European Journal of Oncology Nursing 42 (2019) 103–109

Contents lists available at ScienceDirect

European Journal of Oncology Nursing

journal homepage: www.elsevier.com/locate/ejon

Effect of yoga exercise on the quality of life and upper extremity volume among women with breast cancer related lymphedema: A pilot study

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ARTICLE INFO

Keywords:
Breast cancer lymphedema
Edema
Quality of life
Yoga
Lymphoedema

ABSTRACT

Purpose: This pilot study aimed to evaluate the effect of an 8-weeks-yoga intervention on quality of life and upper extremity edema volume in women with breast cancer related lymphedema.

Methods: This was a controlled trial with pre-post design. A total of 40 women with breast cancer related lymphedema were randomly assigned into an intervention or control groups. The intervention group participated in a yoga exercise class for 8 weeks, in a twice a week instructor-led practice and once a week home practice. Outcomes were EORTC QLQ_C30 to measure quality of life, and water displacement volume-meter to measure upper extremity edema volume. The outcomes were evaluated at baseline, 4th and 8th week. Data were analyzed using SPSS.

Results: Four weeks after the intervention, a significant difference was observed between the groups with respect to role functioning of quality of life ($P = 0.03$). Eight weeks after the intervention, a significant difference was observed between groups concerning physical and emotional functioning of quality of life ($P < 0.05$). The changing trend in physical, role, emotional, and cognitive functioning had increased, and in some scales such as fatigue, pain, insomnia, and financial difficulties the scores were reduced in the intervention group. Regarding edema volume, no significant difference was found between both groups on the 4th and 8th week after the intervention ($P > 0.05$).

Conclusion: As yoga exercise might improve physical, role, and emotional functioning of quality of life as well as reduce fatigue, pain, and insomnia, using this intervention can be suggested amongst women with breast cancer related lymphedema.

1. Introduction

Cancer and its treatment lead to side effects and complications, such as fatigue, gastrointestinal dysfunctions (Pearce et al., 2017), renal injuries (Horie et al., 2018), mucositis (Mansouri et al., 2016; Rambod et al., 2018), and etc. Breast cancer related lymphedema (BCRL) is a chronic, progressive swelling in the upper extremity, caused by damage to lymphatic drainage system following breast cancer treatments (Goker et al., 2013). About 24% of breast cancer survivors deal with serious complication after surgery (Bozkurt et al., 2017). An epidemiological study on women with BCRL showed that 71% had undergone modified radical mastectomy, and 70.5% of them, more than 10 lymph node had been removed during breast surgery (Zakeri, 2014).

Axillary lymph node dissection and radiotherapy are the most common causes of BCRL (Lopez Penha et al., 2014; Warren, 2018). BCRL affects 66% of patients who are being treated (Cal and Bahar, 2016). With increasing number of breast cancer survivors, BCRL incidence rate is on the rise (Quere et al., 2014).

BCRL might led to a gradual decline in the physical and emotional functioning of patients as well as a dramatic drop in their quality of life (QoL) (Taghian et al., 2014). BCRL can affect the upper extremity range of motion as well as pain, heaviness and numbness in arms. In addition to decline in self-confidence, which is related to the disturbance in mental image of the body, anxiety disorders, anger and grief increase the chance of psychological problems (Rogan et al., 2016; Taghian et al., 2014).

Considering the importance of QoL and high incidence of BCRL, different treatments including elevating limb, diuretic medications,

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https://doi.org/10.1016/j.ejon.2019.08.008
Received 18 July 2018; Received in revised form 5 August 2019; Accepted 21 August 2019

