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Clinical Management Strategies for Lymphedema Secondary to Breast Cancer Treatment in Selected Hospitals in Western Region, Kenya

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ABSTRACT

Background: Globally breast cancer remains the most diagnosed cancer with approximately 2.3 million cases in both sexes, about, 28% to 38% develop lymphedema following breast cancer treatment affecting one in five patients, when severe, Lymphedema significantly impact the person's ability to perform tasks and without treatment the condition progresses to serious complications. In Sub-Saharan Africa reported comorbidities associated with lymphedema showed it is on the increase. Kenya has no data on the prevalence of lymphedema, although reports exist on different types of lymphedema treatment. In western Kenya, no studies have examined lymphedema. This study evaluated clinical management strategies for lymphedema secondary to breast cancer treatment in selected hospitals in the Western Region of Kenya.

Material and Methods: This was a cross sectional analytic study. Simple random sampling was used to select health care 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 health care 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 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 (0R=1.6;CI;1.0-24;P=0.037) but patient education was poorly done. Findings from focus group discussion showed 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.

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Introduction

Lymphedema is a chronic and incurable condition that is one of the most distressing complications of breast cancer treatment [1]. Lymphedema is clinically defined as swelling of at least 200mls by volume or 2cms by circumference measurement of the affected limb that may develop anytime from initial treatment to the period of 20 years [2].

Patient report symptoms of discomfort and heaviness full sensation of arm, skin filling tight decreased flexibility and swelling in specific areas that manifested in early stages [3]. Skin thickening and hardening, joint immobility, pain and, pitting of tissues, skin folds and massive swelling and leakage of lymph are noted in later stages [4]. And early detection and intervention is key in risk reduction and management of this wide spread condition [5]. Knowledge of lymphedema regarding symptoms, diagnosis and risk reduction and different treatment options by healthcare providers allow them to offer good quality care [6].

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

Breast cancer and its treatments lead to lymphedema a lifelong, distressing complication associated with the feeling of discomfort [8]. This study formed the basis for improving the care of patients with lymphedema.

The study findings shall provide better understanding of lymphedema and key strategies used in the management and prevention. It is hoped that the study results shall be used to develop protocols and clear guidelines on lymphedema management, help in informing 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.

Aim of the Study

the aim of the study was to assess the competence of healthcare providers in clinical management for lymphedema secondary to breast cancer.

Materials and Methods

Research Design

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

Target Population

192 healthcare providers working in oncology units of Kakamega County Referral Hospital (n=48). Jaramogi Oginga Odinga Teaching and Referral Hospital (n=41). Bungoma County Referral hospital (n==33). Siaya County Referral hospital (n=29). and Bomet County Referral hospital (n=38) Participated in the study. They included doctors, clinical officers, nurses, physical therapists. nutritionists and occupational therapist.

Sampling Method

In Kenya according to CLOBOCAN (2020), breast cancer is on the increase with 6799 (25.6%) new cases annually. This study was carried out in western region because breast cancer is more prevalent with different counties reporting 200 to 300 new cases annually and more than 80% patients show up at a late stage and are put on aggressive treatments that are described as a major cause of breast cancer related lymphedema.

Level 4 and above hospitals in western region were selected due to their capacity to provide cancer treatment modalities either as a stand-alone facility providing (chemotherapy, radiotherapy and surgical Oncology unity) or offer preventive, screening, early detection diagnosis registration and treatment according to the ministry of health guidelines for establishment of cancer management centers in Kenya (2018). 30% of the selected hospitals were randomly selected to participate in the study. This is according to Mugenda and Mugenda (2003) that a sample size of 30% is a good representation of the target population. Healthcare providers were chosen using random sampling technique. A list of healthcare providers working in cancer centers of each hospital was obtained and those who met the inclusion criteria were given numbers depending on the required number at each hospital. The selection was done randomly depending on the number required at each healthcare facility based on the on the proportionate sampling table. Convenience sampling was used to pick patients who met the inclusion criteria and who were available during the period of data collection.

Sample Size Determination

The minimum number of healthcare providers for the study was determined by fisher's formula because the health care providers who give care to the cancer patients are limited.

$$\text{Formula} \quad n = \frac{Z^2 pq}{d^2}$$

n= the desired sample size (if the target population is >10,000).
Z=The standard normal deviation at the required confidence level of 95% (equivalent to 1.96)
P=The proportion in the target population estimated to have the characteristics being measured
(Set at 0.05 = -+5)

Since the proportion of the population with the characteristics is not known then 50% choice of respondent is used as recommended by Fishers et al, (1983), Mensa, (2020). d^2=The percentage of picking or response choice of 50% = 0.5

q = 1-p
The confidence interval

$$N = \frac{(1.96)2(.50)\,(.50)}{(.50)2} = 384$$

Since the target population is less <10,000 then the required sample size was smaller thus adjustment done using the following formula

$$nf = \frac{n}{1+n/N}$$

Where fn = the desired sample size for the population<10,000
n=the calculated sample which is =384

$$fn = \frac{384}{1+(384/384)}$$

$$= 384/1+1=192$$

Therefore, the desired minimum sample size was 192 .

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 Tools

Data was collection tools used in the study were previously validated by the international lymphedema network (ILF) and modified to suit the study. These tools included structured questionnaire for healthcare providers at each selected hospital where healthcare providers picked from among others, the correct responses from a list of responses for each- question. Observation checklist to assess healthcare providers skill on lymphedema care provision, and Focus group discussion used to obtain information on patient care interventions from shared expediencies and expertise.

