



Competence of Healthcare Providers in Managing Lymphedema Post Breast Cancer Treatment: A study in western Kenya hospitals

Rosemary Lusike Wepukhulu^{1*}, John Martin Okoth² and Damaris Ochanda¹

¹*School of Nursing, Midwifery and Paramedical Sciences, Masinde Muliro University of Science and Technology, Kenya and* ²*Department of Nursing Research, Education and Management, Masinde Muliro University of Science and Technology, Kenya*

*Corresponding author: Rosemary Lusike Wepukhulu. Email address: waruinutracy@gmail.com

DOI: <https://dx.doi.org/10.4314/ajhs.v36i4.7>

Abstract

BACKGROUND

Globally, breast cancer, the most diagnosed cancer, affects around 2.3 million individuals. Approximately 28% to 38% of breast cancer patients develop lymphedema post-treatment, impacting one in five patients. Without intervention, the condition leads to serious complications, affecting daily tasks. Sub-Saharan Africa reports increasing comorbidities related to lymphedema, yet no data exists on its prevalence in Kenya. This study assessed clinical management strategies for breast cancer treatment-induced lymphedema in selected Western Kenya hospitals.

MATERIAL AND METHODS

This was a cross-sectional analytic study. Simple random sampling was used to select healthcare facilities offering cancer screening and treatment. Healthcare providers were randomly selected from five health facilities depending on the number required at each health facility. 192 healthcare providers were selected to participate in the study. Data collection was by structured questionnaires, observation checklist and focus group discussion, analysed by SPSS version 23.1 and Qualitative data thematically analysed guided by questions on knowledge, skills and management strategies.

RESULTS

The results showed healthcare providers' knowledge ranging from low to average with a deficit in important areas of practice such as skincare (OR=0.56, p=0.01). stocking pressure (OR=1.841, P=0.004, positive stemmer's sign test (OR=2.217, p=0.001) with over 50% getting incorrect answers. Good history and assessment Skills were demonstrated (OR=1.6; CI;1.0-24; P=0.037) but patient education was poorly done. Focus group discussion showed a deficit in knowledge by failure to clearly define lymphedema.

CONCLUSION

Structured education of lymphedema is needed to increase the knowledge of healthcare providers and improving knowledge may fill the gaps in knowledge and demonstrate good practical skills in patient management.

Keywords: Healthcare Providers, Competence, Clinical Management, Lymphedema, Breast Cancer Treatment, Hospitals, Western Region, Kenya

[*Afr. J. Health Sci.* 2023 36 (4): 396-405]

Introduction

Lymphedema is a chronic and incurable condition and the most distressing complication of breast cancer treatment (1). Lymphedema is a swelling of at least 200mls by volume or 2cms by circumference of the affected limb that develops time from initial

treatment of breast cancer to a period of 20 years (2).

Patients report symptoms of decreased flexibility and swelling in specific areas that manifested in the early stages (3). Skin thickening and folds, joint immobility, pain, pitting, massive swelling and leakage of lymph

are noted in later stages (4). Early detection and intervention are key in risk reduction and management of this widespread condition (5). Knowledge of lymphedema regarding symptoms, diagnosis risk reduction and different treatment options by healthcare providers allows them to offer good quality care (6).

Healthcare providers need greater awareness of the physical and psychological effects of lymphedema through good history taking, physical examination and any subsequent investigations to reveal the extent of the problem. Integration of skills such as limb volume measurements, skin care, care of compression garments, lymphatic drainage and a multidisciplinary approach strengthen the resources leading to the improvement of symptoms and prevention of complications (7).

Breast cancer and its treatments lead to lymphedema a lifelong complication associated with the feeling of discomfort (8). The findings of this study shall therefore provide a better understanding of lymphedema. It is hoped that the results shall be used to develop protocols and guidelines on lymphedema management, form policies and frameworks to support patient care services globally, generate relevant educational programs that meet the needs of healthcare providers in identifying their roles within the multidisciplinary team and finally the knowledge explored from this study shall be an input in cancer centres for future research. The study aimed to assess the competence of healthcare providers in the clinical management of lymphedema secondary to breast cancer.

