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Interventions for Prevention and Management of Gynecological Cancer-Related Lower Limb Lymphedema: A Systematic Scoping Review

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ABSTRACT

Objectives: This scoping review aims to map out evidence on interventions for reducing lower limb lymphedema incidence and symptoms after gynecological cancer surgery.
Methods: This scoping review followed the methods and protocol outlined by the Joanna Briggs Institute Methods Manual. Five databases, including Pubmed, Scopus, Web of Science, CINAHL, and PsycINFO were searched in January 2024.
Results: The review included 15 interventions primarily designed to prevent and manage cancer-related lower extremity lymphedema. Most studies have examined the effect of interventions on the development of lymphedema-related symptoms and quality of life. Most studies tested complex decongestive therapy (CDT) (n = 6, 39.9%), including various techniques, such as manual lymphatic drainage, compression, exercise, and skincare. Of the interventions, 86.6% improved at least one outcome measurement, such as quality of life, lymphedema incidence, symptoms, and lower limb volume.
Conclusions: Limited evidence shows that the use of interventions appears to have the potential to reduce the risk and symptoms of lymphedema and improve the quality of life in women undergoing gynecological cancer treatment.
Implications for Nursing Practice: Developing and testing comprehensive lymphedema education and management strategies in nursing practice is essential to optimize patient outcomes and enhance the quality of life for women undergoing gynecological cancer treatment.

Lower limb lymphedema (LLL) is characterized by unilateral or bilateral swelling, heaviness, pain, itching, numbness, skin changes, and signs of infection. These symptoms can seriously affect the patient's daily activities and quality of life (QoL).[1,2] Evidence shows that women after gynecological cancer treatment develop LLL, causing symptoms such as anxiety, depression, decrease in self-confidence, and sleep problems.[2,3] Lymphedema is a common complication after lymph node dissection and pelvic radiotherapy.[4,5] Studies show that lymphedema affects approximately 90 million people worldwide, with surgical treatment being one of the leading causes of lymphedema, especially in patients with cancer.[4,5] Surgical interventions that remove lymph nodes significantly increase the risk of developing LLL. The risk is even higher when patients receive postoperative radiotherapy.[6] Specifically, among patients with a history of gynecological cancer, the incidence of LLL is reported up to 25%.[7] Although the majority of cases occur in the first year, studies have shown that the risk of developing lymphedema after gynecological cancer persists in the long term.[8,9]

Limited studies are focusing on nonpharmacologic interventions such as a physiotherapy program with manual lymph drainage, compression stockings, regular exercise, and health education[10] and a comprehensive nurse-led intervention consisting of prepost operation education and out of hospital guidance[11] showing decreased incidence of lymphedema and improvement in QoL after gynecologic cancer surgery. There are also clinical guidelines recommending exercise, prophylactic massage, compression garments, skincare, nutrition, and patient education to recognize early symptoms to reduce the risk of LLL.[12-16] However, these guidelines provided limited evidence,[10,12] and studies reported the need for effective interventions to improve the QoL and well-being of women affected by LLL.[17,18]

To our knowledge, no research study synthesizes interventions for the prevention and management of gynecological cancer-related LLL. It is essential to synthesize the approaches used in women who undergo gynecological cancer surgery. This will help guide the development of sustainable and resource-appropriate interventions for

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Layperson Summary

What we investigated and why

In this study, we review the evidence on the different methods used to reduce the risk and symptoms of lymphedema, a common complication after gynecological cancer surgery. Lymphedema can significantly impact a patient's daily life and quality of life; therefore, understanding how to manage it is essential.

How we did our research

We conducted a scoping review following guidelines from the Joanna Briggs Institute, searching multiple databases, including Pubmed, Scopus, Web of Science, CINAHL, and PsycINFO. We focused on studies that explored various interventions to prevent or manage lower limb lymphedema after gynecological cancer surgery.

What we have found

Our review found that nonpharmacological interventions, especially complex decongestive therapy (CDT), have the potential to improve the quality of life for women affected by lymphedema. Many studies showed these methods can reduce lymphedema symptoms and improve patients' overall well-being.

What it means

This review highlights the importance of developing and integrating effective interventions such as CDT into cancer care plans for women undergoing gynecological cancer treatment. By doing so, healthcare providers, especially nurses, can help improve patient outcomes and enhance the quality of life for these women.

preventing and managing LLL. It will inform future research and practices to improve the long-term effects of risk reduction and management interventions and optimize the well-being and quality of life of individuals affected by cancer.