Structured Questionnaires for Healthcare Providers

The questionnaires were written in English, which contained closed ended questions and assessed 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 describes the opinions of the participants, An optimal section comprising of multiple choice questions were used to test the actual knowledge of nature and scope of lymphedema and clinical management, these responses were then marked against a validated marking scheme. The total scores weight against 100% and recorded as appropriate according to the nursing council of Kenya.

Clinical Assessment and Observation Checklist for Healthcare Providers

The observation checklists comprised of 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 was done by the research assistants observing healthcare providers, provide care without them realizing that they are being observed from the point of the patient's entry through to exit.

Focus Group Discussion for Health Care Providers

Five groups were used one at each facility with 4-8 members who were conveniently selected and data collected by voice and notes recording by the principal researcher. According to FCD is used by people with the same characteristics to share the experiences, competencies and expertise [3]. The participation was voluntary and facilitated a broad insight into areas that may not be clarified on individual perspective, in dealing with lymphedema in breast cancer patients among healthcare providers guided by questions on knowledge and skills and strategies used in lymphedema management for shared and change of perception to better manage the patients and enable better patient outcome.

Validity and Reliability of the Instruments

The pilot study was carried out at Vihiga County Referral Hospital prior to the actual data collection period and appropriate adjustment were made to ensure usability and generalizability of the instruments, a representative sample of 20 healthcare providers and 20 breast cancer patients were chosen from the population of study, questionnaires were edited before the actual data collection and the completed questionnaires were scrutinized to check if the questions were understandable, answers during pre-test and those given during the actual data collection were compared to assess the likely response of the instruments. To ensure that data analysis technique matched expected responses corrections were done on the spot and at the end of each field day. In order to eliminate errors, the researcher collected data from healthcare providers who had worked in the centers for more than six months and the research assistants were qualified so that the consistent way of asking and answering questions was developed and Cronbach's alpha test on the checklist used in the study yield over 70% which was acceptable.

Data Collection Procedure

Data was collected from 24th June to 24th July 2021. The information was collected from one hundred and ninety-two healthcare providers and one hundred and ninety-two patients. The study team comprised of the researcher and the research assistants who underwent a day's training and were trained on understanding the questions in the tool, identifying the participants in the inclusion criteria, explained how to collect information using the available tools and assigned at the selected areas. The participants signed informed consents, data tools included a self-administered questionnaire, an observation check list and focus group discussion, the questionnaire had parameters to test the actual knowledge of nature and scope of lymphedema and clinical management and an observation checklist was used to observe and evaluate healthcare providers competence in history taking, physical examination, investigation assessment and diagnosis the use of skills in carrying out procedures in patient management without prior arrangement. 192 patients who consented also filled the questionnaires which were collected by the researcher at the end of each day.

Pre-Testing

Prior to the actual data collection, pre-testing was carried out at Vihiga county referral hospital on 20 healthcare providers (10% of the total population) and 4 patients. The hospital was chosen because it had the same characteristics with other selected hospitals and the tool's validity and reliability checked by the principal investigator where, questionnaires were edited before the actual data collection and the completed questionnaires were scrutinized to check if the questions were understandable, answers during pre-test and those given during the actual data collection were

compared to assess the likely response of the instruments. To ensure that data analysis technique matched expected responses corrections were done on the spot and at the end of each field day.

Data Analysis

Obtained data was verified and entered into Microsoft excel and Analysis was done using statistical package for social science software (SPSS) version 23.1 as per the objectives of the study. descriptive and inferential statistics were used both the median and the mean of 192 healthcare providers who answered questions were determined, the t-test was applied to test mean difference of scores between two categories while one-way ANOVA test was applied to test differences of more categories.

Model Assumptions

Since the mean and the median were almost equal, normality was assumed and hence Linea regression method was used. Bivariate regression was used to test the strength of association and the relationship between variables, demographic variables showed professional qualification and age as significant factor that influenced knowledge. Particularly clinical officers and medical officers were 11 and 17 times higher in scores compared to nurses (Coeff=11.6; ci:5.1-18.2, p-value=0.001and Coeff= 17.7:ci=8.2-27.2p-value<0.001and therefore p-value below 0.05 was considered as level of significance.

Descriptive tables were used to show level of agreement from self-reported knowledge assessment survey that ranged from strongly agree, agree to disagree and strongly disagree. Cronbach's alpha was finally applied to show the internal consistence of the reported results. A value of between 0 and 1 was used to show the coleration where value >0.7 showed a stronger coleration and hence consistency while value<0.3 showed weaker coleration and hence consistence and values between 0.4 and 0.6 showed neutral results, descriptive tables were also used for demographic variables of 192 patients, similarly the median and the interquartile ranges were determined.

Qualitative Data Analysis

Five focus group discussions were held, one in each facility with 4-8 members of health care providers conveniently selected to attend each group. focus group data was thematically analyzed based on the work of Miles & Huberman (1994) as shown in figure 1 and the possess was summarized guided by questions on knowledge, skills, strategies used in management.

