Determinants of quality of life related to lower limb lymphedema in women with gynecological cancer surgery

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ABSTRACT

Objective: This study aimed to identify the predictors of quality of life (QoL) related to lower limb lymphedema among women who had undergone gynecological cancer surgery. Additionally, the association between fatigue and the QoL was examined.

Methods: A cross-sectional design with a convenience sample was adopted. Participants included 200 women with lymphadenectomy following gynecological cancer surgery. Demographic data, QoL related to lower limb lymphedema, and fatigue symptoms were collected.

Results: Of the 200 participants, 60 percent (n = 120) reported a mild to severe impact on QoL related to lower limb lymphedema, with the main impact on the function of mobility and physical symptoms. Age less than 55 years (β = 0.706, OR = 2.027, P = 0.017), a diagnosis of ovarian cancer (β = 0.804, OR = 2.235, P = 0.048), undergoing chemotherapy (β = 0.616, OR = 1.854, P = 0.046), time after surgery (β = 0.833, OR = 0.435, P = 0.05), and fatigue (β = 0.055, OR = 1.06, P < 0.001) were independently associated with QoL related to lower limb lymphedema. Hierarchical multiple regression demonstrated that fatigue was significantly associated with QoL related to lower limb lymphedema after controlling for age, types of cancer, time after surgery, and chemotherapy. Fatigue explained 11% of the variance in the QoL.

Conclusions: More than half of the women with gynecological cancer requiring lymphadenectomy experienced an impact on QoL related to lower limb lymphedema. Effective interventions are warranted to improve the QoL related to lower limb lymphedema among women with gynecological cancer, particularly those who present with fatigue.

Introduction

Oncological surgery with lymphadenectomy is often recommended as the treatment regimen for improving the survival rate of women with gynecological cancer in the early stages.1,2 Intraoperative removal of lymph nodes may disrupt lymphatic circulation, increasing the risk of developing lower limb lymphedema, a chronic and progressive condition occurring six months to 13.5 years after gynecological cancer surgery with lymphadenectomy.1,3 The prevalence among postoperative patients with gynecological cancer ranges from 11% to 67%.1,3,4 Symptoms include swelling of extremities, heaviness, tightness of legs, redness, fibrosis of soft tissues, pain, paresthesia, and infection, with enlarged leg circumference a prominent sign.1,4,5

Quality of life (QoL) is a measurable outcome of a group of symptoms.9 The symptoms of lower limb lymphedema impact the patient's QoL, including mobility, comfort, role function, employment, social interaction, emotional well-being, and body image.10-12 Previous studies have reported that lymphedema negatively impacts women's QoL, including physical, psychological, and social domains.13-15 However, the QoL related to lower limb lymphedema among women after gynecological cancer surgery has not been explored in detail.

Fatigue is a chronic and debilitating subjective symptom characterized by extreme tiredness, exhaustion, and inability to function.16 It is estimated that 26%–67% of patients with gynecological cancer experience chronic fatigue or tiredness.17,18 Chronic fatigue has a negative impact on women's QoL during treatment phases and illness stages, and...
fatigue is associated with depression, sleep disturbance, and cognition dysfunction during cancer-related treatments among patients with cancer.\textsuperscript{16,17,19} Fatigue has been frequently reported in patients with lower limb lymphedema; two-thirds of the patients have reported fatigue symptoms.\textsuperscript{20,21} Patients with cancer and a high level of fatigue usually complain of walking dysfunction, which is associated with lower limb lymphedema.\textsuperscript{22} One study in the Japanese population reported lethargy as a predictor of lymphedema and recommended risk-reduction behaviors in women with gynecological or breast cancer.\textsuperscript{23} Although lethargy is a common symptom and negatively impacts the QoL among women with gynecological cancer, the association of fatigue or lethargy with QoL related to lymphedema has not been studied.

