

Assessment of Family Caregiver Burden and Its Relationships Between Quality of Life, Arm Disability, Grip Strength, and Lymphedema Symptoms in Women with Postmastectomy Lymphedema: A Prospective Cross-Sectional Study

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ABSTRACT

Objective: The aim the study is to assess relationships between caregiver burden, quality of life, arm disability, grip strength, and lymphedema symptoms in women with postmastectomy lymphedema.

Materials and Methods: Fifty-two patients with postmastectomy lymphedema were recruited. Burden Interview, Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire and European Organization for Research and Treatment of Cancer Core Quality of Life Questionnaire (EORTC QLQ-30 and EORTC QLQ BRE-23) were used for the assessments of caregiver burden, arm disability, and quality of life. Lymphedema symptoms were questioned by Visual Analogue Scale (VAS) for pain, heaviness, and tension. Grip strength and arm volumes of the affected and unaffected sides were measured.

Results: Statistically significant positive correlations were detected between Burden Interview scores and DASH scores, VAS for pain and EORTC QLO-30 symptom scores. There were statistically negative correlations between Burden Interview and grip strength of affected side and unaffected side and lymphedema duration. Multiple linear regression was calculated to predict Burden Interview and EORTC QLO-30 functional and symptom scores based on age, DASH, stage, and duration of lymphedema. DASH score was significant predictors of Burden Interview while DASH score and Burden Interview scores were significant predictors of quality of life.

Conclusion: Arm disability indicates caregiver burden and quality of life in patients with postmastectomy lymphedema while caregiver burden predicts the quality of life. These findings have implications for the management of lymphedema. We suggest that arm disability should be diagnosed and treated to improve caregiver burden and quality of life.

Keywords: Breast cancer, caregiver burden, disability, lymphedema, quality of life

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Introduction

Breast cancer remains the leading form of malignancy for women and women diagnosed with the disease has better relative favorable survival than the other common cancers (1). Despite the improvements in the treatment, post-treatment period is of great importance due to complications such as lymphedema, decreased upper limb function and hand grip strength (2). Long-term morbidities of the treatment including lymphedema are significant since patients become cancer-free but have a chronic disability (3). Lymphedema is one of the most seen physical sequelae and has an impact on physical function and quality of life (4). Since physical functioning is strongly associated with the ability to live independently and quality of life, physical impairments, caregiver burden and quality of life are important issues. Therefore, it is essential to determine the relationships between caregiver burden, quality of life and impairments related to disease in women with postmastectomy lymphedema. Also, to improve the efficacy of treatment strategies and lower impact of lymphedema on caregiver burden, quality of life and arm function, it is crucial to understand how they relate to each other. This study aims to assess relationships between caregiver burden, quality of life, arm disability, grip strength, and lymphedema symptoms in patients with postmastectomy lymphedema.

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Materials and Methods

A total of 52 patients with postmastectomy lymphedema who were admitted to lymphedema management outpatient clinic of Department of Physical Medicine and Rehabilitation, Marmara University School of Medicine between February 2018 and July 2018 and their family caregivers participated in this prospective cross-sectional study. The study was approved by the Research Ethics Board of Marmara University School of Medicine. Informed and written consent was obtained from patients and their family caregivers. Inclusion criteria were: (1) Patients with postmastectomy lymphedema aged 18 and above (2) Patients with unilateral breast cancer who underwent breast surgery and at least one axillary lymphadenectomy (3) patients with stable lymphedema for at least 3 months Exclusion criteria were: (1) bilateral lymphedema (2) having other malignant diseases (3) current episodes of cancer or metastases (4) patients with a previous psychiatric disorder or cognitive dysfunction (5) with preoperative upper extremity disability.