Materials and methods

Research design

The study evaluated clinical management strategies for lymphedema secondary to breast cancer treatment in Western Kenya, for this a cross-sectional analytical study design was undertaken with both qualitative and quantitative approaches used.

Study population

192 healthcare providers working in oncology units of County Referral Hospital of

Kakamega (n=48), Kisumu (n=41), Bungoma (n=33), Siaya (n=29) and Bomet (n=38) Participated in the study. These included doctors, clinical officers, nurses, and physical therapists. nutritionists and occupational therapists.

Sampling method

In Kenya according to GLOBOCAN⁹, breast cancer is on the increase with 6799 (25.6%) new cases annually. The study was conducted in the western region where breast cancer is more common. Different counties report 200 to 300 new cases every year and more than 80% of patients are diagnosed at a late stage. This leads to aggressive treatments which are considered a major cause of breast cancer-related lymphedema (10).

Hospitals in the western region that are Level 4 and above were chosen for their ability to provide a variety of cancer treatments, including chemotherapy, radiotherapy, and surgical oncology. These hospitals can either function as standalone facilities or provide preventive, screening, early detection, diagnosis, registration, and treatment services for cancer patients per the guidelines set forth by the Ministry of Health for the establishment of cancer management centres in Kenya. 30% of the selected hospitals were randomly selected to participate in the study. This is according to Mugenda and Mugenda(11) a sample size of 30% is a good representation of the target population. Healthcare providers were chosen using a random sampling technique. A list of healthcare providers working in the cancer centres of each hospital was obtained and those who met the inclusion criteria were assigned numbers depending on the required number of participants at each hospital based on the proportionate sampling table. Convenience sampling was used to pick patients who met the inclusion criteria and who were available at the time of data collection.

Sample size determination

The study determined the minimum sample size of healthcare providers caring for cancer patients using Fisher's formula ($n =$

Z^2pq/d^2), with a confidence level of 95% and standard normal deviation (Z) of 1.96. The estimated proportion (p) was set at 0.05, and due to unknown characteristics, a 50% choice was adopted. The calculated sample size (384) was adjusted for a smaller target population (<10,000) using the formula $n_f = n / (1 + n/N)$, resulting in a final minimum sample size of 192.

Data collection tools

Data collection tools were previously validated by the International Lymphedema Network (ILF) and modified to suit the study. These included a structured questionnaire for healthcare providers at each selected hospital. Observation Checklist to assess healthcare providers' skill in lymphedema care provision, and Focus group discussion used to obtain information on patient care interventions.

Structured questionnaires for healthcare providers

The questionnaires were in English with closed-ended questions to assess the following variables, Socio-demographic characteristics related, sex, age group, professional qualification, and education, the tool also consisted of items applying the Likert scale with the responses ranging from strongly agree(4) agree(3) disagree(2) strongly disagree(1) that described the opinions of the participants, An optimal section comprising of multiple choice questions were used to test the actual knowledge of lymphedema and clinical management. These responses were then marked against a validated marking scheme. The total scores weigh against 100% and are recorded as appropriate according to the Nursing Council of Kenya.

Clinical assessment and observation checklist for healthcare providers

The observation checklist was adopted from LYMQoL developed in 2010 by United Kingdom-based lymphologist Dr Vaughn Keeley and was categorized in general cancer-specific and lymphedema-specific it comprised 7 items which included history taking, physical examination and diagnosis of lymphedema, investigations to confirm the diagnosis, the patient's level of activity assessment and management. Health education, complication assessment, monitoring and follow-up of hospital appointments. "Yes" was used for healthcare providers who competently performed the required procedure and "no" for those who either skipped the procedure or failed to perform the procedure as required. This research was conducted by observing healthcare providers who were unaware of being watched while providing care.