Methods

Aims

The purpose of this systematic scoping review was to map out the literature on the utilization of nonpharmacological interventions to prevent and manage lymphedema after gynecological cancer treatment in women with gynecologic cancer. We specifically aim to explore the use of nonpharmacological interventions to prevent LLL. To achieve this, this review aimed to summarize (1) the characteristics of nonpharmacological interventions (e.g., type of delivery, duration, providers) developed and tested and (2) the effects of the interventions on the risk of cancer-related LLL and other health outcomes.

Protocol

This review used the protocol outlined by the Joanna Briggs Institute (JBI) Methods Manual for systematic reviews. The findings were reported using the elements provided in the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-Scr).[19]

Inclusion and Exclusion Criteria

The inclusion criteria are presented in the Table 1 following the PICOS framework (Table 1). The exclusion criteria include studies published in non-English languages, thesis, and dissertations not published in peer-reviewed journals, conference abstracts, and descriptive or noninterventional studies lacking primary data on nonpharmacological interventions for LLL after cancer treatment.

Data Sources and Search Strategy

Five databases were searched, including Pubmed, Scopus, Web of Science, CINAHL, PsycINFO in January 2024, with the following search terms ((“gynecological cancer” OR “Ovarian Neoplasms”[Mesh] OR “Endometrial Neoplasms”[Mesh] OR “Uterine Cervical Neoplasms”[Mesh] OR “Uterine Cervical Neoplasm” OR “Cervical Neoplasm” OR “Uterine Cervical Cancer” OR “Cervical Neoplasms” OR “Vaginal Neoplasms”[Mesh] OR “Vaginal Neoplasm” OR “Vaginal Cancer” OR “vagina cancer”) AND (“Lymphedema”[Mesh] OR Lymphedema OR lymphoedema OR “Milroy Disease” OR “Milroys Disease” OR “Milroy's Disease”)) AND (“Quality of Life”[Mesh] OR “Life Quality” OR “Health-Related Quality Of Life” OR “HRQOL” OR intervention OR approach OR Management OR “decongestive physiotherapy” OR “health behaviors” OR exercises OR intervention OR management))

Study Selection Process

The search results were stored and organized using EndNote, a bibliographic management tool, and then uploaded to Rayyan QCRI for systematic screening and selection.[20] Titles and abstracts of articles identified in the search process were imported into the application. Study selection was made in two stages: in the first stage, titles and abstracts were reviewed; in the second stage, full texts of the articles were reviewed for inclusion. Two authors (MS, MNT) reviewed the articles separately using the same inclusion and exclusion criteria, and a consensus was reached for each article included among all authors. The initial search yielded a total of 1,385 articles. After removing duplicates, the title and abstract of 734 articles were reviewed. A total of 29 primary research articles remained for full-text review. Thirteen were excluded in this stage due to reporting only study protocol (n = 10), abstract (n = 3), different target intervention (n = 1), and study design (n = 2). Two articles were found through the reference check of the included articles. This scoping review included 15 articles (Fig. 1).

Table 1
Inclusion criteria based on PICOS Framework.

PICOS Element	Inclusion Criteria
Population	Women who underwent gynecologic cancer surgery and are at risk of or experiencing lower limb lymphedema.
Intervention	Nonpharmacological interventions, including education, exercise, self-manual examination, and Complex Decongestive Therapy (CDT) aimed at preventing or managing lower limb lymphedema.
Comparison	Control or comparison groups in studies.
Outcomes	Primary data reporting the effectiveness of interventions on lower limb lymphedema, including both qualitative and quantitative assessments of symptoms, quality of life, and health-related outcomes.
Study Design	Experimental or quasi-experimental studies, including randomized and nonrandomized designs with qualitative and quantitative assessments.