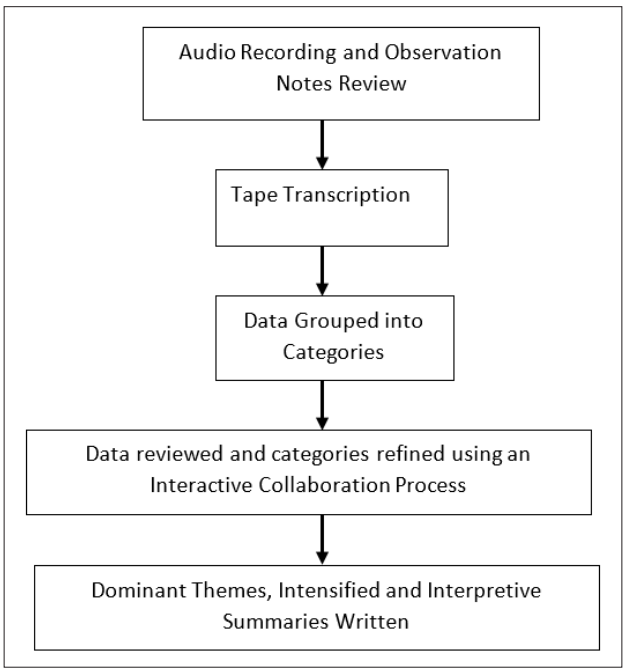


Figure 1: Focus Group Analysis Flow Chart

Ethical Considerations

Approval was sought from the directorate of postgraduate studies, institute and research ethical committee (IREC) Masinde Muliro university of science and technology, National commission for science technology and innovations (NACOSTI), Approvals were sought from five selected counties and county referral hospitals including department of health and sanitation Kisumu county , Jaramogi Oginga Odinga teaching and referral hospital, County government of Siaya, County government of Bungoma, County government of Kakamega, county government of Bomet (Longisa county referral hospital). Consent was fully granted by the researcher through the provision of relevant details and why the study was important and respondents were given an opportunity to signed prior to participation. The information remained protected from disclosure outside the research setting and safeguarded in agreement with participants. There was no identification of study participants during data collection except for coding to identify the questionnaires. The participants were informed that they did not have direct benefits to the study, and fairness and equity would be observed without discrimination.

Results

Socio Demographic Characteristics of Healthcare Providers

Table 2. Shows the demographic characteristics of study participants, a total of 192 Healthcare providers participated in the study

registering 100% response rate. Most of them were 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 majority of the respondents were diploma/certificate holders 117 (60.9%).

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

Socio Demographic Characteristics of Patients

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

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 development of lymphedema symptoms (Median, IQR)	12.5 (8.1, 22.8)	

Healthcare Providers' Competence in Management of Lymphedema Secondary to Breast Cancer

The results include health care providers knowledge on management of lymphedema, the association between demographic variables and knowledge, self-reported knowledge and results of skill assessment.

Health Care Providers' Knowledge on Clinical Management of Lymphedema

This section provides results on assessment of healthcare providers knowledge on lymphedema in breast cancer patients. The questions are described in the attached questionnaire, several areas were examined which included, history taking, physical examination and treatment aimed at assessing knowledge on lymphedema management among healthcare providers 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

A total of 10 multiple choice questions were asked and findings shown in Table, confirm the level to which respondents know about lymphedema management; those who had knowledge in 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. Those who knew a sentinel node as the first lymph node that drain the body (OR = 2.249, p = 0.003) and early detention and intervention as the best to reduce and manage lymphedema were (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 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 4: Individual Knowledge of Lymphedema Management

		Total n (%)	OR(CI)	P-value
1.The importance of skin care for people with lymphedema	Correct	67 (34.9%)	0.567 (0.390-0.882)	0.001
	Incorrect	125(65.1%)		
2. Lymphedema stoking class A pressure	Correct	66 (34.4%)	1.841 (1.215–2.791)	0.004
	Incorrect	126(65.6%		
3. The most appropriate initial management for lymphedema	Correct	82 (43.0%)	3.462 (2.230–5.375)	0.001
	Incorrect	110(57%)		
4. Positive stemmers sign test	Correct	113(59.0%)	2.717 (1.640–4.501)	0.001
	Incorrect	79(41%)		
5.A sentinel node is the first lymph node that drain the body	Correct	129(67.0%)	2.249 (1.321–3.831)	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 (0.824–1.776)	0.331
	Incorrect	58(30.3%)		
7.Early detection and intervention to reduce and manage lymphedema	Correct	164(85.4%)	0.235 (0.072–0.765)	0.016
	Incorrect	28(14.6%)		
8. True statement about lymphedema	Correct	149(78.0%)	0.323 (0.212–0.491)	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

Findings on Skill Assessment

An observation checklist was used to assess skill competence by direct observation. In broad categories, this included history taking, physical examination, investigations, physical activity, patient education, complication assessment, and monitoring and follow up. Skill demonstration by healthcare providers in history taking, assessment diagnosis, treatment and follow-up of lymphedema was assessed by direct observation. A scoring system of yes or no was used for all the procedures done and table 5 shows better performance was observed in history taking and physical examination and vital signs assessment with over 70%. ability to assess any symptoms present (63.6%) and identifying the needs for patients with lymphedema had an average response of 59.1%. while assessment of limb volume had a Low response (27.3%) an indication that the limb volume procedure was not practiced by most respondents.

Healthcare providers were 1.6 times more likely to take history of chief complains, medical history and history of lymphedema and the treatment type OR;1.6:CI:1.0-2.4; p value =0.037. 3.6 times more likely to carry out 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 symptoms assessment OR 0.4:CI:0.1-1.9 P Value = 0.004, 5.4 more likely to educate the patient modifiable risk factors and signs and symptoms. OR;5.4; CI;2.4-9.3,P Value =0.022

Finally, A Cronbach's alpha was applied to show the consistency of the reported results. A value of between 0 and 1 was used to show the correlation where value >0.7 showed a stronger correlation and hence consistency, while values <0.3 showed weaker correlation. The Cronbach's alpha of 0.668 in history taking skill and 0.730 in physical examination showed that they were the mostly applied procedures by the respondents in the management of lymphedema and a Cronbach's alpha value of -0.9011 showed vital information about patient self-care, complication assessment and when to come back for the next visits were not practiced across all health facilities.