Focus group discussion for health care providers

Five groups were used, one at each facility with 4-8 members who were conveniently selected. Data was collected by voice and notes recording by the principal researcher. According to (3). FGD is used by people with the same characteristics to share experiences, competencies and expertise. The participation was voluntary, guided by questions on knowledge skills and strategies used in lymphedema management.

Validity and reliability of the instruments

A pilot study was conducted before data collection and instruments adjusted for usability and generalizability.

Table 1:
Health Care Providers' Sample Distribution

| Health facility | County | Doctors | Clinical officers | Nurses | Others |
|----------------------------------|----------|---------|-------------------|--------|--------|
| JOOTRH | Kisumu | 2 | 6 | 30 | 3 |
| Siaya County Referral Hospital | Siaya | 1 | 4 | 24 | - |
| Bungoma County Referral Hospital | Bungoma | 3 | 10 | 20 | - |
| Longisa County Referral Hospital | Bomet | 2 | 8 | 28 | 3 |
| KCGRH | Kakamega | 6 | 3 | 24 | 15 |
| | Total | 14 | 31 | 126 | 21 |



Data collection procedure

Data was collected from 24th June to 24th July 2021, from one hundred and ninety-two healthcare providers and one hundred and ninety-two patients. A pre-trained research team administered the informed consent process and the study volunteers had to sign the informed consent form. The data collection tools included a self-administered questionnaire, an observation checklist and a focus group discussion, the questionnaire had parameters to test knowledge of lymphedema and management. An observation checklist was used to observe and evaluate healthcare providers' competence in history taking, physical examination, investigation assessment and diagnosis without prior arrangement.

Data analysis

Obtained data was verified and entered into Microsoft Excel. Analysis was done using a statistical package for social science software (SPSS) version 23.1 as per the objectives of the study. Descriptive statistics were used to describe and summarise the distribution of the study variables. Categorical and ordinal data were summarized using frequency distribution, a t-test was applied to test the mean difference of scores between two categories while a one-way ANOVA test was applied to test the differences of more categories.

Descriptive tables were used to show the level of agreement from self-reported knowledge assessment. Multiple regression was used to test the strength of association and Cronbach's alpha was applied to show the internal consistency of the reported results.

Qualitative data analysis

One focus group discussion was held in each facility with 4-8 members conveniently selected to attend each group. Data was thematically analyzed based on the work by Miles & Huberman(14) to transcribe and interpret the interview recordings and summarized guided by questions on knowledge, and skills.

Ethical considerations

Approval was sought from the directorate of postgraduate studies, the institute and research ethical committee (IREC) Masinde Muliro University of Science and Technology, the National Commission for Science Technology and Innovations (NACOSTI), Approvals were sought from the County government of Siaya, Bungoma, and Kakamega, Bomet and Kisumu. The collected information was kept secure and confidential through participant-agreed protection measures. Questionnaires were coded for identification purposes. Participants were informed of no direct benefits and observed fairness and equity without discrimination.

Results

Socio-demographic characteristics

Table 2. Shows the demographic characteristics of study participants, 192 Healthcare providers participated in the study registering a 100% response rate. Mostly female, 117 (60.9%), most frequent age ranged from 31-34 years of age, 46 (24.0%). A higher response was observed among nurses, 126 (65.6%) and the majority of the respondents were diploma/certificate holders 117 (60.9%).

Table 3 shows the sociodemographic characteristics of 192 patients who participated in the study. The ages ranged from 43-60 (IQR=43-60) with the median of the patients being 53.5. Most of them were self-employed, 96 (50.0%), married, 113 (58.9%), Christians, 157 (81.8%) and received chemotherapy amongst other treatments for breast cancer. The median time taken to develop lymphedema symptoms after breast cancer diagnosis and treatment was 12.5 months (IQR=8.1, 22.8).