One systematic review of 23 studies identified the risk factors for lower limb lymphedema development, including the extent of lymphadenectomy, the number of lymph nodes removed, and adjuvant radiotherapy. Other factors included increased age, advanced cancer staging, higher body mass index (BMI), and insufficient physical activity. While several studies have identified the risk factors of lower limb lymphedema, the relationship to QoL is still under-recognized.\textsuperscript{4,12}

Despite the emphasis on the symptoms and management of lymphedema, QoL related to lower limb lymphedema in women after gynecological cancer surgery has not been studied extensively. Little is known about the determinants of the QoL related to lymphedema and the association between fatigue and the QoL among women after gynecological cancer surgery.

This study aimed to identify the health-related determinants of QoL related to lower limb lymphedema in women with gynecological cancer who had undergone lymphadenectomy. Additionally, the associations between fatigue and the QoL related to lymphedema were examined.

Methods

Study design and participants

This study was conducted using a cross-sectional correlational design. To quickly collect data from the readily available subjects, convenience sampling was used to recruit participants from the gynecology outpatient clinic of a medical center in southern Taiwan. The eligibility criteria for participants included women at least 20 years of age diagnosed with gynecological cancer who had undergone cancer surgery with lymphadenectomy. Women were excluded if they reported heart failure, renal failure, cardiovascular accident, lower limb infection, drug abuse, or psychological disorders.

Sample size

The sample size was calculated by G*Power software version 3.1.9.7. A sample size of 166 was determined using multiple linear regression with the assumption of $\alpha = 0.05$, power level $= 0.9$, predictors $= 14$, as well as a medium effect size of 0.15 as a reference. Considering the 20% attrition rate of subjects, this study planned to recruit 200 women.

Measurements

Quality of life related to lower limb lymphedema

A Chinese version of the Lymphedema Functioning, Disability, and Health Questionnaire for Lower Limb Lymphedema (Lymph–ICF–LL–C) was used to assess the participants’ QoL related to lower limb lymphedema in the past two weeks.\textsuperscript{23} The Lymph–ICF–LL is a self-reported scale initially developed by Devogdt and colleagues.\textsuperscript{24} The scale includes five domains used to measure the daily function related to lower limb lymphedema: physical function (six items), mental function (six items), general/household tasks (three items), mobility (seven items), and life/social life (six items). For example, the physical domain illustrates the severity of edema symptoms. A total of 28 items are included in the scale. Each item is rated on an 11-point Likert scale ($0 =$ no problem, $10 =$ very severe problem). Of the 28 items, nine have a non-applicable option if the condition of the question is inappropriate to respondents. The total score of the Lymph–ICF–LL ranges from 0 to 100, with a higher score indicating a lower QoL related to lymphedema.

The scores in each domain and the total scale are calculated with the following formula: the sum of the item scores divided by the number of questions answered, then multiplied by 10. Based on the total scores of the scale and each domain, the QoL related to lower limb lymphedema can be categorized as no impact or dysfunction (0–4), mild impact or dysfunction (5–24), moderate impact or dysfunction (25–49), severe impact or dysfunction (50–95), and very severe impact or dysfunction (96–100).\textsuperscript{25} In the current study, a substantial impact or dysfunction related to lymphedema was defined as a score $\geq 5$ of the total score or each domain of the Lymph–ICF–LL–C. The construct validity of the Lymph–ICF–LL has been confirmed by a significant association with the SF-36; the internal consistency of the scale has been validated with Cronbach’s alpha ranging from 0.89 to 0.97 in the domains and 0.96 for the total score in patients with gynecological or prostate cancers.\textsuperscript{26} The psychometric properties of the Chinese version of Lymph–ICF–LL have been demonstrated in women with gynecological cancer by the scale’s construct validity and internal reliability (Cronbach’s alpha = 0.84–0.95).\textsuperscript{27} In the current study, the reliability of the Lymph–ICF–LL–C was validated with a Cronbach’s alpha of 0.958 on the total scale.