Sample size estimation

The sample size estimation was performed using the G-Power V.3.1.7 (University of Kiel, Kiel, Germany). The sample size was calculated on the basis of the previously reported the mean difference in DASH score in the study conducted by Dawes et al. (4). Power analysis using a power of 95% and a significance of $p=0.05$ showed that 9 patients for each group at least had to be recruited to when the mean expected value in patients with lymphedema symptoms was 5.6 with a standard deviation of 8.3 and the mean expected value in the patients without lymphedema symptoms was 28.6 with a standard deviation of 20.9.

Outcome measures

Demographic data on age, body mass index (BMI), medical and surgical variables such as operation type, chemotherapy or radiotherapy receiving status, the age of caregiver, caregiver status, clinical lymphedema stage, lymphedema duration were recorded. Patients completed Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire and European Organization for Research and Treatment of Cancer Core Quality of Life Questionnaire (EORTC QLQ-30 and EORTC QLQ BRE-23). Lymphedema symptoms including pain, numbness, and tension in the arm were measured on a VAS (0-10). Grip strength and arm volumes of the affected and unaffected sides were measured.

The International Society of Lymphology (ISL) clinical stage

The clinical stage of lymphedema was determined according to ISL. Patients without apparent symptoms were graded as stage 0 because all patients who underwent axillary lymph node dissection were considered to have impaired lymph transport.

Stage 0 (or Ia): A latent or subclinical condition in which limb swelling is not yet evident.

Stage I: An early accumulation of fluid that subsides with limb elevation

Stage II: Tissue swelling that is not reduced by limb elevation alone. Pitting is manifested in earlier stage II, but the limb may or may not pit in later stage II as excess fat and fibrosis supervene.

Stage III: Lymphostatic elephantiasis in which pitting can be absent and trophic skin changes, such as acanthosis, further deposition of fat and fibrosis, and watery overgrowths, have developed.

Limb volume measurements

Lymphedema of the limbs was evaluated with the circumferential method. The circumferential upper limb measurements were performed with the arm abducted at 30°, starting at the level of the carpo-metacarpal joint, every 5 cm proximal to this point along both limbs. Limb volumes professional version 5.0 was used to convert arm circumference measurement values into limb volumes in milliliters (5). Interlimb volume difference was defined as edema.

Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire

The DASH is a self-report questionnaire, which detects physical function and symptoms in people with musculoskeletal disorders of the upper extremity. The DASH has 30 items, and each item is scored on a Likert scale from 1 to 5 where 1 reflects “no difficulty” and 5 “severe difficulty.” Scores are transformed to a 0–100 scale with higher DASH scores indicating greater disability. This instrument assesses physical functions, symptoms, and social functions. The optional four items related to work or sports activities were not used for this study. Test-retest reliability for the DASH exceeds to 0.96 in musculoskeletal population (6). The Turkish validity and reliability study of DASH has been conducted by Duger et al. (7).

Grip strength

Grip strength of the affected and unaffected arms was measured by using a handheld dynamometer (JAMAR, Sammons Preston, Inc., Bolingbrook, IL) in the standardized recommended position by American Society of Hand Therapy, with a rest period of 20 seconds 3 trials were performed and mean values were recorded (8).

Burden Interview

Caregiver burden is measured using the Burden Interview invented by Zarit et al. (9). The Burden Interview is the most widely used scale in studies investigating the caregiver burden. It includes 22 items and is identified as a one-factor scale. The 22 items reflect the respondent's areas of concern such as health, social, and personal life; financial situation; emotional well-being; and interpersonal relationships. Each item is scored from 0 to 4, where 0=never, 1=rarely, 2=sometimes, 3=quite frequently, and 4=nearly always. Caregiver burden is evaluated utilizing the total score obtained from the sum total of the questions. The total score is obtained by adding all the items, which can vary from 0 to 88. Higher scores indicate a high caregiver burden (10). Burden Interview has been validated in Turkish by Inci et al. (11), and its psychometric characteristics have been studied in family caregivers of inpatients in medical and surgical clinics by Ozer et al. (10).

