (57.4%); control group (42.6%)].

Table 2 shows the pre and post-intervention functional and symptom status of the breast cancer-specific quality of life among breast cancer survivors in control and the intervention groups. For the pre-test functional domain, sexual functioning and sexual enjoyment was higher for the intervention group [Sexual functioning (69.1±33.5); sexual enjoyment (68.1±34.7)] and likewise for the control group [sexual functioning (78.4±29.6); sexual enjoyment (76.8±30.5)]. Body image was below the reference value for both groups [intervention (64.3±26.4); control (63.1±20.0)]. Regarding the symptom domain, breast symptoms were higher in both groups [intervention (36.6±16.2); control (40.9±40.9)]. The overall breast cancer-specific functional quality of life was 65.4±22.7 (intervention group) and 71.3±23.4 (control group). The overall breast cancer-specific symptoms were 22.2±6.2 (intervention group) and 24.1±9.6 (control group). For the post-intervention, the functional domain, and body image, the values [89.5±16.9 (intervention), 71.0±12.1 (sexual functioning), 72.3±24.3 (sexual enjoyment), 64.1±11.5 (future perspective)] were all higher for the intervention group post-intervention than the control group [56.2±24.7 (body image), 60.6±16.1 (sexual functioning), 66.7±29.5 (sexual enjoyment), 51.1±23.9 (future perspective)]. As for the symptoms domain, the symptoms experienced by those in the intervention group reduced more post-intervention than those in the control group. Their overall breast cancer-specific functional quality of life was 75.05±10.4 and

58.65±12.9, respectively, for intervention and control while the overall breast cancer-specific symptoms were 11.8±13.0 and 30.9±21.2, respectively, for intervention and control group.

Table 3 shows the observed practice of exercise by women with breast cancer in the intervention group. Modality of exercise practiced was aerobic (100%), resistance (100%), and flexibility (100%). Majority (70.2%) practiced for a period of 12 weeks, and the time contributed by aerobic was 20-60 minutes (100%), resistance was 10-60 seconds (100%), and flexibility was 5-20 seconds (100%). The intensity of exercise practiced was mainly moderate (100%). The majority (83.0%) did not have any side effects due to the exercise.

Table 4 shows there is a significant difference between post-intervention disease specific functional and symptoms QoL of breast cancer women. For the functions, significant differences exist among body image ( $p < 0.001$ ), sexual functioning ( $p = 0.003$ ), future perspective ( $p = 0.007$ ), and the overall functional domain ( $p < 0.001$ ). For the

**Table 3.** Observed exercise by breast cancer survivors in intervention group using the observation checklist.

Observed items	Intervention group(n=47)%
Number of Weeks covered	
<12 weeks	14(29.8)
Up to 12 weeks	33(70.2)
<3 days per week	18 (38.3)
Up to 3 days per week	29 (61.7)
Time covered In minutes per day	
Aerobic 20-60 minutes	47(100)
Resistance 10-60 seconds	47(100)
Flexibility 5-20 seconds	47(100)
Modality of exercise practiced	
Aerobic, resistance and flexibility	47(100)
The intensity of exercise	
Mild/Moderate	47(100)
Notable side effects	
Headache	3(6.4)
Mild syncope	1(2.1)
Dizziness	4(8.5)
None	39(83.0)





**Table 4.** Independent sample t-test of differences in specific functional and symptom breast cancer-specific quality of life among breast cancer survivors who did exercise and those who did not

Variables	Difference in pre and post intervention scores			
	Intervention M±SD	Control M±SD	T	p-value
<b>Functions</b>				
Body image	25.2±11.7	-6.9±19.3	3.671	0.001
Sexual function	2.8±30.2	-17.7±34.9	3.043	0.003
Sexual enjoyment	4.2±21.2	-10.9±43.3	2.235	0.028
Future perspective	14.2±45.9	-12.8±47.9	2.782	0.007
Overall specific functions	9.7±27.3	-12.6±38.1	2.514	0.001
<b>Breast cancer-specific symptoms</b>				
The systemic therapy side effect	-11.9±20.0	5.1±22.3	-3.870	0.001
Breast symptoms	-28.8±10.1	-9.2±32.2	-3.556	0.001
Arm symptoms	0.71±24.2	10.9±32.8	-1.709	0.091
Upset by hair loss	0.3±17.2	24±21.4	-3.944	0.001
Overall symptom domain score	-10.4±12.1	6.8±16.9	-2.325	0.001

symptoms domain, significant differences exist among systemic therapy side effects ( $p < 0.001$ ), breast symptoms ( $p < 0.001$ ), arm symptoms ( $p = 0.091$ ), upset by hair loss ( $p < 0.001$ ), and the overall symptoms domain ( $p < 0.001$ ).