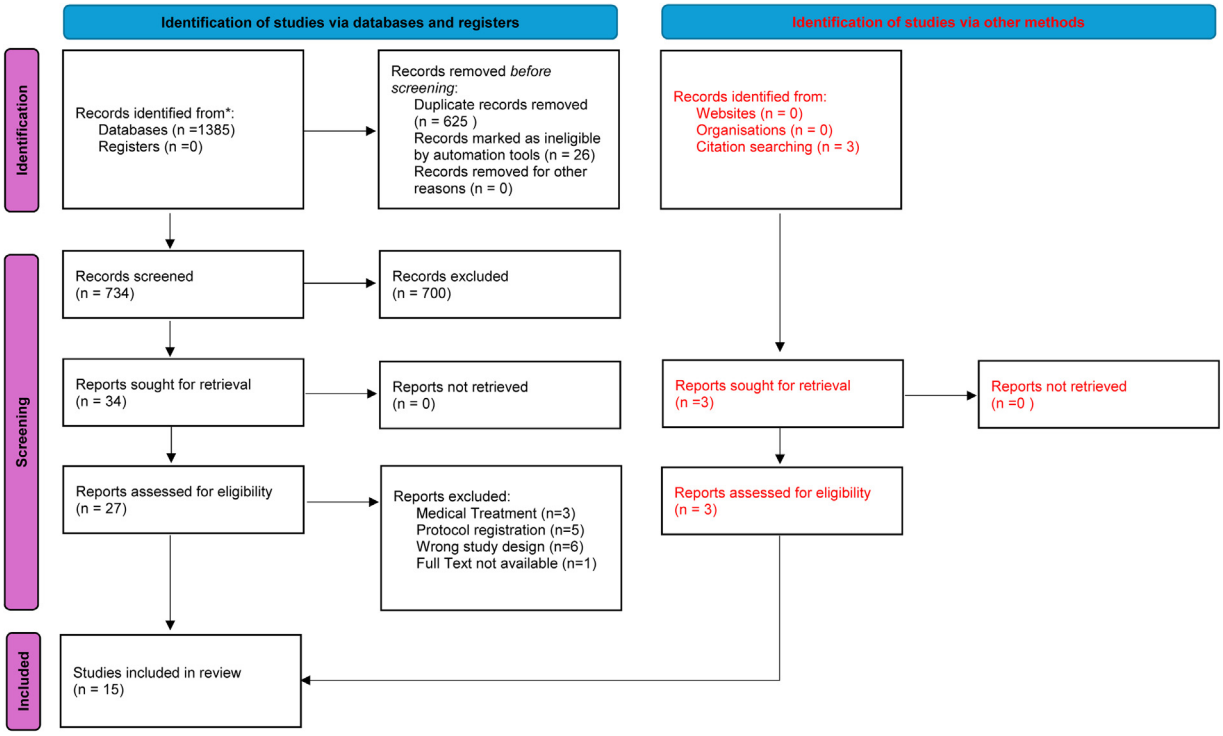

Figure 1. PRISMA flow diagram

Data Extraction

We created a data extraction tool to code the following: year of publication, country of study setting, study design, characteristics of the population studied, description of the intervention (i.e., aim, duration, format, and theory used), and main findings on LLL and health outcomes.

Appraisal of the Quality of the Studies

Because this is a scoping review, we did not conduct a risk of bias assessment, which is consistent with the Joanna Briggs Institute Scoping Review Methods Manual.[19]

Results

Descriptive Characteristics of Studies

There were 15 interventions published between 2008 and 2024 included in this review. Most of the interventions were conducted in China (n = 5, 33.3%),[5,10,11,21,22] other interventions were conducted in South Korea (n = 2, 13.3%),[1,23] Japan (n = 2, 13.3%),[24,25] the UK (n = 1, 6.6%),[26] Canada (n = 1, 6.6%),[27] Türkiye (n = 1, 6.6%),[28] US (n = 1, 6.6%),[29] Slovakia (n = 1, 6.6.1%),[30] and Ireland (n = 1,6.2%).[31] Most interventions used a randomized controlled trial (RCT) design (n = 6, 39.9%),[5,10,22,24,25,29] feasibility study and pilot RCT (n = 4, 7.1%),[1,21,26,27] prospective cohort study (n = 1, 6.6%),[28] retrospective controlled study (n = 1, 6.6%)[11] followed by a prepost-test study design (n = 3, %19.9).[23,30,31]

Targeted Population and Health Behaviors

Many of the studies aimed at lymphedema prevention among individuals with gynecological cancer after surgery (n = 9, 59.9%),[5,10,11,21,22,26-29] and lymphedema management among those diagnosed with LLL (n = 6, 39.9%).[1,23-25,30,31]

