



## Upper extremity function and quality of life in patients with breast cancer related lymphedema

Funkcija ruke i kvalitet života kod bolesnica sa limfedemom nakon lečenja karcinoma dojke

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### Abstract

**Background/Aim.** Upper limb lymphedema is one of the most frequent chronic complications after breast cancer treatment with a significant impact on the upper extremity function and quality of life (QoL). The aim of this study was to estimate health-related quality of life (HRQoL) in patients with breast-cancer-related lymphedema and its correlation with upper limb function and the size of edema. **Methods.** The cross-sectional study included 54 breast-cancer-related lymphedema patients. The quality of life was evaluated by the Short Form 36-Item Health Survey (SF-36). Upper limb function was assessed by the Quick Disability of the Arm, Shoulder and Hand questionnaire (Quick DASH). The size of lymphedema was determined by the arm circumference. **Results.** The higher HRQoL score was assessed for mental health ( $47.0 \pm 12.2$ ) than for physical one ( $42.2 \pm 7.5$ ). The highest values of SF-36 were found in the domains of Mental Health ( $67.7 \pm 22.9$ ) and Social Function ( $70.1 \pm 23.1$ ). The lowest scores were registered in the domains of Role Physical ( $46.9 \pm 39.1$ ) and General Health ( $49.3 \pm 20.1$ ). Upper extremity function statistically significantly correlated with the domains Role Physical, Bodily Pain and Physical Composite Summary and also, with the domain Role Emotional ( $p < 0.01$ ). There was no statistically significant correlation between size of lymphedema and tested domains of quality of life ( $p > 0.05$ ). **Conclusion.** Physical disability in patients with breast-cancer-related lymphedema influences quality of life more than mental health. Upper limb function has a significant impact on quality of life, not only on the physical, but also on the mental component. The presence of breast-cancer-related lymphedema certainly affects upper limb function and quality of life, but in this study no significant correlation between the size of edema and quality of life was found.

### Key words:

breast neoplasms; carcinoma; upper extremity; lymphedema; quality of life.

### Apstrakt

**Uvod/Cilj.** Limfedem ruke je jedna od najčešćih komplikacija nakon lečenja karcinoma dojke koja može da ima značajan uticaj na funkciju gornjeg ekstremiteta i na kvalitet života. Cilj ove studije bio je da proceni kvalitet života kod bolesnica sa limfedemom nakon lečenja karcinoma dojke i njegovu povezanost sa funkcijom ruke i veličinom edema. **Metode.** Ova studija preseka obuhvatila je 54 bolesnice sa limfedemom nakon lečenja karcinoma dojke. Za merenje kvaliteta života korišten je opšti upitnik *Short Form 36-Item Health Survey (SF-36)*. Za procenu funkcije ruke korištena je kratka verzija specifičnog upitnika Nesosobnost ruke, ramena i šake (*Quick Disability of the Arm, Shoulder and Hand questionnaire- Quick DASH*). Veličina limfedema je određivana merenjem obima ruke. **Rezultati.** Veća vrednost kompozitnog skora SF-36 upitnika dobijena je za mentalno ( $47,0 \pm 12,2$ ), nego za fizičko zdravlje ( $42,2 \pm 7,5$ ). Najveće vrednosti pojedinačnih skorova kvaliteta života dobijene su za domene mentalnog zdravlja ( $67,7 \pm 22,9$ ) i socijalnog funkcionisanja ( $70,1 \pm 23,1$ ). Najniže vrednosti su registrovane za domene onesposobljenost zbog fizičkog zdravlja ( $46,9 \pm 39,1$ ) i opšteg zdravlja ( $49,3 \pm 20,1$ ). Funkcija gornjeg ekstremiteta je statistički značajno korelirala sa domenima onesposobljenost zbog fizičkog zdravlja, bolom i fizičkim kompozitnim skorom, kao i sa domenom onesposobljenosti zbog emocionalnog stanja ( $p < 0,01$ ). Nije bilo statistički značajne povezanosti između veličine otoka i testiranih domena kvaliteta života ( $p > 0,05$ ). **Zaključak.** Fizička onesposobljenost kod bolesnica sa limfedemom nakon lečenja karcinoma dojke više utiče na kvalitet života, nego mentalno zdravlje. Funkcija ruke ima značajan uticaj na kvalitet života, ne samo na njegovu fizičku komponentu, već i na mentalnu. Prisustvo limfedema utiče na smanjenje funkcije ruke i kvalitet života, ali u ovoj studiji nismo dobili uzajamnu vezu između kvaliteta života i veličine otoka.