Competence in managing breast cancer-related lymphedema

The study looked into history taking, physical examination and treatment and grades awarded according to the Nursing Council of Kenya grading system 75-100% distinction. 65-74 Credit, 50-64 pass 49 and below fail.

Scores on knowledge of lymphedema management

Ten multiple choice questions were asked and findings are shown in Table 4, to confirm the level to which respondents know about lymphedema management; those who knew important areas of lymphedema management such as skin care (OR = 0.56, $p = 0.01$). Stoking class, A pressure (OR = 1.841, $p = 0.004$). Positive stemmers sign test (OR = 2.717, $p = 0.001$) were less likely to get distinctions. Sentinel node as the first lymph

node that drains the body (OR = 2.249, $p = 0.003$) and early detection and intervention as the best to reduce and manage lymphedema (OR = 0.235, $p = 0.016$) were statistically significantly more likely to have a distinction grade than those who didn't know. Most participants were above average but with a deficit of knowledge in important areas of practice in lymphedema management such as skin care, stoking application and diagnosis with over 50% getting incorrect answers.

Table 2:
Socio-demographic characteristics of healthcare providers

| Variable | | N | % |
|----------------------------|---------------------|-----|------|
| Gender | Male | 75 | 39.1 |
| | Female | 117 | 60.9 |
| Age group | Below 24 years | 25 | 13.0 |
| | 25-30 years | 43 | 22.4 |
| | 31-34 years | 46 | 24.0 |
| | 35-40 years | 19 | 9.9 |
| | 41-44 years | 21 | 10.9 |
| | 45-50 years | 7 | 3.6 |
| | Over 51 years | 31 | 16.2 |
| Professional qualification | Nurse | 126 | 65.6 |
| | Clinical officer | 31 | 16.1 |
| | Medical officer | 12 | 6.2 |
| | Oncologist | 2 | 1.0 |
| | Others | 21 | 10.9 |
| Education | Diploma/certificate | 117 | 60.9 |
| | Bachelor's degree | 66 | 34.4 |
| | Masters | 8 | 4.2 |
| | Doctorate | 1 | 0.5 |

Table 3:
Socio-demographic characteristics of patients

| Variable | | Frequency, N= 192 | (%) |
|----------------|--|-------------------|------|
| Age | Median | 53.5 | |
| | IQR | 43, 60 | |
| Occupation | Employed | 35 | 18.2 |
| | Self-Employed | 96 | 50.0 |
| | Retired | 44 | 22.9 |
| | Others | 17 | 8.9 |
| Marital status | Single | 26 | 13.5 |
| | Married | 113 | 58.9 |
| | Widowed | 52 | 27.1 |
| Religion | Christian | 157 | 81.8 |
| | Muslim | 35 | 18.2 |
| | Time in months taken in the development of lymphedema symptoms (Median, IQR) | 12.5 (8.1, 22.8) | |

Findings on skill assessment

An observation checklist was used to assess skills by direct observation. This included history taking, physical examination, investigations, physical activity, patient education, complication assessment, and monitoring and follow-up. A scoring system of yes or no was used for all the procedures done. Table 5 shows better performance was observed in history taking, physical examination and vital signs with over 70%. Assessing present symptoms (63.6%). Identifying patients' needs had an average response of 59.1%. while limb volume had a low response (27.3%) an indication that the procedure was not practiced by most respondents.

During patient consultations, healthcare providers were found to be more likely to perform certain actions. They were 1.6 times more likely to take a history of the patient's chief complaints, medical history, and history of lymphedema and treatment type (OR; 1.6: CI: 1.0-2.4; p-value = 0.037). They were also 3.6 times more likely to carry out a systemic and symptom assessment (OR; 3.6CI: 1.5-6.7: P-value = 0.039), 4.9 times more likely to take vital signs (OR; 4.9: CI: 2.0-7.4 P-value = 0.002), 0.4 times more likely to carry out a symptoms assessment (OR 0.4: CI: 0.1-1.9 P-value = 0.004), and 5.4 times more likely to educate the patient on modifiable risk factors, signs, and symptoms (OR; 5.4; CI; 2.4-9.3, P-value = 0.022).