The Characteristics of Interventions

Most interventions were designed with some modification of complex decongestive therapy (CDT) (n = 6, 39.9%),[1,5,10,23,28,30] and included various techniques, such as manual lymphatic drainage, compression, exercise, and skincare. Other interventions were the use of compression devices (n = 2, 13.3%),[26,31] progressive resistance exercise training plus health education (n = 2, 13.3%),[21,22] active exercise with compression therapy (n = 2, 13.3%),[24,25] exercise (n = 1, 6.6%)[29] and compression stocking plus education (n = 1, 6.6%).[27] Most of the studies reported who delivered the interventions and the methods used to ensure the fidelity of the intervention delivery. Providing lymphedema intervention by a physical therapist,[1,23-25,28,29,31] nurse,[5,10,11,21,22] oncologists[26] or multidisciplinary (e.g., physician, nurse, physiotherapist).[27,30] The duration of the interventions varied between weeks to 12 months (n = 7, 46.6%),[1,10,23,26,29-31] with a few studies lasting one to 2 years (n = 6, 39.9%).[5,11,21,22,27,28] Two studies conducted follow-up immediately after intervention.[24,25] Most interventions were conducted with face-to-face sessions (n = 10, 66.6%)[1,10,23-28,30,31] and supported by WeChat or telephone follow-up (n = 5, 33.3%) (Table 2).[5,11,21,22,29]

Outcome Measurements Regarding the Effect of the Interventions

All studies used subjective measures and some used the Gynecologic Cancer Lymphedema Questionnaire (GCLQ) (e.g., self-reported questionnaire)[1,10,21,22,28] to assess self-reported lymphedema symptoms. Except for one study,[31] other studies also used objective measurements such as lower extremity measurements and volume. Some studies reported that the effect of lymphedema interventions on QOL with the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire – Core Questionnaire (n = 4),[1,5,27,31] LYMQOL-LEG (n = 1),[30] Nottingham Health Profile (n = 1),[26] SF-36 (n = 1)[23] and cancer-related fatigue with The Brief Fatigue Inventory (BFI) (n = 1).[5] One study reported an intervention's effect on lymphedema-related pain using the Visual Analog Scale.[30]

Table 2
Descriptive characteristics of interventions

Descriptives	n	%
Cancer trajectory*		
During active treatment (radiotherapy or chemotherapy)	1	6.6
After completion of active treatment, surgery, or survival	13	86.6
Preoperative period	2	13.3
Lymphedema presence		
Yes	6	39.9
No	9	59.9
Type of intervention*		
Manual lymphatic drainage	8	53.3
Complex decongestive therapy	6	39.9
Compression	7	46.6
Lymphedema education	7	49.9
Exercise	8	53.3
Mode of intervention		
Face-to-face	10	66.6
Online+face-to-face	4	26.6
Online	1	6.6
Main outcome measures*		
Quality of Life	8	53.3
Lymphedema incidence	8	53.3
Lymphedema symptoms	10	66.6
Circumference of the limb	14	93.3

* Studies included more than one.

Effects of the Interventions on Outcome Measures

Of the interventions, 46.6% (n = 7) reported improvement in the QOL.[1,5,11,23,27,30,31] In only one study, no significant difference was found in the QOL scores of the groups.[26] The studies reported that the interventions reduced symptoms of lymphedema (n = 10, 66.6%).[1,5,10,23-26,28,30,31] Although Do et al.[1] reported improvement in symptoms in both groups, the difference between the groups was not statistically significant.

Some studies have found that interventions aimed at preventing the development of lymphedema or risk reduction significantly reduce the incidence of lymphedema (n = 5, 33.3%).[5,10,11,22,28] In the pilot randomized study by Wang et al.,[10] the cumulative incidence rates at 3 and 6 months postoperatively were 12.2% and 31% in the control group and 5.6% and 11.5% in the intervention group, respectively. In 10 participants who developed lymphedema, the median time to lymphedema diagnosis was 3.2 months (range, 2.7-5.9) in the control group and 8.8 months (range, 2.9-11.8) in the intervention group. Sawan et al.[26] found that interventions did not significantly reduce the incidence of lymphedema, but limb volume increase was significantly higher in the control group. Iyer et al.,[29] in their study with physically inactive ovarian cancer survivors, found no significant difference in the incidence of lymphedema between the groups. Of the interventions, 53.3% (n=8) improved lower limb volume and circumference measurements.[5,10,21-26,28,30] Wu et al.[5] found that the diameter of the lower limb was lower in the CDT group at 3 months and 1 year; however, the difference was insignificant (Table 3).