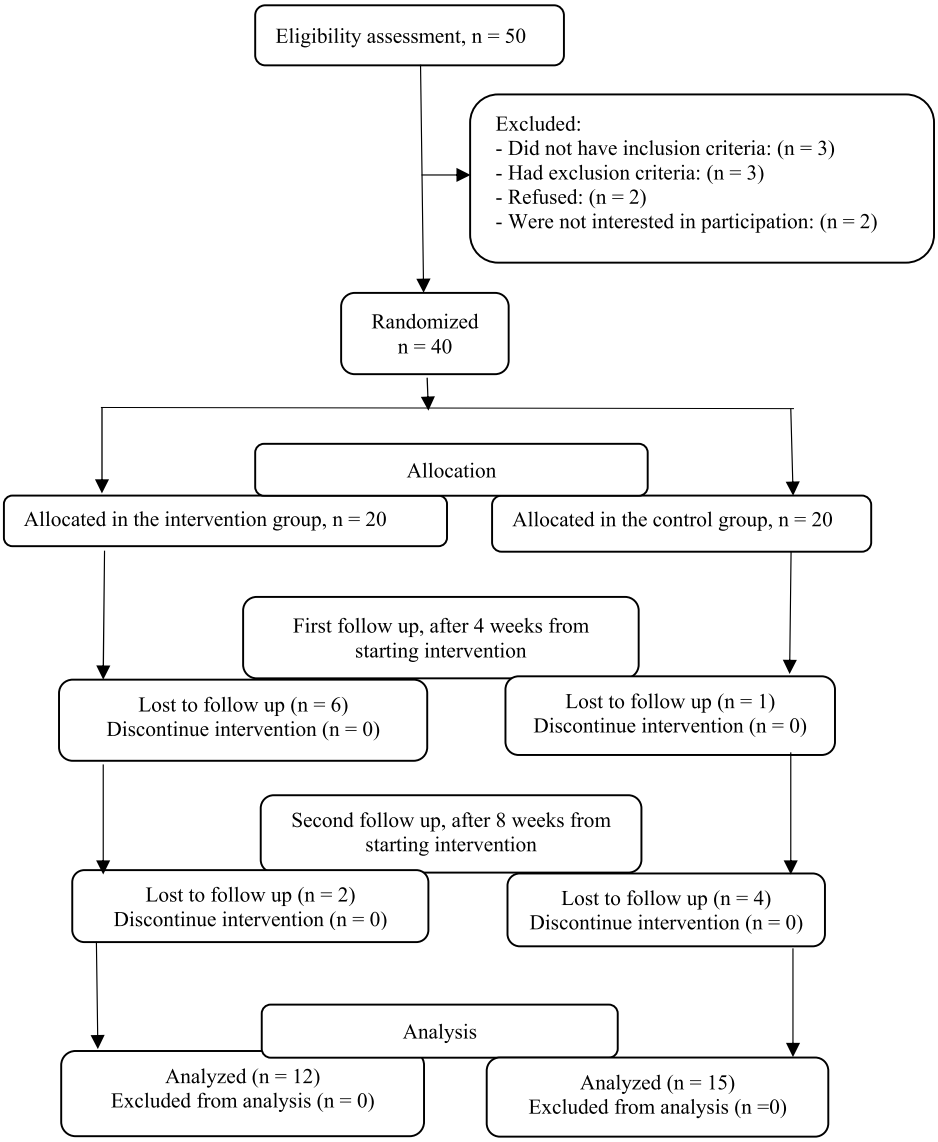

Fig. 1. Flow diagram of the trial.

massage therapy, and using pneumatic pump, and surgeries, decongestive lymphatic therapy, and compressive sleeves have been used (King et al., 2012; Sharkey et al., 2017). However, these treatments have not been able to solve the patients' problems, and there is a debate regarding their effect on improving QoL. Therefore, researchers turned their attention toward complementary and alternative medicine therapies, such as relaxation (Pasyar et al., 2015), yoga (Fisher et al., 2014; Lai et al., 2017; Narahari et al., 2016), massage therapies (Pasyar et al., 2018; Rambod et al., 2013, 2014), upper extremity exercise (McNeely et al., 2010), herbal therapy (Mansouri et al., 2016), coping program intervention (Edraki et al., 2018), and meditation (Hilton et al., 2017) to improve the health of patients with chronic diseases and to reduce their complications. Although some of the aforementioned methods have been used for BCRL, more evidences are required to approve their effects on QoL and upper extremity volume BCRL.