Table 4:
Individual knowledge of lymphedema management

| | Answers | Total n (%) | OR(CI) | P-value |
|--|-----------|-------------|---------------------|---------|
| 1. The importance of skin care for people with lymphedema | Correct | 67 (34.9) | 0.567 (0.390-.882) | 0.001 |
| | Incorrect | 125 (65.1) | | |
| 2. Lymphedema stoking class A pressure | Correct | 66 (34.4) | 1.841 (1.215-.791) | 0.004 |
| | Incorrect | 126 (65.6) | | |
| 3. The most appropriate initial management for lymphedema | Correct | 82 (43.0) | 3.462 (2.230-.375) | 0.001 |
| | Incorrect | 110 (57) | | |
| 4. Positive stemmers sign test | Correct | 113 (59.0) | 2.717 (1.640-.501) | 0.001 |
| | Incorrect | 79 (41) | | |
| 5. A sentinel node is the first lymph node that drain the body | Correct | 129 (67.0) | 2.249 (1.321-.831) | 0.003 |
| | Incorrect | 63 (33.0) | | |
| 6. Patients who do not have symptoms within two years are no longer at risk of developing lymphedema | Correct | 134 (70.0) | 1.210 (0.824-.776) | 0.331 |
| | Incorrect | 58 (30.3) | | |
| 7. Early detection and intervention to reduce and manage lymphedema | Correct | 164 (85.4) | 0.235 (0.072-.765) | 0.016 |
| | Incorrect | 28 (14.6) | | |
| 8. True statement about lymphedema | Correct | 149 (78.0) | 0.323 (0.212-.491) | 0.001 |
| | Incorrect | 43 (22) | | |
| 9. Milroy's disease | Correct | 86 (45.0) | 0.953 (0.607-1.497) | 0.834 |
| | Incorrect | 106 (55) | | |
| 10 How treatment effectiveness is measured. | Correct | 164 (85.5) | 5.7(2.5-6.3) | 0.023 |



Cronbach's alpha was used to assess the internal consistency of the findings. A value greater than 0.7 indicated a strong correlation and consistency, whereas a value less than 0.3 indicated a weak correlation. Cronbach's alpha was 0.668 for history taking and 0.730 for physical examination, with a lack of patient follow-up across all health facilities (alpha = -0.9011).

Findings from focus group discussions showed a deficit of knowledge among

healthcare providers by failure to clearly define lymphedema which must include what lymphedema is, the courses, risk factors and signs and symptoms indicated in the following extracts:

“... a swelling in one of the limbs either lower or upper due to the blockage of the lymphatic system....” (Health care Provider C and D, FGD.1).

Table 5:
Healthcare provider's skill assessment in clinical management of lymphedema (N=192)