Discussion

This scoping review synthesized the evidence on nonpharmacological interventions aiming to reduce and prevent among women with gynecological cancer after surgery. We identified 14 published articles in 2008 to 2024 reporting nonpharmacological interventions for women with gynecological cancer through our review process. Although there are limited studies, this review shows the growing evidence on the use of nonpharmacological interventions on LLL among women with cancer survivors. Future research is needed to develop and evaluate the effects of nonpharmacological interventions on the development and management of LLL among women with gynecologic cancer.

Most of the interventions (57.1%) included in this review were exclusively designed to prevent lymphedema and reduce the risk for LLL after gynecological cancer surgery. In the literature, no reviews focusing on evidence regarding interventions targeting LLL prevention have been found. A review on LLL management reported that CDT is the gold standard for managing lymphedema after gynecological cancer surgery.[6] CDT is a comprehensive treatment approach for managing lymphedema that combines manual lymphatic drainage, compression therapy, exercise, and skincare to reduce swelling and improve lymphatic function.[32] Similarly, most of the studies we included in this review also included CDT. A systematic review of seven exercise interventions for LLL in gynecological cancer reported that three studies found that lymphedema symptoms were significantly improved after exercise interventions.[17] Consistent with our findings, a systematic review,[33] while CDT has shown effectiveness in reducing the volume of affected limbs in patients with LLL, there remains a need for further research to address the duration of benefits and strategies for maintaining therapeutic gains, as well as to standardize the protocol for administering CDT to enhance the quality and comparability of future studies.

Compression therapy is a component of CDT, as is manual lymphatic drainage. Only two studies[24,25] on the effect of compression therapy were included in our review. These studies suggest that compression therapy combined with exercise is more effective than compression therapy alone. Although the literature is limited, a meta-analysis comparing Decongestive Lymphatic Therapy (DLT) and Intermittent Pneumatic Compression (IPC) therapy for lymphedema after breast surgery found that both DLT with IPC and DLT alone were similarly effective in managing ULL.[34] However, DLT with IPC had a greater impact on improving external rotation joint mobility. This finding underscores the importance of a multifaceted approach to treatment, suggesting that patients may benefit from incorporating structured exercise routines alongside traditional compression methods. Further research should explore the optimal types and intensities of exercise to maximize the benefits of this combined therapy.

Although no study in our review exclusively focused on the effect of manual lymphatic drainage, most studies used this method as a component of the interventions. A systematic review[35] reported mixed findings on Manual Lymphatic Drainage (MLD) with some studies reporting positive effects on volume reduction, QOL and symptom-related outcomes, and a reduced incidence of lymphedema in at-risk patients. However, other studies in that review, indicate no additional benefit of MLD when included in complex decongestive therapy, highlighting the need for more rigorous and standardized research in this area.[35]

Although health education on LLL after gynecological cancer surgery was used as a component in most studies, the details of the educational intervention were not provided sufficiently. It has been emphasized that the majority of the patient population at risk for lymphedema after cancer surgery lacks adequate education. There is a need to develop effective educational materials and programs for lymphedema management and risk reduction methods.[36] Education on LLL should be a crucial component of nursing care in the postoperative period. A study focusing on awareness and knowledge of the development of secondary lymphedema after breast and gynecological cancer surgery found that those who were not informed about lymphedema had a higher rate of cellulitis history compared to informed patients. This study suggests that awareness of lymphedema is lower among patients who have undergone surgery for gynecologic malignancies compared to those with breast cancer.[37] Among female cancer survivors, having awareness and knowledge about lymphedema can lead to a later onset of lymphedema, lower lymphedema grades, and fewer infections.[32] Therefore, integrating lymphedema management education into postoperative care is essential for improving patient outcomes and quality of life.