Limb circumference measurements

Lower limb lymphedema was measured by the difference between the bilateral circumference of both lower limbs.\textsuperscript{28} Using a tape measure, six lower leg circumferences were obtained at the (1) metatarsal-phalanges joint, (2) ankle, (3) peroneus longus, (4) femoral epicondyle, (5) 10 cm above the patella, and (6) 20 cm above the patella.\textsuperscript{25,26} The relative circumference difference of the bilateral lower limbs was calculated as $\frac{\text{ABS}(\text{R circumference}–\text{L circumference})}{\text{the smallest circumference}}$. The presence of lower limb lymphedema was defined as equal to or greater than 7% of the relative circumference difference.\textsuperscript{25} Three research assistants were trained to evaluate the circumference measurements. The intraclass correlation coefficients (ICCs) of limb circumference measurement (LCM) for intra- and inter-rater reliability were 0.98–1.0 and 0.96–0.99, respectively.

Fatigue

The Chinese version of the Lee Fatigue Scale-Short (C-LFS-SF), a seven-item self-rated scale, was used to assess physical fatigue in the evening.\textsuperscript{29} The C-LFS-SF is a modified version of the Lee Fatigue Scale (LFS), which contains 13 items related to fatigue and five items related to energy.\textsuperscript{29} Participants were asked to rate each item based on how they felt before going to bed, from 0 (not fatigued) to 10 (extremely fatigued), with a higher score indicating greater severity of fatigue. The English version of LFS-SF has been used to assess fatigue in women after breast cancer surgery.\textsuperscript{30} Construct validity and reliability for the Chinese version of the LFS-SF have been established.\textsuperscript{31} The Cronbach’s alpha for the C-LFS-SF total score was 0.88 in the current study.

Social demographic and health-related data

Socio-demographic data were obtained from participants, while health and clinical information were collected from their medical records. The health and clinical information included cancer location and the FIGO stage (International Federation of Gynecology and Obstetrics), body weight, surgery date and type, site and number of lymph nodes removed, postoperative chemotherapy, and radiation therapy.

Data collection

Data collection occurred during patients’ clinical visits at the outpatient departments of gynecological oncology of a medical center in southern Taiwan. Physicians and nurses referred potential participants to research assistants. When potential participants met the inclusion
criteria, they were given verbal information about the study and asked to provide written informed consent before participation. The participants completed the self-administered questionnaires in a private clinical room, and their limb circumferences were measured. The clinical room contained the necessary equipment to provide participants with a comfortable and convenient environment to complete their questionnaires and the measurement of limb circumferences, such as a medical exam table, desk, and chairs. Participants took 10–15 min to complete the questionnaires, and the measurement of the limb circumferences was completed within 8–10 min. After that, the research assistants reviewed participants’ medical records to obtain their health and medical information. All participants received a gift equivalent to NT$100 when they completed all research measurements. Participants were recruited from February 2016 to November 2017.

Data analysis

Data were analyzed using SPSS version 22.0 (IBM Corp, Armonk, NY, USA). Cases with missing data were excluded if 20% of the items in the Lymph–ICF–LL or the C-LFS-SF were incomplete. Descriptive analysis was used to depict the features of QoL related to lower limb lymphedema. Univariate logistic regressions were performed to determine the associations of socio-demographic variables, health-related variables, and fatigue with QoL. Hierarchical logistic regression was then performed to examine the impact of fatigue on QoL related to lymphedema after controlling for socio-demographic and health-related factors. For the regression analysis, cases with significant outliers in the Lymph–ICF–LL were excluded. A P-value < 0.05 indicated statistical significance.

Ethical consideration

The Institutional Reviewed Board of the National Cheng Kung University Hospital in southern Taiwan approved this study (IRB No. A-ER-103-425). Potential participants were informed about the purpose of the study, voluntary participation, confidentiality of study process, as well as the right to withdraw at any time without repercussions. All participants were asked to provide written informed consent before participation.

Results

Participants characteristics

Of the 216 women who agreed to participate, 200 provided complete data. Half of the participating women (n = 102, 51%) were under 55 years old, with a mean age of 54.4 years (SD = 10.6, range = 23–85). Nearly three-quarters of the participants were married (72%, n = 144) and employed (74%, n = 148). One-quarter (n = 52) reported having completed senior high school, and 34% (n = 68) had a college level of education (Table 1).