European Organization for Research and Treatment of Cancer Core Quality of Life Questionnaire (EORTC QLQ-30 and EORTC QLQ BRE-23)

The EORTC QLQ-C30 questionnaire is a survey conducted to evaluate the quality of life in patients with breast cancer. It consists of 30 questions which assess symptoms that occurred in the previous two weeks. Responses are given on a Likert scale: 1 - not at all, 2 - a little, 3 - quite a bit, 4 - very much. The global health scale consists of two questions asking patients to classify their general health and quality of life in the previous week, by rating it from 1 to 7, in which 1 means poor and 7, excellent. The questionnaires are divided into three scales: global health scale (GHS), functional scale (FS) and symptom scale (SS). The QLQ-BR23 questionnaire has 23 items to assess functional scales and symptom scales. EORTC QLQ-C30 questionnaire and breast module QLQ-BR23 questionnaire has been validated in Turkish by Demirci et al. (12). The QoL scores were calculated according to the QLQ-C30 scoring manual (13).

Statistical Analysis

Statistical analyses were performed using Statistical analysis were performed using Statistical Package for the Social Sciences (SPSS) for Windows version 20.0 software (IBM Corp., Armonk, NY, USA). The variables were investigated using visual (histograms, probability plots) and analytical methods (Kolmogorov-Smirnov test) to determine whether they are normally disturbed. Analysis of the characteristics of patients was performed using descriptive studies. Analysis of variance (ANOVA) tests and independent samples t-tests were used to compare groups. The parameters affecting caregiver burden were investigated using Spearman correlation. A multiple linear regression model was used to identify independent predictors of caregiver burden. A p-value 0.05 was considered as statistically significant.

Results

Flow diagram for recruitment is presented in Figure 1. The sample characteristics are shown in Table 1. Patients were grouped according to lymphedema stages: Group 1: stage 0 and 1, Group 2: stage 2 and Group 3: stage 3. There were statistically significant differences between groups regarding Burden Interview, DASH, edema, EORTC QLQ-30 functional score, EORTC QLQ-30 symptom score and VAS for heaviness. Burden Interview scores of patients at stage 3 lymphedema were significantly higher than patients at other stages. EORTC QLO-30 function scores were statistically significantly lower at stage 3 than other stages. VAS for heaviness was significantly higher at stage 3 than the others (Table 2). Statistically significant positive correlations were found between DASH scores and Burden Interview scores, lymphedema stage, edema, VAS for pain, VAS for tension and heaviness, EORTC QLO-30 symptom, function, and general health scores. There were statistically significant negative correlations between DASH