| Variable | Indicators | Performed-Procedure done (%) | Not Performed-Procedure not done (%) | Cronbach's alpha value | OR(CI) | P-Value |
|--------------------------|--|------------------------------|--------------------------------------|------------------------|--------------|---------|
| History of lymphedema | Chief complains | 44 (22.9) | 148 (77.1) | 0.668 | - | - |
| | Medical/Surgical history | 26 (13.5) | 166 (86.5) | | 0.6(0.1-3.5) | 0.476 |
| | History of lymphedema and treatment type | 44 (22.9) | 148 (77.1) | | - | - |
| Physical examination | Systemic assessment | 26 (13.5) | 166 (86.5) | 0.730 | - | - |
| | Symptom's assessment | 9 (4.7) | 183 (95.3) | | 0.4(0.1-1.9) | 0.004 |
| | Systemic assessment and symptom assessment | 96 (50.0) | 96 (50.0) | | 3,6(1.5-6.7) | 0.033 |
| | Vital signs (BP, RR, SPO, Pulse) only | 17 (8.9) | 175 (91.1) | 0.561 | 0.6(0.1-1.9) | 0.089 |
| | Weight, Height, BMI only | 17 (8.9) | 175 (91.1) | | 0.6(0.1-1.9) | 0.089 |
| | Vital signs (BP, RR, SPO, Pulse) and weight, Height, BMI | 131 (68.2) | 61 (31.8) | | 4.9(2.0-7.4) | 0.002 |
| Investigations | Limb volume | 8 (4.2) | 184 (95.8) | 0.682 | - | - |
| Diagnosis | Identify the needs of patients with lymphedema | 44 (22.9) | 148 (77.1) | | - | - |
| Physical activity | The current level of physical activity and any exercise | 113 (58.8) | 79 (41.1) | | - | - |
| Patient Education | On modifiable risk factors | 9 (4.7) | 183 (95.3) | 0.526 | - | - |
| | On risk factors, Signs and symptoms & Self-management | 52 (27.1) | 140 (72.9) | | 5.4(2.4-9.3) | 0.022 |
| Complication assessment | Wound infection, and necrosis | 44 (22.9) | 148 (77.1) | -0.9011 | - | - |
| Monitoring and follow-up | Give the next date of the appointment | 113 (58.8) | 79 (41.1) | | - | - |



“... just a swelling in the legs or arms...”
(Health care provider k, FGD,3).

“... reported one risk factor as history of surgery.....” (Health Care Provider R, FGD,5),

“.... Radiation Therapy because when the patient gets irradiated the radiation affects the lymphatic system because of the fibrosis that ultimately leads to blockage....” (Health care provider D, FGD,1)

and “.... it depends on the stage of breast cancer, especially patients in late stage....” (Health care provider c).

Discussion

Healthcare providers' lymphedema management knowledge

A total of 192 participants were chosen from five counties to take part in the study. Out of these, 26 (13.5%) failed the knowledge test. The remaining 166 (86.5%) who passed the test had shortcomings in important areas of lymphedema management practice, including skin care, stocking application, and diagnosis. A study by Bayisenge *et al* (15) conducted a cross-sectional study of healthcare providers' knowledge and reported a failure rate of 60% out of 152 participants. In this study, the demographic characteristics revealed a higher response from nurses (65.6%) similar to the previous study by Micheline *et al.*(16).

In this study, the association between demographic variables and scores showed that professional qualification mostly influenced higher scores. Medical officers and clinical officers had statistically significantly higher performance (76.7% and 69.4% respectively) compared to nurses (OR; 17.7 CI (8.2-27.2 P-Value =0.001 and OR;11.6 CI;5.1-8.2 P-Value =0.001). This is similar to a global open study that showed academic qualification, profession, and experience as a significant relationship with knowledge (17). This is also similar to a study by Hossein *et al.*, (2021). 16 articles were reviewed, 12 were cross-sectional, 2 qualitative and 2 international pilot studies that reported

professional qualification as a factor that influenced health care provider's knowledge. Nurses and those in the other subgroup had the lowest scores with a mean score of 56.3% and 57.5% contrary to previous studies that reported that nurses were knowledgeable and had critical thinking skills to provide the best outcome (18) and make a huge impact on the patient's quality of life (16).

The discrepancies among healthcare providers in this study was a clear indication that the multidisciplinary approach reported in the literature was not practised in various hospital regarding lymphedema management. In this study work experience also played a role because those above 51 years of age performed better than others (OR:6.3; 95% CI;1.2-30.0; P=0.026) similar to a study by Fairchild *et al* (19), that reported work experience as one of the factors that influenced better performance. Self-reported knowledge had a higher odds ratio compared to test results. This may be due to subjects not being able to assess themselves accurately, being untruthful, or exaggerating their self-reported knowledge. Cronbach's alpha for physical examination was 0.730 (over 70%) showing consistency of the procedure mostly practiced. Qualitative results show a deficit of knowledge among healthcare providers by failure to clearly define lymphedema which must include what lymphedema is, the courses, risk factors and signs and symptoms. An example is the extract below

“.... it's just a swelling in the legs or arms” ... (care provider k). This is contrary to reports by most healthcare providers that they were knowledgeable. Therefore, healthcare providers need to be equipped with knowledge of lymphedema management to provide quality patient care.