Nearly, half had a normal BMI (45%, n = 90), 26% (n = 52) had obesity, and 6.5% (n = 13) were underweight. Most women had been diagnosed with ovarian (42.0%, n = 84) or endometrial cancer (36.5%, n = 73). Other diagnoses included vulvar, vaginal, and peritoneal cancers (3%, n = 6). Over half of the women’s cancers were at FIGO Stage I (57%, n = 114), with 28% (n = 56) at Stage III. Over half of the participants had experienced bilateral pelvic lymphadenectomy (58%, n = 116) and received adjuvant chemotherapy (68%, n = 135) without adjuvant radiotherapy (91%, n = 182). The median time after surgery was 15 months (range = 1–240 months). Regarding the time since surgery, nearly 50 percent of the participants (n = 93) had undergone cancer surgery with lymphadenectomy within one year, and 13% (n = 26) had undergone surgery five years before. The majority of the participants had either completed their chemotherapy (n = 96, 48%) or never undergone chemotherapy (n = 65, 32.5%). Only 20% of the participants (n = 38) received chemotherapy, and 9% (n = 18) previously completed radiotherapy.

Nearly, 60% of the participants (n = 116) underwent bilateral pelvic lymph node removal, and 39% of the participants (n = 78) underwent bilateral with para-aortic lymph node removal. The mean number of lymph nodes dissected was 18 (SD = 10, range = 1–55). Thirty-five (17%) of the 200 participants had a circumferential difference ≥ 7% between the lower limbs.

Description of the quality of life related to lower limb lymphedema

Figure 1 presents the descriptive analysis for QoL related to lower limb lymphedema. The total mean score of the Lymph–ICF–LL measuring QoL was 13.3 (SD = 15.48, range = 0–90.7) out of a possible 100. The mobility domain had the highest mean score (mean = 18.0, SD = 21.97), followed by the physical domain (mean = 13.4; SD = 17.10). The mental, household, and social domains had low and similar mean scores.

Of the 200 participants, 61% (n = 121) reported an impact of lower limb lymphedema on QoL, with 82 women (41%) reporting their impact as mild and 33 (15%) as moderate. Six women (3%) reported that lower limb lymphedema had severely impacted their QoL. Across the five

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**Table 1**

| Characteristic | n (%) | Mean (SD) | Range |
|---------------|-------|-----------|-------|
| Age (years)   |       |           |       |
| < 55          | 102 (51.0) | 54.4 (10.6) | 23–85 |
| ≥ 55          | 98 (49.0)  |           |       |
| Education     |       |           |       |
| Junior high school | 80 (40.0) | 56 (26.0)  |       |
| Senior high school | 52 (26.0) | 68 (34.0)  |       |
| College       |       |           |       |
| Marital status|       |           |       |
| Married       | 144 (72.0) |           |       |
| Single/divorced/widowed | 56 (28.0) |           |       |
| Employment    |       |           |       |
| Yes           | 52 (26.0)  |           |       |
| No            | 148 (74.0) |           |       |
| BMI (kg/m²)   |       |           |       |
| Underweight (< 18.5) | 13 (6.5) |           |       |
| Normal (18.5 ≤ BMI < 24) | 90 (45.0) |           |       |
| Overweight (24 ≤ BMI < 27) | 45 (22.5) |           |       |
| Obesity (≥ 27) | 52 (26.0) |           |       |
| Primary diagnosis |       |           |       |
| Ovarian cancer | 84 (42.0) |           |       |
| Endometrial cancer | 73 (36.5) |           |       |
| Cervical cancer | 37 (18.5) |           |       |
| Others: vulva, vagina cancer | 6 (3.0) |           |       |
| Cancer stage (FIGO) |       |           |       |
| Stage I       | 114 (57.0) |           |       |
| Stage II      | 19 (9.5)  |           |       |
| Stage III     | 56 (28.0)  |           |       |
| Stage IV      | 11 (5.5)  |           |       |
| Time since surgery (year) |           |       |       |
| < 1 year      | 93 (46.5)  | 2.5 (3.5)  | 0.3–20.1 |
| 1–2 years     | 31 (15.5)  | 1–18      |       |
| 2.1–5 years   | 50 (25.0)  |           |       |
| > 5 years     | 26 (13.0)  |           |       |
| Chemotherapy  |       |           |       |
| None          | 65 (32.5)  |           |       |
| Completed     | 96 (48.0)  |           |       |
| Current       | 39 (19.5)  |           |       |
| Radiotherapy  |       |           |       |
| None          | 182 (91.0) |           |       |
| Completed     | 18 (9.0)   |           |       |
| Pelvic lymph nodes removed |       |           |       |
| Unilateral    | 6 (3.0)    |           |       |
| Bilateral     | 116 (58.0) |           |       |
| Bilateral with para-aortic | 78 (39.0) |           |       |
| Lymph nodes removed (n) |       |           |       |
| < 15          | 71 (35.5)  | 18.4 (9.5) | 1–55  |
| ≥ 15          | 129 (64.5) |           |       |
| Limb circumference difference |       |           |       |
| < 7%          | 165 (82.5) |           |       |
| ≥ 7%          | 35 (17.5)  |           |       |