Table 3
Characteristics of included studies

Reference / Country	Study design	Sample	Aim of the intervention	Intervention components (Mode, duration, frequency, follow-up)	Measurement tools	Conclusions
Freyne et al. [31] 2022 Ireland	Prospective, interventional study	12 patients with the lower limb lymphoedema	To improve quality of life	Compression treatment for at least 1 h per day at home PCD QOL assessment after at least eight weeks of treatment.	EORTC QLQ-C30	Compression pump therapy improved participants' health scores, reducing pain and fatigue. Post-therapy, body image improved significantly, with a notable reduction in lymphedema symptoms.
Kendrova et al.[30] 2020 Slovakia	Experimental	50 patients with secondary lymphedema of the lower extremities	To reduce lymphedema as a predictor of improvement in QoL and what effect CDT has as a treatment of secondary lymphedema of the lower extremity	CDT- Manual lymphatic drainage, instrumental lymphatic drainage, multilayer bandage, vascular gymnastics (with loaded external compression),hydrotherapy, and patient education on the adjustment necessary for a life-long regimen for 14 to 15 d. Follow-up: after treatment	The circumference of the limb, LYMQOL-LEG VAS	After treatment, a reduction in lymphedema development, an increase in QoL, and a reduction in pain.
Sawan et al.[26] 2009 UK	Pilot RCT	Patients undergoing inguinofemoral lymphadenectomy for vulval cancer I:7 C:7	To explore the feasibility of conducting a larger trial to investigate whether the early use of compression stockings is effective in preventing leg lymphedema.	GCSs for 180 d, with a mean of 10 h a day. Follow-up: 3 and 6 month	NHP-1 Circumference of the limb	There was no difference in lymphedema incidence between groups, but the control group had a greater increase in leg volume. Both groups had similar groin wound dehiscence, infection, lymphocyst formation, and QoL scores.
Shallwani et al.[27] 2020 Canada	Pilot RCT	Newly diagnosed gynecological cancer preoperatively I:18 C:18	To explore the preliminary effectiveness of the intervention on lymphedema incidence	Lymphedema education (both groups) + standard or custom-made compression class 1 wear the stockings for 12 to 16 h daily for at least 6 mo postoperatively. IG also received individualized education from the certified lymphedema therapist on general aerobic and resistance exercise, self-lymphatic drainage, and skin care. Follow up: after 12 month	Presence and characteristics of lymphedema Lower limb volume EORTC QLQ-C30	The 12-month cumulative incidence of lymphedema was 31% in the CG and 31.9% in the IG. Among affected participants, lymphedema developed after a median of 3.2 mo in the CG versus 8.8 mo in the IG.
Wang et al.[10] 2020 China	RCT	117 patients with cervical cancer I:59 C:58	To determine the effectiveness of modified CDT in reducing the risk of secondary LLL after radical surgery.	Modified CDT, which included manual lymph drainage, compression hosiery, regular exercise, and health education, lasted for 12 weeks, with three visits from the nurse specialists. Two telephone interviews were conducted one week after discharge from the hospital and 2 mo after surgery, and one clinic visit was performed after the first follow-up assessment 1 mo after surgery.	Circumference measurement GCLQ	Twenty-eight patients (23.9%) developed lymphedema: 20 (34.5%) in the CG and 8 (13.6%) in the IG. The IG had lower excess volume (2.1% vs 2.96%) and a longer mean onset time (8 mo vs 4.6 mo).
Wu et al.[5] 2021 China	RCT	109 female patients with gynecological cancer I:53 C:56	To investigate the efficacy of early prevention of CDT and rehabilitation exercise for the prevention of postoperative LLL	CDT and rehabilitation exercises, health education, and follow-up were conducted by telephone and outpatient visits. The treatment lasted for 40 d. The follow-up lasted 1 y	Simple scale for patients' LLL. Measurement of diameter of low limbs EORTC QLQ-C30, BFI	The CDT group had a 15.09% incidence of lymphedema, compared to 32.14% in the CG. Lymphedema-free time was significantly longer in the CDT group.

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Table 3 (*Continued*)