Clinical management skills of lymphedema by healthcare providers

In a study by Runowicz *et al* (6) systematic reviews of the literature showed Healthcare Providers depended on practical efficiencies and tests to accurately measure,



diagnose and manage lymphedema. The healthcare providers' skills were evaluated by directly observing their patient care. A better performance was observed in history taking and physical examination with Cronbach's alpha of 60 to 70% respectively. Vital information such as complication assessment, prevention intervention and follow-up appointments were missed across all health facilities with the Cronbach's alpha of (-) 0.9011 indicating poor performance. These tallies to a study by Bayisenge *et al* (15) that reported a lack of knowledge regarding assessment, examination, patient education and follow-up appointments. This was consistent with a study by Hossein *et al*(20) in Iran that showed the educational needs of healthcare providers regarding the care of patients were reported either as adequate or poor. These may be due to lack of commitment, shortage of staff and time allocated for each patient. A previous study by Finnane *et al*(21) affirms the current study that transferring self-management skills to the patient through health education was very important.

Limitations of the study

Based on cross-sectional research design, data was collected at one point in time and therefore this study could not be generalized to a larger population. Since the aim of this study was to focus on lymphedema, other articles reporting on the knowledge of healthcare providers on cancer survivors were excluded and there has been extensive research in such fields in the literature while lymphedema has not been addressed properly.

Conclusion

Healthcare provider's knowledge of lymphedema had a higher failure rate based on the reports in the literature. In this study, overall healthcare providers' knowledge was low to average therefore increasing knowledge of health care providers may probably lead to better outcomes of patient management. structured education on lymphedema is needed with more emphasis placed on the gaps in the field to increase knowledge and is an input in cancer centers for future research.

Acknowledgments: I owe my debt of gratitude to my supervisor's professor John Okoth and Dr Damaris Ochanda for guidance throughout the study. My appreciation to Bungoma, Siaya, Kisumu, Kakamega and Bomet County Referral Hospitals and Masinde Muliro University School of Postgraduate for permission to carry out the study.

Conflict of interest statement: No conflicts of interest to disclose

Availability of data statement: The data that support the findings of this study are available on request from the corresponding author(RL) the data is not publicly available due to privacy and ethical restrictions.

Authors contact email:

Rosemary Lusike - waruinutracy@gmail.com

John Martin Okoth - jokoth@mmust.ac.ke

Damaris Ochanda - dochanda@mmust.ac.ke

References

1. **Krok-Schoen JL, Oliveri JM, Kurta ML, Paskett ED.** Breast cancer-related lymphedema: risk factors, prevention, diagnosis and treatment. *Breast Cancer Manag* [Internet]. 2015;4(1):41–51. Available from: <https://doi.org/10.2217/bmt.14.51>
2. **Shaitelman SF, Cromwell KD, Rasmussen JC, Stout NL, Armer JM, Lasinski BB, et al.** Recent progress in the treatment and prevention of cancer-related lymphedema. *CA Cancer J Clin* [Internet]. 2015;65(1):55–81. Available from: <https://acsjournals.onlinelibrary.wiley.com/doi/abs/10.3322/caac.21253>
3. **Stewart DW, Shamdasani PN.** Focus Group: Theory and Practice. Third Edition. SAGE Publications; 2014. 20–224 p.
4. **Wanchai A, Armer JM, Stewart BR, Lasinski BB.** Breast cancer-related lymphedema: A literature review for clinical practice. *Int J Nurs Sci* [Internet]. 2016;3(2):202–7. Available from: <https://www.sciencedirect.com/science/article/pii/S2352013215300673>
5. **Milambo M, Tshilombo V, Ndayisaba L, Tamuzi J.** Current Level of Evidence on Late Complications of Breast-Cancer Management in the Democratic Republic of the Congo: Review of the literature. 2018 Jan 1; 04:144.