Researchers stated the highest level of satisfaction with yoga practices (Di Blasio et al., 2016) and believe that yoga is safe and effective method for BCRL' patients (Loudon et al., 2012). Yoga is a combination of physical and breathing exercises in addition to meditation techniques (Prathikanti et al., 2017). It consists of strength training, stretching and balancing exercises plus deep breathing and relaxation techniques (Hilton et al., 2017). Studies reported a reduction in chronic fatigue amongst breast cancer survivors after 3 months of yoga practice (Bower et al., 2012). Yoga can help a person to become aware of his physical condition by reducing stress through regular breathing (Noradechanunt et al., 2017). Also, it brings a positive attitude toward life, leading to healthier life and more positive energy (Cramer et al., 2012). Yoga and diaphragmatic breathing can purposefully transfer lymph from the lymphatic pathway to the venous route, by increasing muscle tone and activating articular pumps, thereby reducing inflammation (Ridner et al., 2012).

In the literature review, Narahari et al. showed that yoga can improve the range of motion and decrease pain intensity in women with BCRL (Narahari et al., 2016). Moreover, 8-week-yoga intervention reduced the symptom scales of QoL in women with BCRL while during this period, their arm volume of lymphedema did not change significantly (Loudon et al., 2014). Although limited number of studies have assessed the effect of yoga, more evidences are essential to evaluate the effect of yoga on QoL and upper extremity edema volume in women with BCRL.

2. Methods

2.1. Hypotheses

This pilot study hypothesizes were:

1 The mean scores of QoL and its subscales will be different in the intervention and control group 4 and 8 weeks after yoga exercises.
2. The mean score of upper extremity edema volume will be different in the intervention and control group 4 and 8 weeks after yoga exercises.

2.2. Design

This was a randomized controlled trial study. This pilot study was to evaluate feasibility, acceptability and potential effectiveness of the intervention (Donald, 2018). The study was conducted in Motahhari clinic affiliated with Shiraz University of Medical Sciences (SUMS), Shiraz, Iran.

2.3. Participants

The target population were all women with confirmed breast cancer-related lymphedema. The inclusion criteria were willing to participate in the study, having the ability to communicate verbally, to move independently without any auxiliary equipment, at least one-year had passed their breast surgery, and having a DVD player at home.

On the other hand, exclusion criteria were already participating in yoga class, having participated in similar intervention such as relaxation, massage therapy, etc. during the past three months, having any condition that could lead to exacerbation of illness or hospitalization, positive history of congestive heart failure or chronic obstructive pulmonary disease, patients under chemotherapy or radiotherapy, having pacemaker, and pregnancy.

2.4. Sampling

Forty patients with breast cancer related lymphedema were randomly assigned in the intervention or control groups. During the first follow up, 4 weeks after initiating intervention, 6 participants in the intervention group and one from the control group withdrew from the study. Moreover, in the second follow up, 8 weeks after intervention, 2 and 4 participants in the intervention and control groups withdrew from the study (Fig. 1).

2.5. Sample size

Based on a study by Siedentop et al., reported mean difference of overall quality of life in women with breast cancer from baseline and 3 months after yoga intervention was 15.62, standard deviation = 17 (Siedentopf et al., 2013), $\alpha = 0.05$, and $\beta = 80\%$, the sample size was estimated as 40 participants (20 in each group).

2.6. Randomization

At first, candidates were recruited using a random number table. Then, they were randomly assigned into two groups by block randomization method, using “Create a blocked randomization list” software.

2.7. Intervention

The intervention method in this study was yoga exercise program plus the routine BCRL care. The duration of yoga exercise program was 8 weeks (3 sessions each week). Two sessions of the weekly schedule were held under yoga mentor supervision and patients were advised to perform one session at home, using the educational DVD. Then, the participants charted their practice hours in a logbook. On the other hand, the control group only received standard routine care of lymphedema clinic and were evaluate three-times.