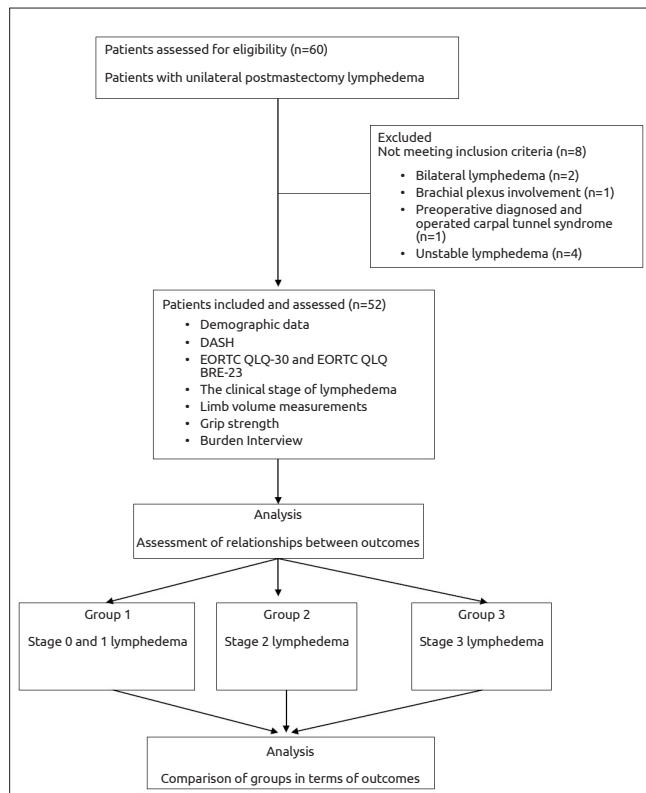


Figure 1. Flow diagram of the study recruitment

Table 1. Patient and caregiver characteristics

Age (years; mean±SD)	48±10.54
BMI (kg/m ² ; mean±SD)	27.93±4.4
Education level	
Primary school	24 (46.1%)
Secondary school	5 (9.6%)
High school	11 (21.2%)
University	12 (23.1%)
Lymphedema clinical stage median (minimum-maximum)	2 (0-3)
Duration of lymphedema (months; mean±SD)	39.47±29.89
Edema	423.35±395.19
Affected side	
Right	28 (53.8%)
Left	24 (46.2%)
Dominant side	
Right	50 (96.2%)
Left Right	2 (3.8%)
Surgery type	
Mastectomy	41(78%)
Breast-conserving surgery	11(22%)
Chemotherapy	41 (82%)
Radiotherapy	42 (84%)
Grip strength affected side	16.58±5.4
Grip strength unaffected side	20.88±4.38
Burden interview	27.82±12.25
DASH questionnaire	43.71±22.07
EORTC QLQ-30 functional score	61.96±26.51
EORTC QLQ-30 symptom score	33.03±19.96
EORTC QLQ-30 general health score	56.37±19.66
EORTC QLQ BRE-23 functional score	57.1±15
EORTC QLQ BRE-23 symptom score	44.36±24.29
VAS for pain	3.82±3.08
VAS for tension in the arm	4.23±3.11
VAS for heaviness	4.7±2.8
Caregiver age	48.46±17.18
Caregiver gender	
Female	14(26.9%)
Male	38 (73.1%)
Caregiver relationship to patient	
Husband	35 (67.3%)
Daughter	12 (23.1%)
Son	1 (1.9%)
Sister	3 (5.8%)
Other	1 (1.9%)
Caregiver education level	
Primary school	17 (32.7%)
Secondary school	8 (15.4%)
High school	10 (19.2%)
University	17 (32.7%)

BMI: body mass index; ISL: The International Society of Lymphology; DASH: disabilities of the arm, shoulder, and hand; EORTC QLQ: European Organization for Research and Treatment of Cancer Core Quality of Life Questionnaire

Table 2. Comparison of outcome variables among lymphedema stages

	Stage 0 and 1	Stage 2	Stage 3	p ^a	p ^b	p ^c	p ^d
Burden Interview	31.33±13.26	25.54±12.81	46.6±10.13	0.01	0.73	0.015	0.03
DASH	35.74±21.13	48.62±19.51	61.58±17.04	0.03	0.26	0.02	0.03
Grip affected side (kgf)	17.44±5.5	14.63±5.06	15.6±4.77	0.91	0.91	0.65	0.71
Grip unaffected side (kgf)	21±4.3	20.9±3.61	19.2±3.89	0.205	0.31	0.32	0.09
Edema	153±222	599±411.51	1639	0.0001	0.0001	0.0001	0.03
EORTC QLQ-30 functional score	66.91±22.01	66.46±15.85	36.88±32.07	0.001	0.28	0.002	0.002
EORTC QLQ-30 symptom score	34.47±21.57	27.73±15.63	48.2±18.7	0.07	0.69	0.069	0.018
EORTC QLQ-30 general health score	58.33±20.83	54.54±23.67	58.33±19.54	0.116	0.95	0.475	0.51
EORTC QLQ BRE-23 functional score	55.09±19.84	61.36±14.07	65.83±21.12	0.99	0.95	0.98	0.99
EORTC QLQ BRE-23 symptom score	40.27±22.87	40.53±22.36	57.5±28.77	0.49	0.32	0.25	0.78
VAS for pain	3.77±2.77	3.36±3.35	4.4±1.51	0.96	0.8	0.92	0.93
VAS for tension in the arm	4.33±2.39	3.54±3.26	6.6±1.81	0.15	0.15	0.09	0.39
VAS for heaviness	3.88±2.31	5±3.13	6.8±2.28	0.03	0.03	0.016	0.43