Reference / Country	Study design	Sample	Aim of the intervention	Intervention components (Mode, duration, frequency, follow-up)	Measurement tools	Conclusions
Daggez et al.[28] 2023 Turkiye	Prospective cohort study	100 patients diagnosed with gynecological cancers I:60 C:40	To evaluate prophylactic complex physiotherapy in patients with gynecological cancer and its effects on patient-reported symptoms	CDT at least 5 d a week for 12 month	Circumferences of the right and left lower extremities, GCLQ	Lymphedema occurred in 5% of the prophylactic physiotherapy group and 60% of the nonphysiotherapy group. There was a significant difference in the GCLQ scores at 12 mo between those with and without lymphedema in the physiotherapy group.
Do et al.[1] 2017 South Korea	Pilot RCT	40 patients with LLL after gynecologic surgery for cervical, endometrial, or ovarian cancer, I:20 C:20	To investigate the effects of a complex rehabilitation (CR) program and CDT on edema status, physical function, and QoL in patient	CR comprised stretching, strengthening, and aerobic exercises performed for 40 min, five times a week for 4 weeks. Administered intensive CDT during weeks 0–2 and by the patients themselves during weeks 2–4.	Limb volume, bioimpedance, muscular strength, EORTC QLQ-C30 GCLQ-K	Edema status, fatigue, pain, and GCLQ-K scores improved significantly in both groups after 4 weeks. Physical function, fatigue, the 30-s chair stand test, and quadriceps muscle strength improved more in the CRCDT group compared to the CDT group.
Abe,[24] 2020 Japan	RCT	18 women with LLL secondary to surgical treatment of gynecological cancer,	To determine the relative benefits of AECT with different postures for patients with LLL	AECT in a seated position, AECT in a supine position (supine AECT), and compression-only therapy in a supine position (CT) (Each intervention was performed for 15 min, and the three conditions were separated by a 1-week washout period. Follow-up: primary and secondary endpoints were performed immediately before and after the intervention	Patient repoted symptoms of lymphedema, limb volume measurements	The decrease in limb volume was greater after supine AECT than after CT. Preintervention pitting severity and skin stiffness were significantly correlated with volume decrease magnitude after all interventions and specifically after supine AECT.
Fukushima et al.[25] 2016 Japan	RCT	23 women with LLL	To evaluate the immediate effects of AECT,(Active exercise with compression therapy) on LLL	Participants completed high-load AECT, low-load AECT, and compression-only therapy (CT) Each intervention was performed for 15 min, and the three interventions were each separated by a 1-week washout period to eliminate any carryover effects. Measurements were taken before and after each intervention.	The patient reported symptoms of lymphedema, limb volume measurements (perometry)	Volume reduction varied significantly among the three interventions. High-load AECT reduced lower-limb volume more than CT. General and skin symptoms were similar across all interventions, but preintervention skin symptoms significantly correlated with volume reduction after high- and low-load AECT
Iyer et al.[29] 2018 US.	RCT	95 physically inactive ovarian cancer survivors I:50 C:45	To determine the prevalence of LLL in a sample of ovarian cancer survivors via 3 different diagnostic methods and to assess the effect of a randomized exercise intervention	The exercise intervention consisted of a 6-month home-based moderate-intensity aerobic exercise program facilitated by weekly telephone calls. Provided weekly counseling and support via telephone to motivate participants using a 26-chapter book developed for the study (1 chapter per week of intervention). The attention control arm received weekly phone calls.	The Norman Lymphedema Questionnaire optoelectronic perometer self-report questionnaire	At 6 mo, LLL prevalence decreased to 28% in the exercise group and 35% in the control group, with no significant difference between the two groups.

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Table 3 (*Continued*)

Reference / Country	Study design	Sample	Aim of the intervention	Intervention components (Mode, duration, frequency, follow-up)	Measurement tools	Conclusions
Kim,[23] 2008 South Korea	Experimental	57 gynecological cancer patients LLL	To ascertain whether or not CDT for 57 gynecological cancer	Treatment consisted of a 'decongestive phase', which lasted from 2 weeks to 4 weeks, with daily treatment. The patients then followed a 'maintenance phase' of self-care for the rest of their lives. The decongestive phase included MLD, compression bandaging, remedial exercise, and skin care. The duration of each MLD session was from 45 min to 1 h. follow-up visits were scheduled for one month.	Leg circumferences SF-36 Questionnaire	The change in % excess volume was significantly decreased after CDT. The QOL scores were significantly higher than the scores at baseline, indicating an improvement in the QOL.
Liao et al.[11] 2023 China	Restrospective controlled study	90 patients who received surgical treatment at the hospital for malignant gynecological tumors I:45 C:45	To explore the effects of a comprehensive nursing intervention	A comprehensive nursing intervention based on a metaheuristic learning model,1 y follow-up	WHOQOL-BREF incidence of lymphedema measured the circumference of participants' LLL	The IG's decrease in the mean circumference at 10 cm below the knee was significantly greater than CG, LLL incidence was a significantly lower rate than that of the CG, QoL was significantly higher than that of the CG
Zhang et al.[21] 2022 China	Feasibility study	Cervical cancer patients who underwent radical hysterectomy with pelvic lymphadenectomy	To evaluate the preventive effect of PRET, we conducted this pilot study to assess the feasibility of PRET after cervical cancer surgery.	Health education + participants were instructed to do this exercise in a supine position. One month after surgery, the participants were asked to do this exercise standing. From d 61, patients began resistance training of lower limbs with a 10 kg elastic bandage in the standing position. The first three phases (within one month after surgery) took 20−25 min to complete. For the last two phases (one month after surgery), each exercise consisted of a 10-minute warm-up and 10 min of relaxation. It took 40 min in total. Follow-up lasted for 1 y.	Physical measures, GCLQ Feasibility measures	The adherence rate was over 75% for most patients, with the perceived difficulty of the PRET being high. Over half found the exercise intensity appropriate, and no serious adverse events were observed.
Zhang et al.[22] 2024 China	RCT	Patients who underwent radical surgery for cervical cancer treatment PRET::89 C:89 GCS:89	To assess the efficacy of a self-designed PRET for preventing the development of lower limb lymphedema.	PRET + health education: The lower limb size was measured. Each patient in this group received medical grade 15−22 mmHg graduated off-the-shelf compression stocking. Graduated compression above-the-knee stockings used for the patients who were asked to wear them for no less than 23 h per day.	Bioelectrical impedance analysis Physical measures, GCLQ	Among patients, lower limb lymphedema occurred in 9% of the progressive resistance exercise group, 28.1% of the compression stocking group, and 42.7% of the control group. The risk was significantly lower in the exercise group than in the control group. The study lacked the power to show significant risk reduction in the compression stocking group.