### Ključne reči:

dojka, neoplazme; karcinomi; ruka; limfedem; kvalitet života.

## Introduction

Upper limb lymphedema is one of the most frequent chronic complications after the breast cancer treatment. The incidence of breast cancer related lymphedema (BCRL) varies from 0% after sentinel lymph node dissection to 56% after axillary lymph node dissection and radiation therapy to the axilla<sup>1-4</sup>. Its incidence is not precisely established because of unpredictable onset (it can develop immediately after the breast cancer treatment or many years later) and the lack of consensus about clinical criteria for the diagnosis and standard methods of assessment<sup>1,3-5</sup>.

Several symptoms and impairments often occur in these patients: heaviness, tightness, numbness, weakness and pain (due to brachial plexopathy, peripheral neuropathy, rotator cuff disease, adhesive capsulitis, De Quervain tenosynovitis) as well as susceptibility to infection of an edematous limb. All of these impairments can cause functional problems (range of motion reduction, decreased shoulder and arm muscles strength) and limitations in activities requiring use of the affected extremity<sup>1,6,7</sup>.

Disfiguring, disabling and chronic nature of BCRL and activity limitations may have significant influence on patient's daily life and, hence, quality of life (QoL)<sup>5,8</sup>. Reduced QoL is not just a consequence of reduced physical functioning but also derives from adverse effects on the psychosocial and social domains of function<sup>9</sup>.

Therefore, the relationship between lymphedema, upper limb function and quality of life has emerged as an important component in caring for breast cancer survivors<sup>4</sup>.

The aim of this study was to estimate a health related quality of life (HRQoL) in patients with lymphedema after breast cancer treatment and its correlation with upper limb function and the size of edema.

## Methods

This cross-sectional study included 54 BCRL patients. All the patients had unilateral axillary lymph node dissection. Exclusion criteria were: metastatic cancer patients, shoulder and arm impairments due to neurologic, rheumatologic or orthopedic conditions, diagnosed before surgery, persisting infection, psychiatric disorders diagnosed and treated with drugs.

The quality of life was evaluated with the Short Form 36-Item Health Survey (SF-36). The SF-36 is a widely used, generic, self-report measure of health status and it has good internal consistency, convergent and divergent validity and moderately good construct validity within breast cancer survivors<sup>10</sup>. It contains 36 items that are combined to form four physical domain scales: Physical Functioning (PF), Role Physical (RP), Bodily Pain (BP), General Health (GH), summarized as the Physical Component Summary (PCS) measure; and four mental domain scales: Vitality (VT), Social Functioning (SF), Role Emotional (RE) and Mental Health (MH) summarized as the Mental Component Summary (MCS) measure. Each scale is standardized on a 0 to 100 score; higher scores indicate better health status. The PCS

and MCS were designed to have the mean score of 50 and a standard deviation of 10 in a representative sample<sup>11</sup>. (To calculate PCS and MCS, we used norms for the United States, from 1998.

Upper extremity function was assessed by the Quick Disability of the Arm, Shoulder and Hand questionnaire (Quick DASH), which is valid and reliable instrument for measurement of upper extremity disability in breast cancer survivors<sup>12</sup>. The Quick DASH was developed as a shortened version of the DASH Outcome Measure<sup>13</sup>. Instead of the 30 items of the DASH, the Quick DASH uses 11 items to measure physical function and symptoms related to upper limb musculoskeletal disorders during a 7-day period before administration. Each item has 5 response options, with a patient's answering 1 for activities performed with "no difficulty", and 5 for activities unable to perform or performed with "extreme difficulty". The final score is calculated by the first summing total responses and then dividing this figure by the total number of completed items. From this figure 1 is subtracted and then multiplied by 25. A score can only be calculated with a maximum of 1 omitted item<sup>12</sup>.