2.7.1. Yoga exercise protocol

In order to increase the accuracy of choosing an appropriate exercises and to prevent possible complications, the yoga protocol was used by Narahari et al. (2016). Based on this protocol, the exercises include 20 asana yoga exercises and 5 breathing exercises (Narahari et al., 2016).

These exercises were selected due to their role in chest expansion, maximizing the range of neck, shoulder, and elbow movements, ultimately maximizing stretching in the skin by activating the muscles around the axillary and lymph nodes. Also, in order to familiarize the participants, a pamphlet was given about the benefits of yoga exercise on the body structure (Narahari et al., 2016).

It should be noted that standard routine treatments included: physical examination, measuring different parts of the hand with measuring tape by a physician (based on centimeters), measuring hand volume by a physician (based on milliliter), manual lymphatic drainage (MLD) training and arm sleeve, complete decongestive therapy (CDT), antibiotic therapy. In addition, training included bandage and MLD training, exercise, skin care, physiotherapy, taping, mobilization and group exercise.

2.8. Outcome measurements

The outcomes of this study were assessed at baseline (T0), 4 weeks and 8 weeks (T2) in both intervention and control groups. The outcome measurements consisted of a form, Cancer’ quality of life questionnaire and limb volume measurements. The demographic and clinical form was used to document socio-demographic and disease-related characteristics of patients.

The European Organization for Research and Treatment of Cancer quality of life questionnaire (EORTC QLQ-C30) was used. This questionnaire assess the QoL of cancer patients. It is used in wide range of cancer patients’ population. EORCT-QLQ-C30 consists of nine multi-item scales including five functional scales (physical, role, cognitive, emotional and social functioning), three symptom scales (fatigue, pain, nausea and vomiting), and global health status/QoL scale. Six single item scales are dyspnea, insomnia, appetite loss, constipation, diarrhea and financial difficulties. All the scales range from 0 to 100. A higher score in functioning scale shows a higher level of functioning, but a high score for a symptom scale indicates a higher level of problems. It is a valid and reliable assessment questionnaire, which is being used in many countries (Aaronson et al., 1993). The validity and reliability of the Persian version of EORCT-QLQ-C30 was approved by Safaee et al. (Safaee and Moghim Dehkordi, 2007).

For limb volume measurements, water displacement method was used. It is a gold standard for measuring the amount of arm swelling in patients with lymphedema or in other words to detect edema and lymphedema (Borthwick et al., 2013; Chromy et al., 2015). This method has a good accuracy for estimation of limb volume (Chromy et al., 2015).

2.9. Blinding

In this study, the person who collected the data and the statistician who analyzed the data were blinded with respect to intervention and control groups’ allocation.

2.10. Ethical considerations

This study was conducted according to Helsinki declaration and its later amendment. It was registered in the Iranian registry of clinical trials (www.irct.ir) with ID: IRCT2017092523639N1. It was also

approved by the local Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.REC.1396.108). Permission was obtained from SUMS, Motahhari outpatient clinic and Shiraz Breast Diseases Research Center. The objectives and procedure of the study were explained, and written informed consent forms were signed by all the participants. In addition, they received information about probable side effects. They were also informed that they had the right to withdraw from the study at any time. A numerical code was used for patients' anonymity.

2.11. Data analysis

Data were analyzed using SPSS, version 22 (IBM Crop., Armonk, NY). Descriptive statistics were calculated for demographic and clinical characteristics and for the study outcomes. For parametric data, paired and independent *t*-tests were performed to evaluate the differences between upper extremities edema volumes as well as changes from baseline to weeks 4 and 8. Since the distributions of QoL data were not normal, Mann-Whitney, and Friedman tests were used. P values less than 0.05 were considered to be statistically significant.

3. Results

3.1. Demographic and clinical characteristics

The participants' demographic and clinical characteristics are presented in Table 1. The data revealed that the characteristics of the participants were homogenous in terms of socio-demographic, and disease-related and medical treatment features in both the intervention and control groups ($P > 0.05$) (Table 1).