BMI, Body mass index; FIGO, International Federation of Gynecology Obstetrics.
domains of QoL, over half of the women (57%, n = 114) reported an impact on physical aspects, while 59% (n = 118) reported an impact on mobility. Nearly, half (46%, n = 91) reported that lymphedema had negatively impacted their mental health.

**Quality of life determinants related to lower limb lymphedema**

Before conducting logistic regressions, outliers were analyzed, resulting in two subjects being deleted. Data from 198 women were thus used for the univariate and multiple logistic analyses. Table 2 shows the results of the univariate binary logistic regressions. The univariate logistic regressions identified four variables as significant predictors of QoL: age (< 55 years) (β = 0.706, OR = 2.027, 95% CI: 1.14–3.61, P = 0.017), ovarian cancer (β = 0.804, OR = 2.235, 95% CI: 1.04–4.96, P = 0.048), chemotherapy (β = 0.616, OR = 1.854, 95% CI: 1.01–3.39, P = 0.04), and fatigue (β = 0.055, OR = 1.06, 95% CI: 1.03–1.09, P < 0.001). However, the time after surgery of over five years had a borderline significance (β = −0.833, OR = 0.435, 95% CI: 0.19–1.00, P = 0.05). Younger women diagnosed with ovarian cancer who had recent surgery and chemotherapy were more likely to report poor QoL related to lower limb lymphedema. For the time after surgery, the impact of lower limb lymphedema on QoL was not associated with QoL related to lower limb lymphedema. However, the relative circumference difference was not associated with QoL related to lower limb lymphedema.

Table 3 presents a hierarchical logistic regression with three blocks containing five predictive variables entered as independent variables. First, age was entered in Block One, accounting for a 4% variance of QoL. Next, types of cancer, time since surgery, and chemotherapy were entered in Block Two. Apart from age (OR = 1.87, P = 0.043), none of the second-order variables were significantly associated with QoL, and these variables only accounted for 4% of the variance of QoL. Finally, fatigue was entered in Block Three, and it significantly contributed to QoL (OR = 1.052, P < 0.001). The Hosmer and Lemeshow test indicated a good fit of the multivariate model (chi-square = 9.626, P = 0.292), which explained 19% of the total variance in the QoL related to lower limb lymphedema, with fatigue accounting for 11% variance of the QoL related to lower limb lymphedema.

**Discussion**

This study revealed that six out of every 10 women who underwent lymphadenectomy during gynecological cancer surgery experienced a decrease in QoL due to postoperative lower limb lymphedema. The mobility and physical restrictions were the most substantial impacts on the QoL related to lower limb lymphedema. The findings confirm the results from previous studies; limitation in mobility is common in patients with lower limb lymphedema. Greene and Meskell reported that over half of the women with lower limb lymphedema complained of difficulty with walking, standing, bending, or getting up from a chair. Recently, a longitudinal study of physical activity following gynecological cancer surgery revealed that lymphedema significantly contributed to the decrease in physical activity from before to two years after surgery. The physical symptoms of lower limb lymphedema, such as pain and stiffness, tightness, and heaviness, can limit the degree of leg flexion and the ability to walk or climb stairs. Mobility restriction is also a barrier to patients’ social activities with friends and family. Mobility is a representative indicator of QoL related to lower limb lymphedema. Therefore, future research is needed to evaluate physical activity and the barriers for women after gynecological cancer surgery with lymphadenectomy.