Table 5 Healthcare Provider's Skill Assessment in Clinical Management of Lymphedema (N=192)

Variable	Indicators	Performed (%)	Not Performed(%)	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 & Symptom's 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) & 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 for patients with lymphedema	44 (22.9)	148 (77.1)		-	-
Physical activity	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 next date of appointment	113 (58.8)	79 (41.1)		-	-

Findings from focus groups discussion showed 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 extracts below "…..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).

"… *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).

BUT THE EXTRACT BELOW BEST DESCRIBES THE DIAGNOSIS OF LYMPHEDEMA, "…. *IT CAN DIAGNOSE BY HISTORY TAKING, PHYSICAL EXAMINATION AND LIMB VOLUME ASSESSMENT*…. " (HEALTHCARE PROVIDER, FGD1).

Discussion

Healthcare Providers' Knowledge in Clinical Management of Lymphedema

A total of 192 participants were used from 5 counties to participate in the study, 26(13.5%) did not pass the knowledge test and out of the 166 (86.5%) who passed had a deficit in important areas of practice in management of lymphedema such as skin care, stocking application and diagnosis with over 50% getting wrong answers. A study by on healthcare providers knowledge reported failure rate of 60% out of 152 participants. In this study the demographic characteristics revealed a higher response from nurses (65.6%) and the majority were diploma/ certificate holders, similar to the previous study which reported that nurses are the majority [9,10].

In this study the association between demographic variables and scores showed that professional qualification mostly influenced higher scores. Significant results were obtained from medical officers and clinical officers with the means of 76.7% and 69.4% 17.1 and 11.6 more likely to perform better than 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 global open study that showed academic qualification, profession, and experience as a significant relationship with knowledge [11]. This is also similar to a study by [12]. On healthcare practitioner's knowledge of lymphedema 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 the mean score of 56.3% and 57.5 contrary to previous studies that reported that nurses are knowledgeable and have critical thinking skill to provide the best outcome [13] and make a huge impact on the patient's quality of life [10].

The discrepancies among health care providers in this study was a clear indication that multidisciplinary approach reported in the literature was not practiced in various hospital in regard to 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 that reported work experience as one of the factors that influenced better performance. Self-reported knowledge had

higher odds ration compared to the test results and the Cronbach's alpha correlation between variables was 0.730 (over 70%) these could be due to subjects not being able to assess themselves correctly or may not be truthful, qualitative results show 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. 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 [11].

Healthcare Provider's Skills in Clinical Management of Lymphedema

In a study by Ruwowicz et al ., (2016) states that Healthcare Providers with appropriate training depend on practical efficiencies and tests in order to accurately measure diagnose and manage lymphedema. The skills in the current study were assessed by direct observation as healthcare providers provided the care to the patients 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 out across all health facilities with the Cronbach's alpha of (-) 0.9011 indicating poor performance. These tallies to a study by that reported lack of knowledge regarding assessment, examination, patient education and follow up appointments [9]. This was consistent with a study by in Iran which showed that educational needs of healthcare providers regarding care of patients were reported either as adequate or poor [12]. These may be due to lack of commitment or due to shortage of staff and time allocated for each patient is limited. A previous study by affirms the current study that transferring skill for self-management to the patient through health education is very important is very important [14].

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. The sample size was generally small and to maximize the sample size and increase the validity of the study the researcher increased the number of health facilities included in the study.

Conclusion

Health care providers 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 structured education of lymphedema is needed with more emphasis made on the gaps in the field to increase knowledge that may probably lead to better outcomes of lymphedema patients management with fundamental skills in patient care [15].

Acknowledgments

I owe my indebt 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 post graduate for permission to carry out the study.

Conflict of Interest Statement

I identified this journal because it a multidisciplinary journal covering all aspects of health sciences and management and I have 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.

Appendix I: Letter From Directorate of Post Graduate Studies

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

Tel: 056-30870
Fax: 056-30153
E-mail: directordps@mmust.ac.ke
Website: www.mmust.ac.ke

P.O Box 190
Kakamega – 50100
Kenya

Directorate of Postgraduate Studies

Ref: MMU/COR: 509099

14th April, 2021

Rosemary Lusike Wepukhulu,
HNR/G/07/2016,
P.O. Box 190-50100,
KAKAMEGA.

Dear Ms. Wepukhulu,

RE: APPROVAL OF PROPOSAL

I am pleased to inform you that the Directorate of Postgraduate Studies has considered and approved your Masters Proposal entitled: "***Clinical Management of Lymphedema Secondary to Breast Cancer Treatment by Healthcare Providers in Selected Hospitals in Western Region Kenya"*** and appointed the following as supervisors:

1. Prof. Lt. Col (Rtd) John M. Okoth - SONMAPS, MMUST
2. Dr. Damaris Ochanda - SONMAPS, MMUST

You are required to submit through your supervisor(s) progress reports every three months to the Director of Postgraduate Studies. Such reports should be copied to the following: Chairman, School of Nursing & Midwifery Graduate Studies Committee and Chairman, Department of Nursing Research, Education and Management and Graduate Studies Committee. Kindly adhere to research ethics consideration in conducting research.

It is the policy and regulations of the University that you observe a deadline of two years from the date of registration to complete your master's thesis. Do not hesitate to consult this office in case of any problem encountered in the course of your work.

We wish you the best in your research and hope the study will make original contribution to knowledge.