Data are presented as mean±SD

VAS: visual analogue scale; DASH: disabilities of the arm, shoulder, and hand; EORTC QLQ: European Organization for Research and Treatment of Cancer Core Quality of Life Questionnaire

p^a: p value by independent samples t test for intergroup comparisons by ANOVA

p^b: p value by independent samples t test for pairwise differences between lymphedema stage 0,1 and stage 2

p^c: p value by independent samples t test for pairwise differences between lymphedema stage 0,1 and stage 3

p^d: p value by independent samples t test for pairwise differences between lymphedema stage 2 and stage 3

and grip strength of the affected and unaffected limbs (Table 3). Statistically significant positive correlations were also detected between Burden Interview scores and DASH scores, VAS for pain and EORTC QLO-30 symptom scores. There were statistically negative correlations between Burden Interview and grip strength of affected side and unaffected side, lymphedema duration (Table 3). Multiple linear regression was calculated to predict Burden Interview based on age, DASH, stage, and duration of lymphedema. A significant regression equation was found ($F(4,45) = 5.307, p < 0.001$), with an R^2 of 0.321 (Table 4). DASH scores were significant predictors of Burden Interview. Multiple linear regression analyses were calculated to predict EORTCQ functional and symptom scores based on age, DASH, Burden Interview, stage and duration of lymphedema. DASH scores and Burden Interview scores were significant predictors of EORTCQ functional and symptom scores ($F(5,41) = 8.467, p < 0.000, R^2 = 0.508, F(5,44) = 6.58, p < 0.000, R^2 = 0.428$; consecutively) (Table 5)

Discussion and Conclusion

Postmastectomy lymphedema is a condition that causes long-term sequelae such as decreased physical function, impaired quality of life and psychological distress. Impact of lymphedema on arm function and quality of life and related factors were previously studied. However, their relations to caregiver burden were not demonstrated before. This study aimed to assess relationships between caregiver burden, quality of life, arm disability, grip strength, and lymphedema symptoms in patients with postmastectomy lymphedema. Our results revealed that caregiver burden was associated with arm disability and quality of life of these patients while arm disability was associated with lymphedema stage, lymphedema symptoms and quality of life. Arm disability affects caregiver burden and quality of life in these patients. We found that

arm disability was higher in patients at stage 3 lymphedema than patients at milder stages. Supporting, Dawes et al. (4) found that DASH scores of women with symptoms of lymphedema was higher than those without symptoms. We compared patients at different stages of lymphedema and found that patients at stage 3 demonstrated more impairment in EORTC QOL-30 function scores. In contrast to the findings of the present study, Dawes et al. (4) reported that women with the different volume groups did not vary significantly on subscales of EORTC QOL-30. There were no differences among groups regarding VAS for pain and tension while VAS heaviness was higher in patients at stage 3 lymphedema. Dawes et al. (4) did not detect any differences between symptomatic and asymptomatic patients regarding McGill pain questionnaire, but they also measured pain using SF-36 and found more limitation due to pain in this scale. Patients at stage 0 and 1, stage 2 and stage 3 were found to be similar regarding grip strength of the affected and the unaffected side. In line with these results of the current study, Gomes et al. (2) demonstrated that grip strength did not change regardless of the presence and absence of lymphedema. Supporting, Hladiuk et al. (14) reported that muscle strength had recovered at one month after operation in %80 of women. We detected that arm disability was significantly associated with age, caregiver burden, lymphedema stage, edema, VAS for pain, VAS for tension and heaviness, EORTC QLO-30 symptom, function, and general health scores. Contrary to our findings, Dawes et al. (4) found no relationships between the volume of edema and DASH scores. In another study investigating the relationship between swelling, numbness, pain and arm function, pain intensity and swelling in the arm were found related to the functional status of arm/shoulder (15). In their study on quality of life, upper extremity function and effects of treatment in patients with postmastectomy lymphedema, Park et al. (16) found that upper extremity function was correlated with the