The results of the present study revealed that younger adult (< 55 years old) women reported poorer QoL related to lower limb lymphedema. Our results are consistent with those of prior studies that reported that younger adult women were more vulnerable to the QoL impact related to lower limb lymphedema than older women. A possible reason for the poor QoL in younger adult women is that they may be more involved in their jobs and social activities. Thus, they may perceive more restrictions in role performance due to lower limb lymphedema. A prior study of patients with endometrial cancer and lower limb lymphedema reported a significant positive association between a woman’s age and...
their physical and role functions. Future studies should explore the physical-socio-psychological dimensions of young adult women with lower limb lymphedema.

This study reported that health-related factors, such as chemotherapy, ovarian cancer, and short term after cancer surgery, contribute significantly to poor QoL related to lower limb lymphedema. Women with ovarian cancer reported a poorer QoL than those with other gynecological cancers. A previous study found that over half of ovarian cancer patients developed lower limb lymphedema. Patients with ovarian cancer were more likely to develop lower limb lymphedema and fatigue symptoms. Additionally, fatigue symptoms, such as tiredness and the inability to function, are usually due to the deterioration of patient’s functional status and musculoskeletal condition. Evidence-based research has reported that patients with high levels of fatigue usually complain of walking dysfunction. These findings highlight a need for further investigation into the communal mechanism of lymphedema and fatigue symptoms.

The study showed that limb circumference difference (LCD) and BMI were not associated with the QoL related to lymphedema. Similarly, a non-association between LCD and QoL has been reported. It is possible that most women in the current study had a mild degree of lymphedema, and only 18% of the participants had prominent LCD (≥ 7%), which may have resulted in a non-significant association on the QoL.

Table 2

| Variables                                | B  | SE  | Wald | OR  | P     | 95% CI  |
|------------------------------------------|----|-----|------|-----|-------|---------|
| Age (Ref: ≥ 55 years old)                | 0.706 | 0.295 | 5.74 | 2.027 | 0.017 | 1.14-3.61 |
| BMI                                      | 0.022 | 0.032 | 0.47 | 1.022 | 0.485 | 0.96-1.09 |
| Diagnosis (Ref: cervical cancer)         | | | | | | |
| Ovarian cancer                           | 0.804 | 0.406 | 3.92 | 2.235 | 0.048 | 1.01-4.96 |
| Endometrial cancer                       | 0.471 | 0.410 | 1.32 | 1.602 | 0.250 | 0.72-3.58 |
| Others                                   | 0.517 | 0.392 | 0.28 | 1.676 | 0.595 | 0.25-1.27 |
| Cancer stage (Ref: Stage I)              | | | | | | |
| Stage II                                 | -0.725 | 0.512 | 2.00 | 0.49 | 0.157 | 0.21-1.50 |
| Stage III                                | 0.138 | 0.343 | 0.16 | 1.15 | 0.688 | 0.63-2.40 |
| Stage IV                                 | -1.861 | 0.656 | 2.62 | 0.35 | 0.106 | 0.10-1.30 |
| Time since surgery (Ref: < 1 year)       | | | | | | |
| 1–2 year                                 | 0.124 | 0.330 | 0.141 | 1.132 | 0.707 | 0.59-2.16 |
| 2.1–5 years                              | -0.051 | 0.335 | 0.023 | 0.951 | 0.880 | 0.49-1.84 |
| > 5 years                                | -0.833 | 0.427 | 3.087 | 0.435 | 0.050 | 0.19-1.00 |
| Aorta lymph nodes (Ref: Pelvic lymph node) | 0.551 | 0.304 | 3.28 | 1.74 | 0.070 | 0.96-3.15 |
| Chemotherapy (Ref: None)                 | 0.616 | 0.309 | 3.98 | 1.85 | 0.046 | 1.01-3.39 |
| Radiotherapy (Ref: None)                 | -0.058 | 0.516 | 0.01 | 0.94 | 0.910 | 0.34-2.59 |
| Circumference difference (≥ 7%)          | -0.354 | 0.379 | 0.872 | 0.70 | 0.350 | 0.33-1.48 |
| Fatigue                                  | 0.055 | 0.013 | 17.387 | 1.06 | <0.001 | 1.03-1.09 |

BMI, Body mass index; LLL, Lower limb lymphedema.