Yours Sincerely,

Dr. Consolata Ngala
DEPUTY DIRECTOR, DIRECTORATE OF POSTGRADUATE STUDIES

Appendix I1: letter from IERC

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY
Tel: 056-31375
Fax: 056-30153
E-mail: ierc@mmust.ac.ke
Website: www.mmust.ac.ke
P. O. Box 190-50100
Kakamega, Kenya

Institutional Ethics Review Committee (IERC)

Ref: MMU/COR: 403012 Vol 3 (01) **Date:** 08th June, 2021

Rosemary Lusike
Masinde Muliro University of Science and Technology,
P.O. Box 190-50100,
Kakamega.

Dear Ms Lusike

RE: Clinical Management of Lymphedema Secondary to Breast Cancer Treatment by Healthcare Providers in Selected Hospitals in Western Region Kenya. - MMUST/IERC/196/2021

Thank you for submitting your proposal entitled as above for initial review. This is to inform you that the committee conducted the initial review and approved (with no further revisions) the above Referenced application for one year.
This approval is valid from **08th June, 2021** through to **08th June, 2022**. Please note that authorization to conduct this study will automatically expire on by **08th June, 2022.** If you plan to continue with data collection or analysis beyond this date please submit an application for continuing approval to the MMUST IERC by **08th June, 2022.**

Approval for continuation of the study will be subject to submission and review of an annual report that must reach the MMUST IERC Secretariat by **08th June, 2022.** You are required to submit any amendments to this protocol and any other information pertinent to human participation in this study to MMUST IERC prior to implementation.

Please note that any unanticipated problems or adverse effects/event resulting from the conduct of this study must be reported to MMUST IERC. Also note that you are required to seek for research permit from NACOSTI prior to the initiation of the study.

Yours faithfully,

Dr. Gordon Nguka (PhD)
Chairman, Institutional Ethics Review Committee

Copy to:
- The Secretary, National Bio-Ethics Committee
- Vice Chancellor
- DVC (PR&I)

Appendix 111: Approval Letter from Nacosti

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **155622**

Date of Issue: **17/June/2021**

RESEARCH LICENSE

This is to Certify that Ms.. Rosemary Lusike Wepukhulu of Masinde Muliro University of Science and Technology, has been licensed to conduct research in Bomet, Bungoma, Kakamega, Kisumu, Siaya on the topic: CLINICAL MANAGEMENT OF LYMPHEDEMA SECONDARY TO BREAST CANCER TREATMENT BY HEALTHCARE PROVIDERS IN SELECTED HOSPITALS IN WESTERN REGION KENYA for the period ending : 17/June/2022.

License No: **NACOSTI/P/21/11282**

155622

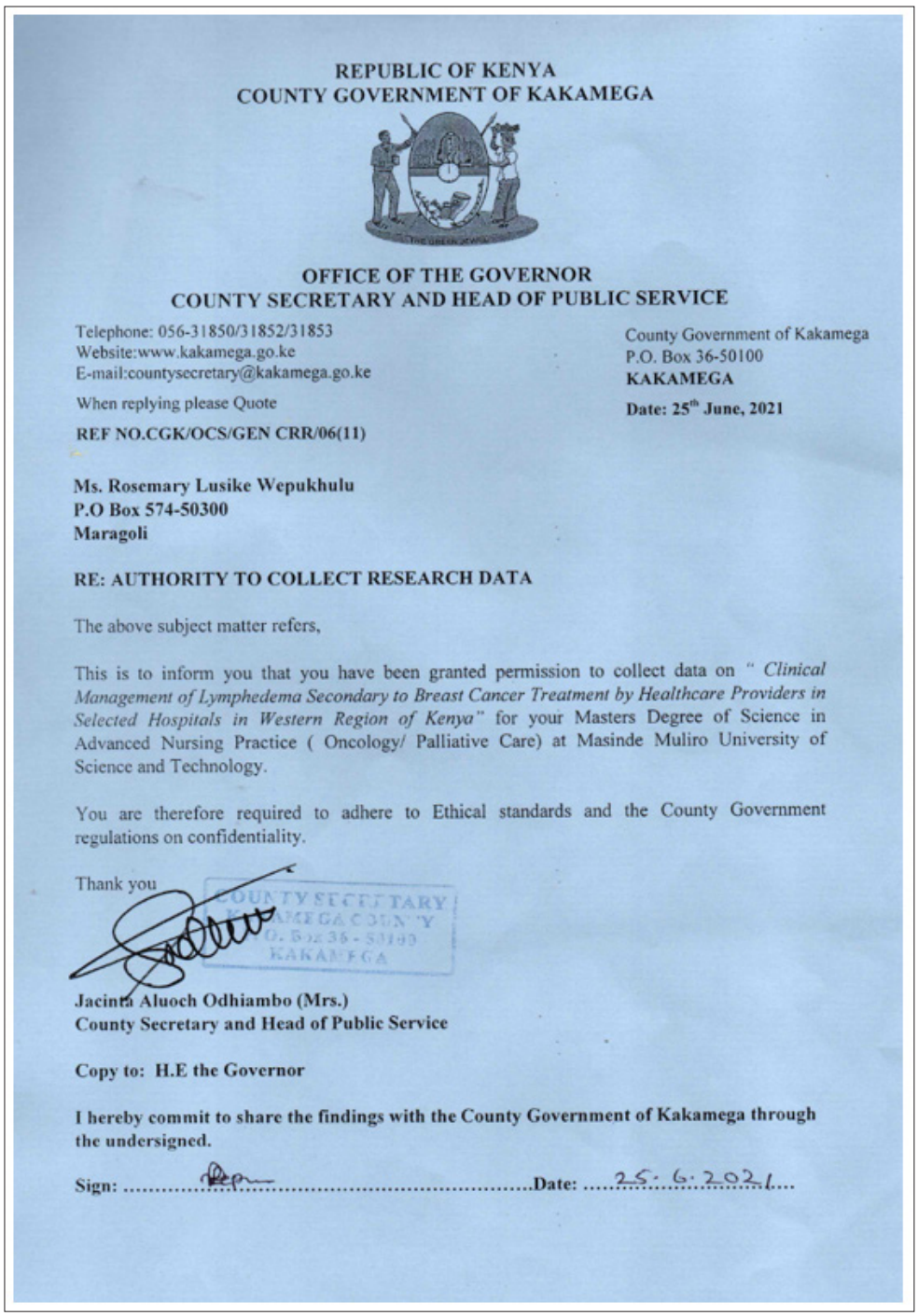
Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