Table 1
Comparing the intervention and control groups according to demographic and clinical characteristics.

Variables	Groups		P value
	Intervention	Control	
Age(years) Mean (SD)	51.6 (10.46)	51.8 (11.4)	0.819
Body mass index (kg/m^2) Mean (SD)	29.33 (4.07)	30.63 (5.28)	0.362
Number of completed Radiation therapy sessions Mean (SD)	21.15 (9.90)	23.05 (8.40)	0.231
Number of completed chemotherapy sessions Mean (SD)	6.70 (1.34)	6.90 (1.88)	0.517
Number of dissected lymph nodes during surgery Mean (SD)	20.81(10.98)	16.91(7.14)	0.140
Marital status			
Single	1(5)	2 (10)	0.570
Married	14 (70)	14 (70)	
Widow	4 (20)	2 (10)	
Divorced	1 (5)	2 (10)	
Education level			
Illiterate	0 (0)	1 (5)	0.701
Primary school	5 (25)	5 (25)	
High school	10 (50)	11 (55)	
University degree	5 (25)	3 (15)	
Job status			
Housewife	15 (75)	15 (75)	1.000
Employed	2 (10)	2 (10)	
Retired	3 (15)	3 (15)	
Lymphedema stage			
Stage 0	1(5)	2 (10)	0.721
Stage I	2 (10)	4 (20)	
Stage II	15 (75)	12 (60)	
Stage III	2 (10)	2 (10)	
Dominant hand			
Right	17 (85)	18 (97.5)	0.316
Left	3 (15)	2 (2.5)	
Incision site			
Right	7 (35)	11 (55)	0.204
Left	13 (65)	9 (45)	

3.2. QoL assessment

The mean scores of five functional scales of EORTC QLQ-C30 in three steps of the study is shown in Table 2. Before the study, no significant difference was found between groups with respect to the four functional scales of EORTC QLQ-C30 including physical, role, emotional and cognitive functioning ($P > 0.05$), except social functioning. Moreover, in this step, no significant difference was observed between the groups with respect to global health, symptoms scales such as fatigue, nausea and vomiting, pain, and six single item scales including dyspnea, insomnia, constipation, diarrhea, and financial difficulties ($P > 0.05$), except appetite loss.

As it can be seen in Table 2, four weeks after starting intervention, a significant difference was observed between the intervention and control groups concerning the role functioning subscale of EORTC QLQ-C30 (p = 0.03). However, the other four functional scales of EORTC QLQ-C30 were similar between groups ($P > 0.05$). Moreover, no significant difference was observed between the two groups concerning the global health, symptoms scales and six single item scales of EORTC QLQ-C30 ($P > 0.05$).

As shown in Table 2, eight weeks after intervention, a significant difference was showed between groups concerning physical, and emotional functioning of EORTC QLQ-C30 ($P < 0.05$). However, the comparison between groups showed no significant difference regarding the mean scores of other subscales of EORTC QLQ-C30.

As Table 2 shows, in the intervention group, mean scores trend of physical, role, emotional and cognitive functioning was statistically significant during the three study periods. Moreover, the changing trend in mean score of symptoms subscales such fatigue and pain and other items such as insomnia and financial difficulties was significant during the three study periods ($P < 0.05$).

On the other hand, mean scores trend of other subscales of EORTC QLQ-C30 was not significant during the three study periods.

In the control group, mean scores trend of role, social functioning and financial difficulties was statistically significant during the study periods. However, mean scores trend of other subscales of EORTC QLQ-C30 was not significant during the study periods (Table 2).

Based on the study results, the first hypothesis "The mean scores of QoL and its subscales will be different in the intervention and control groups 4 and 8 weeks after yoga exercises." was validated to some extent.