Table 3. Correlations between caregiver burden, age, DASH, grip strength, lymphedema stage and duration, edema, arm symptoms and quality of life

	BI	Age	DASH	Grip affected side	Grip unaf- fected side	Lymph- edema stage	Lymph edema duration	Edema	VAS pain	VAS tension	VAS heaviness	EORTC QLQ- 30 FS	EORTC QLQ- 30 GHS	EORTC QLQ BRE- 23 FS	EORTC QLQ BRE- 23 SS
BI	r 1	0.002	0.535**	-0.440**	-0.284*	0.228	-0.277*	0.271	0.360**	0.180	0.238	0.592**	-0.266	-0.200	0.231
	p	0.991	0.000	0.001	0.043	0.105	0.049	0.052	0.010	0.203	0.089	0.000	0.057	0.209	0.174
Age(years)	r	0.002	1	-0.027	-0.064	0.348*	-0.081	0.124	-0.319*	-0.252	-0.018	-0.003	-0.052	0.399**	0.211
	p	0.991	0.851	0.693	0.654	0.011	0.572	0.380	0.023	0.071	0.896	0.985	0.716	0.010	0.217
DASH	r	0.535**	-0.027	1	-0.508**	0.371**	-0.161	0.291*	0.356*	0.321*	0.442**	0.531**	-0.435**	-0.275	0.119
	p	0.000	0.851	0.000	0.022	0.007	0.265	0.038	0.011	0.022	0.001	0.000	0.001	0.086	0.495
Grip affected side(kgf)	r	-0.440**	0.057	1	0.632**	-0.051	0.067	-0.057	-0.487**	-0.195	-0.109	0.301*	0.077	0.188	-0.126
	p	0.001	0.693	0.000	0.000	0.724	0.646	0.693	0.000	0.170	0.446	0.037	0.589	0.244	0.471
Grip unaffected side(kgf)	r	-0.284*	-0.064	0.632**	1	-0.001	0.050	-0.014	-0.246	0.030	0.012	0.368*	-0.259	0.351*	-0.278
	p	0.043	0.654	0.000	0.992	0.992	0.732	0.923	0.085	0.833	0.932	0.010	0.066	0.546	0.106
Lymphedema stage	r	0.228	0.348*	0.371**	-0.051	1	-0.214	0.632**	0.031	0.285*	0.375**	-0.363*	0.206	-0.254	0.180
	p	0.105	0.011	0.007	0.724	0.992	0.132	0.000	0.829	0.041	0.006	0.010	0.143	0.069	0.294
Lymphedema duration	r	-0.277*	-0.081	0.067	0.050	1	-0.214	0.031	-0.016	-0.053	-0.054	0.182	-0.214	-0.033	0.051
	p	0.049	0.572	0.265	0.732	0.132	0.831	0.831	0.913	0.710	0.708	0.217	0.132	0.073	0.772
Edema	r	0.271	0.124	0.291*	-0.014	0.632**	0.031	1	0.060	0.306*	0.368**	-0.149	0.033	-0.126	0.007
	p	0.052	0.380	0.038	0.923	0.000	0.831	0.678	0.678	0.027	0.007	0.306	0.814	0.374	0.969
VAS pain	r	0.360**	-0.319*	0.356*	-0.246	0.031	-0.016	0.060	1	0.496**	0.366**	-0.125	0.315*	-0.148	0.040
	p	0.010	0.023	0.011	0.085	0.829	0.913	0.678	0.000	0.000	0.008	0.398	0.024	0.299	0.817
VAS tension	r	0.180	-0.252	0.321*	0.030	0.285*	-0.053	0.306*	0.496**	1	0.644**	-0.308*	0.260	-0.190	0.126
	p	0.203	0.071	0.022	0.833	0.041	0.710	0.027	0.000	0.000	0.000	0.032	0.062	0.177	0.465
VAS heaviness	r	0.238	-0.018	0.442**	0.012	0.375**	-0.054	0.368**	0.644**	1	-0.343*	0.350*	-0.374**	-0.038	0.230
	p	0.089	0.896	0.001	0.932	0.006	0.708	0.007	0.008	0.000	0.016	0.011	0.006	0.815	0.177
EORTC QLQ- 30 FS	r	-0.622**	-0.053	0.301*	0.368*	-0.363*	0.182	-0.149	-0.125	-0.308*	-0.343*	1	-0.769**	0.140	0.558**
	p	0.000	0.717	0.000	0.037	0.010	0.217	0.306	0.398	0.032	0.016	0.000	0.336	0.000	0.052