Appendix IV :Authorization Letter from Kakamega County



REPUBLIC OF KENYA
COUNTY GOVERNMENT OF KAKAMEGA

OFFICE OF THE GOVERNOR
COUNTY SECRETARY AND HEAD OF PUBLIC SERVICE

Telephone: 056-31850/31852/31853
Website:www.kakamega.go.ke
E-mail:countysecretary@kakamega.go.ke

When replying please Quote

REF NO.CGK/OCS/GEN CRR/06(11)

County Government of Kakamega
P.O. Box 36-50100
KAKAMEGA

Date: 25th June, 2021

Ms. Rosemary Lusike Wepukhulu
P.O Box 574-50300
Maragoli

RE: AUTHORITY TO COLLECT RESEARCH DATA

The above subject matter refers,

This is to inform you that you have been granted permission to collect data on " *Clinical Management of Lymphedema Secondary to Breast Cancer Treatment by Healthcare Providers in Selected Hospitals in Western Region of Kenya*" for your Masters Degree of Science in Advanced Nursing Practice (Oncology/ Palliative Care) at Masinde Muliro University of Science and Technology.

You are therefore required to adhere to Ethical standards and the County Government regulations on confidentiality.

Thank you

COUNTY SECRETARY
KAKAMEGA COUNTY
P.O. Box 36-50100
KAKAMEGA

Jacinta Aluoch Odhiambo (Mrs.)
County Secretary and Head of Public Service

Copy to: H.E the Governor

I hereby commit to share the findings with the County Government of Kakamega through the undersigned.

Sign: .....Date: 25.6.2021....

Appendix V: Authorization Letter from County Director of Education

REPUBLIC OF KENYA

MINISTRY OF EDUCATION
STATE DEPARTMENT OF EARLY LEA3RING AND BASIC EDUCA4TION

Telephone: 056 -30411
Fax: 056 – 31307
E-mail: rceducation2016@gmail.com
When replying please quote our Ref.

County Director of Education
Kakamega County
P. O. BOX 137 - 50100
KAKAMEGA

REF: KAKA/C/GA/29/17/VOL.V/120 **23rd June, 2021**

Ms. Rosemary Lusike Wepukhulu
Masinde Muliro University
Of Science & Technology
KAKAMEGA

RE: RESEARCH AUTHORIZATION

The above has been granted permission by National Council for Science & Technology vide letter Ref. NACOSTI/P/21/11282 dated 17th June,2021 to carry out research on "**Clinical Management of Lymphedema Secondary to Breast Cancer Treatment by Healthcare Providers in Kakamega County**" for a period ending 17th June, 2022.

Please accord him any necessary assistance he may require.

FOR
COUNTY DIRECTOR OF EDUCATION
KAKAMEGA COUNTY

DICKSON O. OGONYA
COUNTY DIRECTOR OF EDUCATION
KAKAMEGA COUNTY

CC
The Regional Director of Education
WESTERN REGION

Appendix VI: Letter From Interior and Coordination of National Government

REPUBLIC OF KENYA

MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL GOVERNMENT

Telegrams "DISTRICTER" Kakamega
Telephone 056 -31131
Fax 056 – 31133
Email: cckakamega12@yahoo.com
When replying please quote

COUNTY COMMISSIONER
KAKAMEGA
P O BOX 43 - 50100
KAKAMEGA.

Ref: ED/12/1/VOL.V/161

Date: 22nd June, 2021

Ms. Rosemary Lusike Wepukhulu
P O Box 190 - 50100
KAKAMEGA

RE: RESEARCH AUTHORIZATION

Following your authorization vide letter Ref: NACOSTI/P/21/11282 dated 17TH June, 2021 by NACOSTI to undertake research on ***"Clinical Management of Lymphedema Secondary to Breast Cancer Treatment by Healthcare Providers in Selected Hospitals in Western Region, Kenya"*** for the period ending 17th June, 2022.

I am pleased to inform you that you have been authorized to carry out the research on the same.

COUNTY COMMISSIONER
KAKAMEGA COUNTY

EREDI C. M.
FOR: COUNTY COMMISSIONER
KAKAMEGA COUNTY

Appendix VII: Letter From County Government of Bungoma

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF BUNGOMA
MINISTRY OF HEALTH
OFFICE OF THE COUNTY DIRECTOR
HEALTH

Telegrams: "MEDICAL", BUNGOMA
Telephone: (055) 30230 Fax: (055) 30650
E-mail: docakatu@yahoo.com
When replaying please quote

COUNTY DIRECTOR OF HEALTH
BUNGOMA COUNTY
P. O. BOX 18 – 50200
BUNGOMA

OUR REF: CG/BGM/CDH/RESRC/VOL.1(87) **DATE:** 8TH JULY, 2021

Rosemary Lusike
Masinde Muliro University of Science and Technology
P.O. Box 190 – 50100
Kakamega

RE: PERMISSION TO CARRY OUT RESEARCH IN BUNGOMA COUNTY

Following your application for authority to carry out research in **"Clinical Management of Lymphedema Secondary to Breast Cancer Treatment by Healthcare Providers in Selected Hospitals in Western Region Kenya.",** I am pleased to inform you that you have been authorized to undertake the research for the period ending 17th June, 2022.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the County Director of Health. The soft copy of the same should be submitted through the online Research Information system.