3.2.1. Upper extremities edema volume

As shown in Fig. 2, before the intervention, the mean score for upper extremities edema volume were 247.71 (SD = 378.29), and 331.50 (SD = 384.00) in the intervention and control groups. The result of this step showed no significant differences between the groups with respect to upper extremities edema volume ($P > 0.05$). In 4th week after intervention, the mean scores of upper extremities edema volume in the intervention and control groups was 294.75 (SD = 429.53), 285.00 (420.00). In the 8th week after intervention, the mean scores of upper extremities edema volume in the intervention and control group were 267.68 (SD = 410.79), 278.18 (420.00), respectively. No significant difference was observed between the intervention and control groups 4 and 8 weeks after intervention ($P > 0.05$).

Based on the study result, the second hypothesis "The mean score of upper extremity edema volume will be different in the intervention and control group 4 and 8 weeks after yoga exercises" was not approved.

4. Discussion

The results of this study indicated that yoga intervention could

Table 2
The comparison of quality of life and their subscales between the intervention and control groups during three steps of measurements.

	T0[a]			T1[b]			T2[c]			Comparison of T0,T1, T2[e]; P value	
	Intervention Group Mean (SD)	Control Group Mean (SD)	P value[d]	Intervention Group Mean (SD)	Control Group Mean (SD)	P value[d]	Intervention Group Mean (SD)	Control Group Mean (SD)	P value[d]	Intervention Group	Control Group
QLQ-C30 – Functional scales											
Physical functioning	73.93 (10.53)	70.33 (20.39)	0.75	82.58 (8.30)	74.57 (12.97)	0.05	90.74 (6.17)	77.74 (9.74)	**0.001**	$\chi2 = 21.17$;**p < 0.001**	$\chi2 = 2.26$; p = 0.32
Role functioning	66.62 (27.59)	67.02 (30.64)	0.86	93.32 (10.56)	74.53 (29.59)	**0.03**	93.04 (11.16)	89.99 (21.65)	0.98	$\chi2 = 11.52$;**p = 0.003**	$\chi2 = 11.02$;**p = 0.004**
Emotional functioning	57.83 (39.61)	52.12 (26.16)	0.83	80.88 (24.74)	63.56 (30.08)	0.08	84.70 (16.60)	54.42 (33.60)	**0.009**	$\chi2 = 7.95$;**p = 0.01**	$\chi2 = 4.11$; p = 0.12
Cognitive functioning	58.88 (27.94)	64.14 (35.17)	0.60	82.18 (13.34)	65.76 (28.05)	0.10	84.70 (16.60)	85.54 (33.60)	0.76	$\chi2 = 6.78$;**p = 0.03**	$\chi2 = 5.77$; p = 0.05
Social functioning	89.95 (26.06)	69.14 (29.25)	**0.01**	97.77 (5.87)	83.32 (29.92)	0.09	98.60 (4.82)	92.21 (17.67)	0.21	$\chi2 = 4.62$; p = 0.09	$\chi2 = 9.64$;**p = 0.008**
QLQ-C30 – Global health	63.30 (28.78)	59.55 (19.00)	0.95	75.52 (21.77)	65.18 (9.69)	0.26	81.90 (15.43)	74.96 (15.10)	0.13	$\chi2 = 4.42$; p = 0.10	$\chi2 = 3.88$; 0.14
QLQ-C30- Symptoms scales											
Fatigue	39.88 (30.96)	43.82 (28.24)	0.68	24.38 (28.80)	29.74 (26.17)	0.57	17.57 (14.55)	32.56 (28.59)	0.13	$\chi2 = 10.95$;**p = 0.004**	$\chi2 = 5.04 =$; p = 0.06
Nausea and vomiting	6.65 (12.55)	6.65 (16.57)	0.39	1.10 (4.28)	4.37 (15.53)	0.67	2.76 (6.46)	5.54 (12.04)	0.71	$\chi2 = 4.66$; p = 0.09	$\chi2 = 1.50$; p = 0.47
Pain	81.59 (40.44)	52.47 (33.89)	0.84	28.80 (39.41)	30.67 (27.35)	0.39	9.70 (14.99)	23.31 (20.70)	0.08	$\chi2 = 11.40$;**p = 0.003**	$\chi2 = 4.13$; p = 0.12
QLQ-C30- Six single item scales											
Dyspnea	16.65 (22.91)	13.32 (25.12)	0.49	15.54 (25.74)	24.53 (25.96)	0.61	8.32 (15.06)	11.10 (16.24)	0.64	$\chi2 = 3.50$; p = 0.17	$\chi2 = 0.09$; p = 0.95
Insomnia	53.31 (41.03)	59.98 (42.71)	0.53	11.10 (20.55)	33.31 (36.83)	0.06	8.32 (15.06)	22.20 (32.51)	0.29	$\chi2 = 14.46$;**p = 0.001**	$\chi2 = 3.90$; p = 0.14
Appetite loss	23.31 (26.69)	6.66 (17.42)	**0.01**	8.88 (23.43)	21.03 (76.26)	0.88	2.77 (9.61)	8.88 (15.24)	0.23	$\chi2 = 4.00$; p = 0.13	$\chi2 = 0.35$; p = 0.83
Constipation	13.32 (22.66)	10.15 (21.80)	0.70	2.22 (8.59)	6.66 (17.82)	0.40	2.77 (9.61)	7.01 (13.78)	0.40	$\chi2 = 2.92$; p = 0.23	$\chi2 = 0.66$; p = 0.71
Diarrhea	4.99 (16.29)	1.66 (7.44)	0.53	0.00 (0.00)	0.00 (0.00)	1.00	2.77 (9.61)	6.66 (18.66)	0.65	$\chi2 = 2.00$; p = 0.36	$\chi2 = 2.00$; p = 0.36
Financial difficulties	36.64 (38.82)	33.31 (35.85)	0.88	8.88 (14.55)	26.28 (28.47)	0.05	2.77 (9.61)	11.10 (16.24)	0.12	$\chi2 = 9.92$;**p = 0.007**	$\chi2 = 6.82$;**p = 0.03**