The lymphedema was determined by the arm circumference measured at the 7 points of the affected and contralateral side. The size of lymphedema was expressed as the relation between total circumference of healthy and affected arm, and calculated according to the following formula: [(total circumference of affected arm – total circumference of healthy arm) / total circumference of healthy arm] × 100.

Statistical analysis included descriptive statistics (arithmetic mean, standard deviation, median, range, minimum, maximum) and correlation analysis. Pearson's correlation coefficient was used to examine the relation between variables. Testing was two-sided, with sets at 0.05 for a statistical significance and 0.01 for a high statistical significance. The SPSS 15.0 statistical software package was used for all calculations.

## Results

The study included 54 BCRL patients treated at the Institute of Physical Medicine and Rehabilitation "Dr Miroslav Zotović", Banja Luka, Bosnia and Herzegovina. Table 1 shows the clinical characteristics of the patients.

The higher HRQoL score was assessed for mental health ( $47.0 \pm 12.2$ ) than for physical one ( $42.2 \pm 7.5$ ) and it was statistically significant ( $p < 0.05$ ). The highest values of SF-36 were found in the domains of Social Functioning ( $70.1 \pm 23.1$ ) and Mental Health ( $67.7 \pm 22.9$ ). The lowest scores of SF-36 were registered in domains of Role Physical ( $46.9 \pm 39.1$ ) and General Health ( $49.3 \pm 20.1$ ). The results of the domain scales of the SF-36 questionnaire are shown in Figure 1.

The mean Quick DASH score was 30.04 (SD =  $\pm 10.95$ ; range 14.4–59.0).

Upper extremity function was statistically significantly correlated with the domains Role Physical, Bodily Pain and the Physical Component Summary ( $p < 0.01$ ). There was

Table 1

Clinical characteristics of the patients				
Variable	n (%)	Mean (SD)	Median	Range (min–max)
Age (years)		56.04 ( $\pm$ 9.03)	57.00	(38–72)
< 50	14 (25.9)			
50–69	37 (68.5)			
> 70	3 ( 5.6)			
Time from surgery (months)		46.41 ( $\pm$ 31.96)	38.00	(6–117)
Type of breast surgery				
radical mastectomy	36 (66.7)			
partial mastectomy	3 ( 5.5)			
segmentectomy	15 (27.8)			
Number of lymph nodes removed		13.78 ( $\pm$ 5.39)	14.00	(6–35)
Therapy				
chemotherapy	44 (81.5)			
radiotherapy	36 (66.7)			
hormonal	37 (68.5)			
Duration of lymphedema (months)		33.37( $\pm$ 26.04)	23.00	(6–114)
BMI (kg/m <sup>2</sup> )		27 ( $\pm$ 4.32)	26.90	(18.36–37.64)
underweight (< 18.50)	1 (1.8)			
normal range (18.50–24.99)	17 (31.5)			
pre-obese (25.00–29.99)	25 (46.3)			
obese (> 30)	11 (20.4)			
Comorbidity (medications for)				
heart disease	14 (25.9)			
thyroid problems	12 (22.2)			
diabetes	3 ( 5.5)			
circulation problems	6 (11.1)			
osteoporosis	9 (16.7)			

BMI – body mass index; SD – standard deviation.