Thank you.

COUNTY DIRECTOR OF HEALTH
BUNGOMA COUNTY
P. O. Box 18-50200
BUNGOMA

DR. JOHNSTON AKATU
COUNTY DIRECTOR OF HEALTH
BUNGOMA

Appendix VIII: Letter From County Government of Kisumu

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF KISUMU

Telegrams: "PRO (MED)"
Tel: 254-057-2020105
Fax: 254-057-2023176
E-mail: kisumucdh@gmail.com

Director of Public Health, Preventive/
Promotion and Environmental Health
P.O. Box 721 – 40100,
Kisumu.

DEPARTMENT OF HEALTH &SANITATION

Our Ref: GN 133 VOL.VII/(122) **Date:** 8th July, 2021

To:

CEO – JOOTRH

Med Supts.- KCRH, Kombewa, Chulaimbo, Ahero, Nyakach, Muhoroni, Nyahera, Lumumba, Migosi & Rabuor

RE: APPROVAL TO CONDUCT RESEARCH IN KISUMU COUNTY

The department has reviewed and approved this research titled **'Clinical Management of Lymphedema Secondary to Breast Cancer Treatment by Healthcare Providers in selected Hospitals in Western Region, Kenya'**

This principal investigator for this research activity is **Rosemary Lusike Wepukhulu**.

Kindly accord her all the necessary support.

Fredrick Oluoch
County Director Public Health & Sanitation
Kisumu County

COUNTY DIRECTOR
OF HEALTH
KISUMU

CC. Principal investigator Rosemary Lusike Wepukhulu

Appendix IX: Approval Letter from Jootrh Kisumu

COUNTY GOVERNMENT OF KISUMU
DEPARTMENT OF HEALTH

Telephone: 057-2020801/2020803/2020321
Fax: 057-2024337
E-mail: ercjoorth@gmail.com

When replying please quote

IERC/JOOTRH/463/21
Ref: .....

JARAMOGI OGINGA ODINGA TEACHING & REFERRAL HOSPITAL
P.O. BOX 849
KISUMU

22nd July, 2021
Date.....

To: Rosemary Lusike Wepukhulu

Dear Rosemary,

RE: REQUEST FOR ETHICAL APPROVAL TO UNDERTAKE A STUDY TITLED:- CLINICAL MANAGEMENT OF LYMPEDEMA SECONDARY TO BREAST CANCER TREATMENT BY HEALTH CARE PROVIDERS IN SELECTED HOSPITALS IN WESTERN REGION KENYA.

This is to inform you that ***JOOTRH IERC*** has reviewed and approved your above research proposal. Your application approval number is ***IERC/JOOTRH/433/21.***The approval period is ***22nd July, 2021 – 22nd July, 2022.***
This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***JOOTRH - IERC***.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***JOOTRH - IERC*** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***JOOTRH - IERC*** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to JOOTRH - ***IERC***.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://oris.nacosti.go.ke and also obtain other clearances needed.

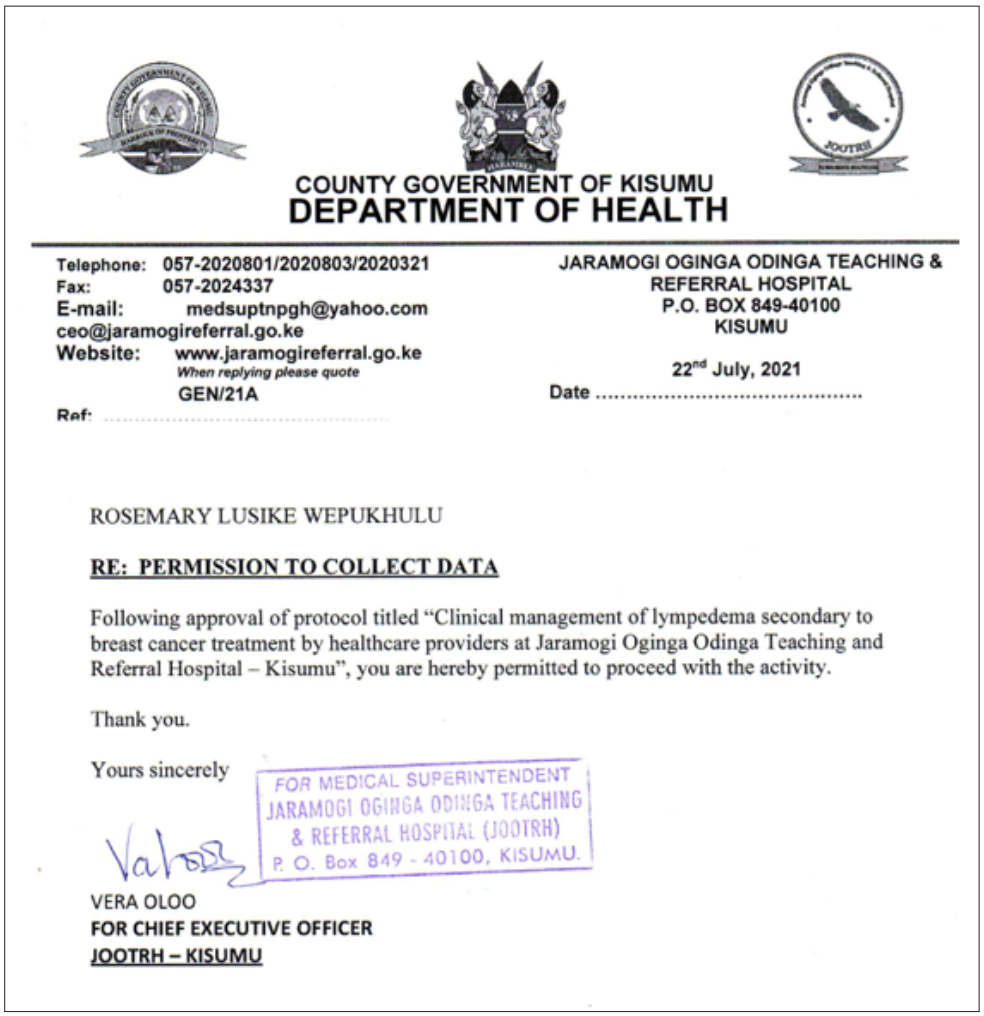
In case the study site is JOOTRH, kindly report to Chief Executive Officer before commencement of data collection.