[a] **T0:** Before the intervention.
[b] T1: Four weeks after starting the intervention.
[c] T2: Eight weeks after starting the intervention.
[d] Mann-Whitney test was used.
[e] Friedman Test.

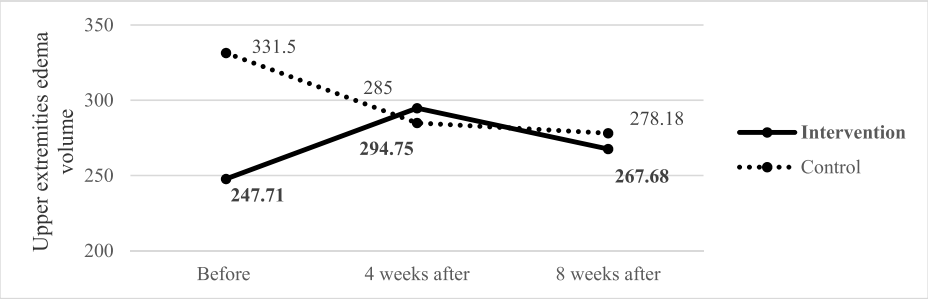

Fig. 2. Upper extremities edema volume during the three study periods between the intervention and control groups.

improve role functioning of QoL in woman with BCRL. Moreover, the changing trend in role functioning was raised as a result of yoga intervention. Similarly, it was reported that yoga therapy for 10 weeks was able improve the role functioning of QoL in post-operative breast cancer participants (Andysz et al., 2014).

Our study also showed that using yoga intervention for 8 weeks could improve physical and emotional functioning of QoL in woman with BCRL. Moreover, changing trend in physical, emotional and cognitive functioning of QoL was positive in participants who underwent yoga intervention. In addition, the participants who underwent yoga intervention seems to have experienced less financial difficulties during the study. In line with this study, researchers reported that five weeks yoga exercise held for breast cancer patients immediately after surgery, made a significant improvement in functional status and overall QoL (Siedentopf et al., 2013). Yoga improves limbo-pelvic posture, and strengths shoulder abduction in women with BCRL (Loudon et al., 2016). In fact, yoga by enhancing physical activity, and reducing fatigue and pain might relieve anxiety and promote social function in chronic diseases (Hasanpour-Dehkordi et al., 2016).