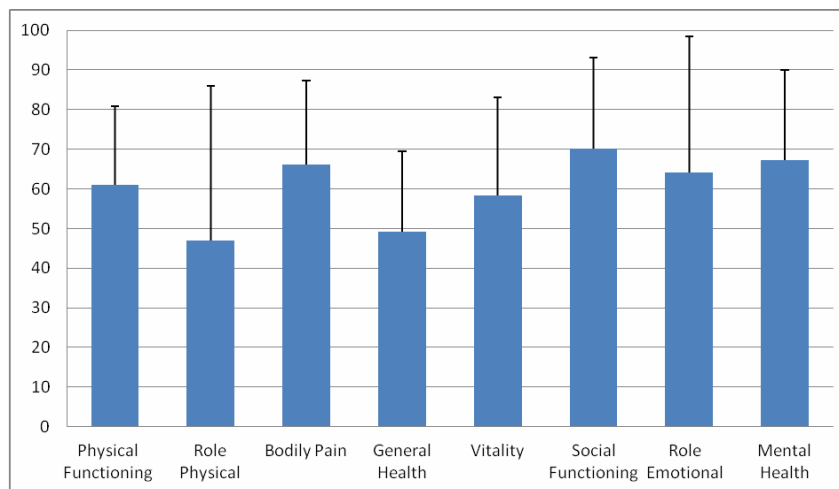


Fig. 1 – Domain scales of Short form 36-item Health Survey (SF-36).

also a negative correlation between Quick DASH and Role Emotional ( $p < 0.01$ ) and between Quick DASH and Vitality, Social Functioning and Mental Component Summary at the level  $p < 0.05$  (Table 2).

The mean size of lymphedema was 4.56% (SD =  $\pm$  3.52; range 0–14.18%). There were 2 patients without changes in the arm circumference. We had not excluded them from the study, because they had edema of breast and axilla. The majority of women (90.74%) had mild or moderate lymphedema (difference between total circumference of healthy and affected arm < 10%). Severe lymphedema (the difference between total upper limb circumferences > 10%) was found in 9.26% women. The dominant arm was invol-

ved in 40.62% of cases. There was no statistically significant correlation between the size of lymphedema and tested domains of quality of life questionnaire (Table 3). Also, there was no correlation between the size of edema and the Quick DASH score.

### Discussion

Many studies compared the quality of life between breast cancer survivors and general population. Other studies are mostly focused on comparison HRQoL of patients with lymphedema and patients without lymphedema. Although there have been some differences between studies in specific domains

**Table 2**  
**Correlation between Quick Disability of the Arm, Shoulder and Hand Questionnaire (Quick DASH) and quality of life [Short Form 36-Item Health Survey (SF-36) scores]**

PCS, MCS and domain scales of SF-36	r*	p
Physical QoL		
Physical Functioning	-0.247	0.071
Role Physical	-0.364	0.007
Bodily Pain	-0.577	0.001
General Health	-0.154	0.270
PCS	-0.503	0.001
Mental QoL		
Vitality	-0.283	0.038
Social Functioning	-0.318	0.020
Role Emotional	-0.444	0.001
Mental Health	-0.185	0.186
MCS	-0,322	0.018

\*Pearson's correlation coefficient.

PCS – Physical Component Summary; MCS – Mental Component Summary; Physical QoL – Physical quality of life; Mental QoL – Mental quality of life; SF36 – Short Form 36-Item Health Survey.

**Table 3**  
**Correlation between the size of edema and scores of Short Form 36-Item Health Survey (SF -36)**

PCS, MCS and domain scales of SF-36	r*	p
Physical QoL		
Physical Functioning	-0.075	0.591
Role Physical	-0.080	0.563
Bodily Pain	-0.117	0.401
General Health	-0.030	0.828
PCS	-0.079	0.572
Mental QoL		
Vitality	-0.085	0.542
Social Functioning	-0.095	0.494
Role Emotional	-0.033	0.815
Mental Health	-0.095	0.493
MCS	-0.106	0.445

\*Pearson's correlation coefficient.

For abbreviations see under Table 2.

of HRQoL affected, the general consensus is that HRQoL is lower in breast cancer survivors with lymphedema or related arm symptoms compared with breast cancer survivors without lymphedema or arm symptoms<sup>2,3,14-16</sup>. This study did not have a control group. But, the results of this study related to the lower physical component of quality of life of patients with lymphedema are similar to previous studies<sup>3,17</sup>.

The lowest scores of SF-36 were registered in domains of Role Physical and General Health. Lee et al.<sup>4</sup> have obtained the same results. Velanovich and Szymanski<sup>18</sup> reported that patients with lymphedema had significantly lower median scores in the domains of Role Emotional and Bodily Pain.

All patients in our study had chronic lymphedema (mean duration 33.37 months, range 6–114 months). We believe that the mental component of quality of life is less affected, because they accept their condition as chronic and learn to live with it.