Table 5 shows no significant differences among most of the specific QoL scales in relation to age, duration of diagnosis, and stage of the cancer diagnosis. However, there were significant differences among sexual function which was negatively correlated with age for the control group ( $p = 0.043$ ); sexual function was positively correlated with duration of diagnosis for the

intervention group ( $R = -0.449$ ,  $p = 0.002$ ), while sexual enjoyment was positively correlated with duration of diagnosis for the control group ( $R = -0.283$ ,  $p = 0.022$ ); future perspective was positively correlated with stage of the cancer diagnosis for both groups [intervention ( $R = 0.333$ ,  $p = 0.022$ ); control ( $R = 0.347$ ,  $P = 0.017$ )]; breast symptoms was positively correlated with duration of diagnosis ( $R = -0.473$ ,  $p = 0.001$ ) for the intervention group, while arm symptoms had a positive correlation with duration of diagnosis ( $R = 0.347$ ,  $p = 0.017$ ) and stage of cancer at diagnosis ( $R = -0.352$ ,  $P = 0.015$ ) for the control group.

**Table 5:** Linear regression model of demographic and clinical variables on breast cancer specific symptom scales

Variables	Difference in pre and post intervention scores			
	Intervention		Control	
	Standardized coefficient Beta	P-value	Standardized coefficient Beta	p-value
Body image vs age	0.038	0.804	0.075	0.618
Body image vs DOD	0.223	0.140	0.091	0.542
Body image vs SOCAD	-0.093	0.540	0.126	0.398
Sexual function vs age	0.287	0.051	0.297	0.043
Sexual function vs DOD	-0.449	0.002	0.145	0.331
Sexual function vs SOCAD	-0.031	0.834	0.227	0.125
Sexual enjoyment vs age	0.237	0.196	-0.037	0.805
Sexual enjoyment vs DOD	-0.283	0.022	0.211	0.155
Sexual enjoyment vs SOCAD	0.162	0.076	-0.056	0.709
Future perspective vs age	-0.134	0.368	0.226	0.126
Future Perspective vs DOD	0.172	0.252	0.097	0.515
Future perspective vs SOCAD	0.333	0.022	0.347	0.017
<b>Breast cancer-specific symptoms</b>				
The systemic therapy side effect vs age	-0.089	0.551	0.089	0.554
The systemic therapy side effect vs DOD	-0.193	0.198	0.274	0.063
The systemic therapy side effect vs SOCAD	-0.076	0.611	0.029	0.848
Breast symptoms vs age	0.107	0.480	0.054	0.719
Breast symptoms vs DOD	-0.473	0.001	0.235	0.111
Breast symptoms vs SOCAD	0.049	0.746	0.003	0.982
Arm symptoms vs age	0.067	0.656	0.006	0.970
Arm symptoms vs DOD	-0.130	0.389	0.347	0.017
Arm symptoms vs SOCAD	0.118	0.430	-0.352	0.015
Upset by hair loss vs age	.109	0.121	-0.123	0.082
Upset by hair loss vs DOD	0.137	0.232	0.211	0.342
Upset by hair loss vs SOCAD	0.041	0.573	0.092	0.241

DOD-duration of diagnosis. SOCAD-stage of cancer at diagnosis



## Discussion

Assessment of the pre-intervention functional and symptoms scale of breast cancer-specific quality of life of breast cancer survivors in the control and intervention groups using the EORTC BR23 QLQ showed that except body image for both groups which was below the reference point and future perspectives for the intervention group, other subscales of the instrument were far above the reference values. The women's breast symptoms and hair loss upset experienced by a few of them were very worrisome. This finding agrees with Haddou et al.<sup>13</sup> who discovered that the functional status of breast cancer patients was low while the status of the symptoms remained high.<sup>12</sup> In the present study, the same was discovered except for sexual functioning and sexual enjoyment. Nageeti et al. found that body image, breast symptom, and future perspective scored the lowest among women with breast cancer<sup>22</sup>, while the most distressing symptom was hair loss as discovered in this present study. Impaired body image is a serious issue that affects women with breast cancer.<sup>23-25</sup> In contrast, Imran et al. reported higher scores for body image and future perspective<sup>17</sup>, while the least score was for sexual functioning pre-assessment, which was not the case in this study where body image score was less than the reference value. However, sexual enjoyment and sexual functioning had higher scores.

The organized exercise intervention was carried out for women who survived breast cancer in the intervention group. This exercise was done to reduce their sedentary lifestyle and improve their physical activity level because it has been stated by Horneber that most cancer populations are sedentary.<sup>26</sup> The exercise done consisted of endurance (aerobic), resistance, and flexibility exercises. The participants tolerated these exercises well. As observed during the practice, the exercises were judged to be safe, and the same was also seen in a similar study by David and Cynthia.<sup>27</sup> The exercise program was organized specifically for the women who participated actively. Therefore, organized specific programs are effective and may improve breast cancer-specific quality of life in breast cancer survivors.<sup>28</sup> There is an urgent need to implement programs like this in hospitals that manage cancer, especially breast cancer patients. This implementation will improve cancer patients' overall well-being, especially breast cancer-specific QoL issues.<sup>29</sup>