This study also indicated that the changing trend in some symptoms scales of QoL such as fatigue, and pain were reduced as a result of yoga intervention. Similarly, a study showed that using yoga intervention could reduce symptom subscale for QoL in women with BCRL (Loudon et al., 2014). Another study stated that 5 weeks yoga intervention immediately or 5 weeks after breast cancer surgery could reduce the participants physical symptoms (Siedentopf et al., 2013). Moreover, a feasibility study about the effect of yoga program for women with breast cancer during chemotherapy, reported that this intervention could improve the cognitive aspects of fatigue (Komatsu et al., 2016). Yoga could reduce the frequency and severity of fatigue in women with breast cancer (Vadiraja et al., 2017). In fact, it can also reduce fatigue severity and pain in chronic diseases (Hasanpour-Dehkordi et al., 2016).

The present study showed that insomnia was reduced during the study periods amongst the participants who were underwent yoga intervention. It was shown that sleep improvement had occurred in those with advanced breast cancer following yoga intervention (Rao et al., 2017) Actually, yoga as a well-tolerated exercise could decrease insomnia among cancer patients (Mustian et al., 2014).

The present study indicated that 4 and 8 weeks yoga intervention could not affect upper extremities' edema volume in women with BCRL. In line with our study, Loudon et al. reported that after 8 weeks yoga intervention, there were no significant differences between groups regarding arm volume of lymphedema. However, the mentioned intervention was effective after 12 weeks (Loudon et al., 2014). On the contrary, another study noted that 12 weeks yoga did not affect participants visual edema scores and change in arm volume (Lai et al., 2017).

4.1. Limitations

The study had several limitations. First, the motivation and interest of the participants influenced the implementation and follow up of the training program. Second, the individual differences when answering the questionnaire had an uncontrolled impact on the study results. Third, the study intervention spanned only 8 weeks with a relatively small sample size; hence, long-term follow-ups study in different cultural settings with larger sample size is recommended.

4.2. Implication for practice

The implication of the study for clinical practice is that yoga exercise can be a safe and well tolerated exercise in women with BCRL. Using yoga accompanied with standard care and treatment of BCRL can improve physical, role, emotional functioning of QoL, and it might reduce fatigue, pain, insomnia and financial difficulties in women with BCRL.

5. Conclusion

Yoga exercises can influence most of the functional and symptom related aspects of QoL in women with BCRL. Significant increase in physical, emotional, cognitive and emotional functioning, as well as significant reduction in pain, fatigue, insomnia, and financial difficulties should be noted as the positive result of yoga exercise. Although slight beneficial changes were observed in both the intervention and control groups arm volume, it was not statistically significant. Hence, it can be stated that yoga exercises did not induce lymphedema in our study. More studies are warranted to confirm the effectiveness of yoga intervention on improving QoL and upper extremities edema volume in women with BCRL.

Acknowledgment

This study was part of the Master of Science thesis by Nazanin Barshan Tashnizi. The authors would like to thank Shiraz University of Medical Sciences, Motahhari Polyclinic and Shiraz Breast Diseases Research Center members for their support during this research. The authors wish to appreciate all 40 breast cancer related lymphedema patients who participated in this study. Dr Saeed Ghanbari, Dr. Zeinab sadat Zakeri and the center for development of clinical research of Nemazee hospital is also appreciated for his statistical assistance. This project was financially supported by Vice-Chancellor for Research, Shiraz University of Medical Sciences, Iran, (Grant Num:1396-01-08-14417). The authors wish to thank Mr. H. Argasi at the Research Consultation Center (RCC) of Shiraz University of Medical Sciences for his invaluable assistance in editing this manuscript.

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