Our results show a strong relationship between arm dysfunction and BCRL patient's quality of life. These results are complementary to the findings of other researchers<sup>3,19-22</sup>.

Hormes et al.<sup>19</sup> found that arm swelling and lymphedema severity were less correlated with quality of life than total number of arm symptoms and specific individual symptoms. Pain in the affected arm correlated with poor quality of life outcomes, regardless arm swelling<sup>19</sup>.

In the Munich Field Study of the quality of life of breast cancer patients it was also reported that arm problems had the strongest influence on quality of life<sup>20</sup>.

Neswold et al.<sup>21</sup> found that breast cancer survivors with other self-reported arm symptoms than lymphedema had significantly poorer quality of life and that breast cancer survivors with clinically assessed restricted mobility showed significant associations with all SF-36 domains except Social Functioning, Mental Health and MCS and no significant associations with lymphedema based on clinical examinations<sup>21</sup>.

In our study, all the SF-36 domains, except Physical Functioning, Mental Health and General Health, significantly correlate with self-reported upper limb function.

A relationship between upper extremity function and physical quality of life scores in our study was expected. It is interesting to find a significant correlation between upper extremity function and all the mental domains of quality of life, except Mental Health. A possible explanation can be that pain and related arm symptoms, existing in patients with poorer upper extremity function, might have influence on mental component of quality of life, like vitality, emotional and social functioning.

Our results also demonstrate that the size of lymphedema, defined by interlimb circumference differences, can not properly reflect the negative influence of lymphedema on the functioning and HRQoL. Swelling is a defining characteristic of lymphedema, but it is not the only symptom; the results of earlier studies suggest that other aspect of lymphedema (in addition to swelling), such as pain and altered function may have impact on HRQoL<sup>3, 14, 19, 23, 24</sup>.

When evaluating the impact of lymphedema on quality of life, we stress the importance of lymphoedema presence more than size of lymphedema. Secondly, the difference between upper limb circumferences might not be as significant as the total number and specific types of existing arm symptoms. The largest lymphedemas are not the most severe. We suggest the use of both, the subjective and objective parameters, in determining the severity of lymphedema.

Our study supports earlier findings that the severity of lymphedema is not significantly correlated with worse outcomes QoL and that volume reduction treatments, although useful, may not be sufficient to provide better functioning and quality of life of these patients<sup>14, 16</sup>. Rehabilitation assessment should include quantification of pain, limb size, range of motion and strength in all segments of the upper extremity and identification of potential causes of arm symptoms and dysfunction. Early rehabilitation programs should be implemented to minimize risk of BCRL and upper body morbidity development and optimize function and quality of life<sup>25</sup>.

The most important message of this paper is that dysfunction of the upper limb has stronger influence on quality of life than the size of edema. It can be recommended that assessment of the quality of life of breast cancer patients should include different aspects of lymphedema and upper extremity function.

There are some limitations of this study: small sample size – future studies should include a larger number of patients to reduce statistical limitations; the study was not a longitudinal but cross-sectional one – further studies on longitudinal change of the quality of life in patients are needed; the study did not have a control group; the SF-36 does not capture specific symptoms in patients suffering from BCRL such as heavy and swollen arms or difficulty in holding or carrying objects. For this reason, the use of a lymphedema-specific instrument, with breast cancer and arm function subscales, along with a generic instrument for HRQoL is recommended<sup>13, 26</sup>; Quick DASH is a self-report measure of upper limb function. For optimal assessment of upper limb dysfunction we need to use both, self-report and objective measures of upper limb function such as shoulder range of motion, strength and fine motor coordination.

### Conclusion

Physical disability in patients with breast-cancer-related lymphedema influences quality of life more than mental health. Upper limb function has a significant impact on quality of life, not only on the physical, but also on the mental component. The presence of breast-cancer-related lymphedema certainly affects upper limb function and quality of life, but, in this study, no significant correlation between the size of edema and the quality of life was found. Having in mind that lymphedema can cause functional problems and activity limitations, we must emphasize the importance of the early diagnosis and rehabilitation treatment.

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Received on February 8, 2015.

Revised on April 21, 2015.

Accepted on May 26, 2015.

Online First April, 2016.