6. **Runowicz CD, Leach CR, Henry NL, Henry KS, Mackey HT, Cowens-Alvarado RL, et al.** American Cancer Society/American Society of Clinical Oncology Breast Cancer Survivorship Care Guideline. *Journal of Clinical Oncology* [Internet]. 2015 Dec 7;34(6):611–35. Available from: <https://doi.org/10.1200/JCO.2015.64.3809>
7. **Borman P, Yaman A, Yasrebi S, Özdemir O.** The Importance of Awareness and Education in Patients with Breast Cancer-Related Lymphedema. *Journal of Cancer Education* [Internet]. 2017;32(3):629–33. Available from: <https://doi.org/10.1007/s13187-016-1026-1>
8. **American Cancer Society.** Facts and Figures 2016. Atlanta; 2016.
9. **Union for International Cancer Control.** GLOBOCAN 2020. 2020. New Global Cancer Data.
10. **Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A.** Global cancer statistics, 2012. *CA Cancer J Clin* [Internet]. 2015 Mar 1;65(2):87–108. Available from: <https://doi.org/10.3322/caac.21262>
11. **Mugenda OM, Mugenda AG.** Research methods: Quantitative & qualitative approaches. Vol. 2. *Acts press Nairobi*; 2003.
12. **Fisher DC, Sahn DJ, Friedman MJ, Larson D, Valdes-Cruz LM, Horowitz S, et al.** The effect of variations of pulsed Doppler sampling site on calculation of cardiac output: an experimental study in open-chest dogs. *Circulation*. 1983;67(2):370–6.
13. **Mensa M, Vargas-Bianchi L.** Nurtured and sorrowful: Positive and negative emotional appeals in COVID-19 themed brand communications. 2020;
14. **Miles MB, Huberman AM.** Qualitative data analysis: An expanded sourcebook. *sage*; 1994.
15. **Bayisenge U, Schurer J, Wong R, Amuguni H, Davey G.** Podoconiosis in Rwanda: Knowledge, attitudes and practices among health professionals and environmental officers. *PLoS Negl Trop Dis*. 2020;14(10):e0008740.
16. **Michelini S, Paolacci S, Manara E, Eretta C, Mattassi R, Lee BB, et al.** Genetic tests in lymphatic vascular malformations and lymphedema. *J Med Genet* [Internet]. 2018 Apr;55(4):222—232. Available from: <https://doi.org/10.1136/jmedgenet-2017-105064>
17. **Fairchild B, Ellsworth WA, Selber JC, Bogue DP, Zavlin D, Nemir S, et al.** Safety and Efficacy of Smooth Surface Tissue Expander Breast Reconstruction. *Aesthet Surg J*. 2018;
18. **Kayiran O, de la Cruz C, Tane K, Soran A.** Lymphedema: From diagnosis to treatment. *Turk J Surg*. 2017;33 2:51–7.
19. **Fairchild B, Ellsworth WA, Selber JC, Bogue DP, Zavlin D, Nemir S, et al.** Safety and Efficacy of Smooth Surface Tissue Expander Breast Reconstruction. *Aesthet Surg J*. 2018;
20. **Yarmohammadi H, Rooddehghan A, Soltanipur M, Sarafraz A, Mahdavi Anari SF.** Healthcare Practitioners' Knowledge of Lymphedema. Satiani B, editor. *Int J Vasc Med* [Internet]. 2021; 2021:3806150. Available from: <https://doi.org/10.1155/2021/3806150>
21. **Finnane A, Janda M, Hayes SC.** Review of the evidence of lymphedema treatment effect. *American Journal of physical medicine & rehabilitation* [Internet]. 2015;94(6):483–98. Available from: <http://europepmc.org/abstract/MED/2574162>
1