Regarding the post-intervention breast cancer-specific functional and symptoms quality of life of women with breast cancer in the control and intervention groups, the results showed that there was a remarkable improvement in the functional and symptoms status of women with breast cancer in the intervention group after the exercise intervention compared to the women in the control group who had lower scores in the functional domain and there was

no noticeable decrease likewise in their symptoms compared to their pre-intervention scores. A similar result was reported in other studies where exercise intervention improved the women's overall well-being in the intervention group compared to the control group who did not exercise.<sup>27, 28</sup> Similar results were also reported by Volaklis who found that exercise improved body image and self-esteem<sup>30</sup>, and also Denlinger and Engstrom who discovered an improvement in breast cancer-specific quality of life among breast cancer patients after physical activity.<sup>15</sup> Another study also reported that exercise significantly affected specific quality-of-life issues, including body image/self-esteem, sexuality, and pain.<sup>30</sup>

The results also showed that sexual functioning and sexual enjoyment were good before and after exercise intervention. This finding suggests that these women's disease condition did not influence the sexual functioning and sexual enjoyment in both groups. Sexuality and sexual functioning, assessed in this study, belong to a cardinal domain of BR23 quality of life in breast cancer patients. Previous research supports this result showing that women stay sexually active and functional with no elevated psychosocial disorders or sexual dysfunction and no decrease in sexual activity after mastectomy.<sup>31</sup> Two studies contradict this result, reporting a significant deterioration in sexual function and sexual disorders among breast cancer patients.<sup>32, 33</sup> These studies also stated that many cancer survivors are at risk for developing psycho-physiological symptoms, including sexual dysfunction. Contradicting this finding, another study reported no single pattern of sexual life after breast cancer.<sup>34</sup> A study by de la Cruz found that women with breast cancer might have reduced or interrupted sexual activity while receiving treatment, and many of them have an ineffective sexual function with changes in various areas of sexuality, and these changes differ among women receiving treatment and those who have completed their treatment.<sup>35</sup> It is essential to state that feeling of intimacy or sexual activity should be sustained even when there is a health challenge, including breast cancer, to enhance emotional stability. Hence, ACS stated that sexuality and intimacy have been shown to help people face cancer by dealing with feelings of distress and going through treatment.<sup>36</sup> Therefore, finding that participants in this study were still sexually functional is promising as it will help them remain emotionally stable despite the prevailing condition.

The results showed that significant difference existed concerning the breast cancer-specific QoL issues of women with breast cancer. For the functional domain, statistically significant improvement was observed across many functional scales for women who did exercise compared to those who did not. For the symptoms, a statistically



significant decrease was observed between the scale and overall domain scores for symptoms among women who did exercise compared to those who did not. This finding is consistent with several reports that exercise has a significant influence on the breast cancer-specific QoL of the patients that do exercise despite some barriers that may influence its effective practice.<sup>29,30,37,38</sup>

Results also revealed there was no significant difference among most of the scales of the specific QoL concerning age, duration of diagnosis, and stage of cancer diagnosis except sexual function vs age for the control group, sexual function vs duration of diagnosis for the intervention group, sexual enjoyment vs duration of diagnosis for the control group, future perspective vs stage of the cancer diagnosis for both groups, breast symptoms vs duration of diagnosis for the intervention group, arm symptoms concerning the duration of diagnosis and stage of cancer at diagnosis for the control group. No known study has reported specific breast cancer QoL of life and age, duration of diagnosis, and cancer stage at diagnosis. However, a report by Rukshani et al. showed that higher QoL was associated with patients who were married, highly educated, employed, and had good family support.<sup>39</sup> Although the duration of illness was also significant, similar to our result, duration of illness specifically influenced sexual functioning and sexual enjoyment for the intervention and control group.

Similarly, educational status of college and above, being divorced, higher household income, higher scores of physical and social functioning were associated with significantly improved (better) quality of life rather than age, duration of illness or stage at diagnosis.<sup>40</sup> On the other hand, a relation was found in another report between the QoL ( $R = -0.19$ ,  $p = 0.034$ ) and the women's age.<sup>41</sup> With age, the respondents' QoL decreased, while in this study, age only influenced the sexual functioning of the women in the control group rather than the overall QoL. Thus, it is essential to know that women with breast cancer experience serious chronic health sequelae which affect breast cancer-specific QoL issues, and these adverse effects may be mitigated or reduced with the help of exercise. Breast cancer patients that come to the hospital usually have nurses as their first point of call, and nurses also remain one of the essential persons throughout their lives. Therefore, nurses, especially those in the oncology department, are encouraged to utilize every opportunity to educate the women with breast cancer about exercises they can do during and after treatment. They should also ensure the implementation and sustenance of the exercises through their support and other health care workers who manage these patients to enhance their well-being, especially breast cancer-specific quality of life issues.

In conclusion, exercise is beneficial in improving

the breast cancer-specific quality of life of women with breast cancer. Therefore, it is necessary that exercise becomes part of the treatment regimen for breast cancer patients. Shreds of evidence from the literature suggest that exercise may improve the overall well-being of women who survive breast cancer in particular and other cancer patients in general.

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### Conflict of Interest

The authors declare there is no conflict of interests associated with this study.

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