Table 3. Correlations between caregiver burden, age, DASH, grip strength, lymphedema stage and duration, edema, arm symptoms and quality of life (continued)

	BI	Age	DASH	Grip affected side	Grip unaffected side	Lymphedema stage	Lymphedema duration	Edema	VAS pain	VAS tension	VAS heaviness	EORTC QLQ-30 FS	EORTC QLQ-30 SS	EORTC QLQ-30 GHS	EORTC QLQ-BRE-23 FS	EORTC QLQ-BRE-23 SS
EORTC QLQ-30 SS	r	0.592**	-0.003	0.531**	-0.313*	-0.259	0.206	0.033	0.315*	0.260	0.350*	-0.769**	1	-0.285*	-0.449**	0.387*
	p	0.000	0.985	0.000	0.025	0.066	0.143	0.814	0.024	0.062	0.011	0.000		0.041	0.003	0.020
EORTC QLQ-30 GHS	r	-0.266	-0.052	-0.435**	0.077	-0.087	-0.254	-0.126	-0.148	-0.190	-0.374**	0.140	-0.285*	1	0.115	-0.093
	p	0.057	0.716	0.001	0.589	0.546	0.069	0.374	0.299	0.177	0.006	0.336	0.041		0.474	0.589
EORTC QLQ-BRE-23 FS	r	-0.200	0.399**	-0.275	0.188	0.351*	0.092	0.096	0.002	-0.023	-0.038	0.558**	-0.449**	0.115	1	-0.314
	p	0.209	0.010	0.086	0.244	0.026	0.569	0.550	0.989	0.887	0.815	0.000	0.003	0.474		0.104
EORTC QLQ-BRE-23 SS	r	0.231	0.211	0.119	-0.126	-0.278	0.180	0.007	0.040	0.126	0.230	-0.336	0.387*	-0.093	-0.314	1
	p	0.174	0.217	0.495	0.471	0.106	0.294	0.969	0.817	0.465	0.177	0.052	0.020	0.589	0.104	

BI: burden interview; VAS: visual analogue scale; DASH: disabilities of the arm, shoulder and hand; EORTC QLQ: European Organization for Research and Treatment of Cancer Quality of Life Questionnaire; FS: function score; SS: symptom score; GHS: general health score; BRE-23: Breast cancer module

age of patients and quality of life was influenced by metastatic stage of breast cancer. Similarly, the quality of life of breast cancer survivors with arm symptoms was reported to be worse than the patients without arm symptoms (17). Also, there were significant associations between restricted arm mobility, lymphedema and life interference domain of Impact of Cancer Scale which is a specific quality of life instrument for long-term cancer survivors (17). The results of the present study showed that arm disability and caregiver burden were indicators of quality of life of patients with postmastectomy lymphedema. In line with our results, it was demonstrated that arm symptoms were more correlated with quality of life than interlimb volume differences and lymphedema severity (18). Similarly, Dawes et al. (4) demonstrated significant relationships between DASH and health-related quality of life.