Abbreviations: I-Intervention; C-Control; RCT-Randomised controlled study; PCD-pneumatic compression devices; QoL-Quality of life; EORTC QLQ-C30-European organisation for research and treatment of cancer quality of life questionnaire – core questionnaire; CDT- Complex decongestive physiotherapy; VAS-Visual analogue scale, LYMQOL-LEG- Lymphedema quality of life questionnaire-leg, GCSs-Graduated compression stockings; NHP-1-Nottingham health profile-part 1; LLL-Lower limb lymphedema; GCLQ-The gynecologic cancer lymphedema questionnaire; MLD-Manual lymphatic drainage; BFI- The brief fatigue ınventory; PRET- Program of progressive resistance exercise training; WHOQOL-BREF-World Health Organization Quality-of-Life Scale; AECT-Active exercise with compression therapy

There are also some methodological issues in the studies included in this review. Most studies used RCT, but four used pilot and feasibility study design, and outcome measurements were assessed mostly after the interventions without long-term follow-up. Similarly, Iwersen et al.[38] reported no randomized clinical trials regarding the conservative treatment of LLL post-treatment of gynecological cancer. Most studies had small sample sizes due to feasibility and pilot study design. Despite the various methods available for managing LLL, there is still a significant gap in research on which methods are the most effective and appropriate. More studies and systematic reviews are needed to address this gap. Additionally, sufficiently powered randomized trials using standardized assessments and validated outcome measures are crucial for improving LLL treatment.[30,39] By focusing on high-quality research, the medical community can better understand the efficacy of different treatments and optimize care for patients with LLL.

Strengths and Limitations

Our scoping review provides a comprehensive overview of interventions for managing LLL related to gynecological cancer, drawing from a broad range of studies across multiple databases. This broad approach strengthens our findings and offers valuable insights into effective practices that can improve patient outcomes, particularly in quality of life and symptom management. However, the study has some limitations. Language and publication bias also present potential limitations, as relevant studies published in non-English languages may have been excluded on less rigorous study designs, affecting the overall strength and generalizability of the conclusions.

Conclusions

This scoping review shows that interventions, particularly CDT, can effectively reduce the incidence and symptoms of LLL following gynecological cancer treatment, enhancing patients' quality of life. However, there is a need for further high-quality RCTs with long-term follow-up to strengthen the level of evidence. Standardized intervention protocols, such as those for CDT and compression therapy, would help ensure consistent evaluations across studies. It is essential to develop structured patient education programs focusing on early symptom recognition, preventive measures, and self-care strategies. These programs could be supported by interactive digital resources, such as videos or mobile applications, to increase patient engagement. Additionally, integrating lymphedema management protocols into routine nursing care for gynecological cancer after surgery and providing continuing education training for nurses can further improve patient health outcomes.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Maide Nur Tümkaya: Writing – review & editing, Writing – original draft, Visualization, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Memnun Seven:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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Supplementary materials

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