Table 3

The hierarchical logistic regression analysis examining the relationship between fatigue and QoL related to LLL.

| Variables                                | Model 1 | Model 2 | Model 3 | |
|------------------------------------------|---------|---------|---------|---|
| | B (SE) | B 95% CI | B (SE) | β 95% CI | β 95% CI | |
| Age (Ref: ≥ 55 years old)                | 0.71 (0.30) | 2.03* | 1.14-3.61 | 0.62 (0.31) | 1.87* | 1.02-3.41 | 0.48 (0.32) | 1.62 | 0.86-3.05 |
| Cancer types (Ref: cervical cancer)      | | | | | | |
| Ovarian cancer                           | 0.48 (0.45) | 1.61 | 0.67-3.87 | 0.25 (0.47) | 1.29 | 0.51-3.22 |
| Endometrial cancer                       | 0.32 (0.45) | 1.25 | 0.52-3.01 | 0.31 (0.47) | 1.24 | 0.36-4.31 |
| Other                                    | -0.13 (1.01) | 0.88 | 0.12-6.32 | -0.39 (1.12) | 0.68 | 0.08-6.01 |
| Chemotherapy (Ref: None)                 | 0.35 (0.35) | 1.42 | 0.72-2.8 | 0.36 (0.36) | 1.43 | 0.71-2.91 |
| Time since surgery (years)               | -0.04 (0.05) | 0.96 | 0.87-1.05 | -0.04 (0.05) | 0.96 | 0.87-1.06 |
| Fatigue                                  | 0.05 (0.01) | 1.05*** | 1.03-1.08 | |
| R² Change                                | 0.04 | 0.08 | 0.19 | 0.04 | 0.11 | |

B, unstandardized coefficients; SE, standard error; β, standardized coefficients. *: P < 0.05; **: P < 0.01; ***: P < 0.001.
undergone gynecological cancer surgery with lymphoedema. Healthcare providers need to pay attention to the vulnerable population who may have poor QoL due to lymphedema, such as younger women with recent ovarian cancer surgery with lymphoedema, who have received chemotherapy and have a high level of fatigue. The assessment of the QoL related to lymphedema should be comprehensive and include physical and psychosocial domains, particularly the physical symptoms and the function of mobility. Furthermore, fatigue symptoms should be assessed. Tailored interventions for this vulnerable population should contain pre- and postoperative counseling, education, and strategies to minimize physical symptoms and psychosocial impact due to lower limb lymphedema.60

Strengths and limitations

One of this study’s strengths is the number of participants with various gynecological cancers that represent a wider gynecological cancer population, as well as a comprehensive assessment of the QoL related to lower limb lymphedema, including physical, psychosocial, and daily life functions. This study has some limitations. The findings are limited to a convenience sample with gynecological cancer, and the findings may not apply to other populations with different types of limb lymphedema. Due to the study’s cross-sectional design, changes in QoL related to lower limb lymphedema and fatigue symptoms were not evaluated.

Conclusions

In summary, more than half of the women with gynecological cancer surgery reported an albeit mild impact of QoL related to lymphedema. The mobility and physical restrictions were the most substantial impacts. Fatigue contributed to lower QoL related to lymphedema. Further research on interventions is needed to determine the best practice on ameliorating physical symptoms, mobility dysfunction, and fatigue.

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Author contributions

Yu-Yun Hsu: conceptualization, design, funding acquisition, data analysis, manuscript writing, and review.
Chia-Yu Liu: data collection, subject recruitment, and data analysis and draft writing of the results.
Chien-Liang Ho: design, subject recruitment and writing review.
Keng-Fu Hsu: subject recruitment and writing review.

Declaration of competing interest

None declared.

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Ethics statement

This study was approved by the Institutional Review Board of the National Cheng Kung University (IRB No. A-ER-103–425).

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