According to the findings of our study patients at stage 3 face more caregiver burden, arm disability and health-related quality of life. Therefore, this study has a significant clinical message concerning patients with postmastectomy lymphedema, namely that lymphedema results in caregiver burden, contrary to known fact that physical demand related to physical difficulty and caregiver demand following breast cancer treatment seems to be low, not high.

Today, complex decongestive therapy is accepted as the gold standard therapy for postmastectomy lymphedema. Up to now, studies investigating the effectiveness of complex decongestive therapy focused on volume reduction and improvement of the quality of life rather than arm disability and physical demand of patients and caregiver burden. Only a limited number of studies evaluated the effects of complex decongestive therapy on upper limb functions (6). Arm disability, physical demand, and caregiver burden are an essential factor that must be considered in the management of postmastectomy lymphedema. Hayes et al. (1) assessed the frequency and physical demand of daily tasks requiring upper body function in women following breast cancer treatment. They detected that diagnosis of lymphedema and fitness level were the most related factors with task burden (1). To the best of our knowledge, no studies investigating caregiver burden exist even though patients with postmastectomy lymphedema experience burden in daily activity tasks. Assessing the caregiver burden in addition to arm disability and health-related quality of life can be viewed as strengths of the present study. Its cross-sectional design can be acknowledged as a limitation. This was an observational study using a convenience sample. Comparison of caregiver burden before and after lymphedema development and treatment can more enlighten the importance of caregiver burden in the management of patients with postmastectomy lymphedema.

In conclusion, caregiver burden was found to be correlated with arm disability, pain and health-related quality of life, grip strength, and lymphedema duration. Arm disability affects caregiver burden and quality of life in patients with postmastectomy lymphedema while caregiver burden af-

Table 4. Linear regression analysis of predictors for caregiver burden

	B	SE B	β	t	p
Age	0.048	0.2	0.032	0.24	0.812
DASH	0.361	0.095	0.517	3.81	0.0001
Lymphedema stage	-0.386	2.65	-0.021	-0.145	0.88
Lymphedema duration	-0.076	0.053	-0.18	-1.424	0.16

DASH: disabilities of the arm, shoulder and hand

Table 5. Linear regression analysis of predictors for EORTC QLQ-30 functional and symptom score and symptom score

		B	SE B	β	t	p
EORTC QLQ-30 functional score	Age	-0.234	0.261	-0.110	-0.898	0.374
	DASH	-0.508	0.147	-0.47	-30.45	0.001
	BI	-0.538	0.195	-0.352	-20.756	0.009
	Lymphedema stage	0.068	3.659	0.003	0.018	0.985
	Lymphedema duration	-0.014	0.069	-0.023	-0.199	0.843
EORTC QLQ-30 symptom score	Age	0.010	0.231	0.006	0.044	0.965
	DASH	0.305	0.126	0.351	2.427	0.019
	BI	0.489	0.172	0.393	2.844	0.007
	Lymphedema stage	-0.894	3.066	-0.039	-0.292	0.772

BI: burden interview; DASH: disabilities of the arm, shoulder and hand; EORTC QLQ: European Organization for Research and Treatment of Cancer Core Quality of Life Questionnaire

fects the quality of life. These findings have implications for the management of lymphedema. Arm disability should be diagnosed and treated to improve caregiver burden and quality of life. Further studies investigating the effect of treatments for lymphedema also focusing on improvement of arm disability related to caregiver burden and quality of life should be conducted.

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