Yours sincerely,

INSTITUTIONAL ETHICS & REVIEW COMMITTEE
22 JUL 2021
JOOTRH

for: SECRETARY, IERC

Appendix X: Approval Letter from Department of Health Kisumu



COUNTY GOVERNMENT OF KISUMU
DEPARTMENT OF HEALTH

Telephone: 057-2020801/2020803/2020321
Fax: 057-2024337
E-mail: medsuptnpgh@yahoo.com
ceo@jaramogireferral.go.ke
Website: www.jaramogireferral.go.ke
When replying please quote
GEN/21A
Ref: .....

JARAMOGI OGINGA ODINGA TEACHING & REFERRAL HOSPITAL
P.O. BOX 849-40100
KISUMU

22nd July, 2021
Date .....

ROSEMARY LUSIKE WEPUKHULU

RE: PERMISSION TO COLLECT DATA

Following approval of protocol titled "Clinical management of lympedema secondary to breast cancer treatment by healthcare providers at Jaramogi Oginga Odinga Teaching and Referral Hospital – Kisumu", you are hereby permitted to proceed with the activity.

Thank you.

Yours sincerely

FOR MEDICAL SUPERINTENDENT
JARAMOGI OGINGA ODINGA TEACHING
& REFERRAL HOSPITAL (JOOTRH)
P. O. Box 849 - 40100, KISUMU.

VERA OLOO
FOR CHIEF EXECUTIVE OFFICER
JOOTRH – KISUMU

Appendix XI: Approval Letter from Medical Superitendent Siaya County

COUNTY GOVERNMENT OF SIAYA

DEPARTMENT OF HEALTH AND SANITATION

E-mail: siayachd@gmail.com
ADJACENT TO JCC CHURCH
PHONE:
SIAYA TOWN

COUNTY HEALTH HEADQUARTERS
SIAYA COUNTY
P O BOX 597
SIAYA

Our Ref: CGS/CHD/RESEARCH/VOL.IV (108) **9TH JULY, 2021**

- Medical Superintendent
- Siaya County Referral Hospital
  SIAYA COUNTY

RE: CLEARANCE TO CONDUCT A RESEARCH ON CLINICAL MANAGEMENT OF LYMPHEDEMA SECONDARY TO BREAST CANCER TREATMENT BY HEALTHCARE PROVIDERS IN SELECTED HOSPITALS IN WESTERN REGION KENY

Rosemary Lusike Wepukhulu of Masinde Muliro University of Science and Technology has received authorization from the National Commission for Science Technology and Innovation (NACOSTI) vide License No: NACOSTI/P/21/11282_and Masinde Muliro University of Science and Technology (MMUST) Institutional Review Committee (IERC) vide MMUST/IERC/196/2021, to conduct the above referenced study in our County.

Specific Objectives

1. Assess healthcare provider's knowledge in the management of lymphedema secondary to breast cancer treatment.
2. Investigate healthcare provider's skills in the management of lymphedema secondary to breast cancer treatment.
3. Examine the strategies used in the management of lymphedema secondary to breast cancer treatment.

Data shall be collected through observation and Focus group discussion.

The study timeline runs through 22 /June 2022.

This is to notify you that the Research has been approved by the office of the undersigned, kindly accord her necessary assistance.

Thank you

Dr. Felix Tindi
County Pharmacist
SIAYA

COUNTY DIRECTOR OF HEALTH
SIAYA COUNTY
09 JUL 2021
P.O. Box 597-40600,
SIAYA.

Copy to:

- ✓ CECM –Health and Sanitation
- ✓ Ag. Chief Officer – Health and Sanitation

Appendix XII: Approval Letter from Research Authorization from Siaya County

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF SIAYA
DEPARTMENT OF HEALTH AND SANITATION

Telegrams: ''MEDICAL, Siaya
Telephone: 0757955067
When replying please quote

MEDICAL SUPERINTENDANT
SIAYA COUNTY REFERRAL HOSPITAL
P .O. BOX 144 - 40600
SIAYA

Ref: SYA/CRH/MED. SUP. COR/VI.49 **Date:** 14th July, 2021

Rosemary Lusike
Principal Investigator

Dear Madam

RE: RESEARCH AUTHORIZATION

This is to notify you that the Siaya County Referral Hospital Institution Review Committee has approved your application to conduct the study on ***"clinical management of lymphedema secondary to breast cancer treatment by healthcare providers".***

At the completion of the research, you are expected to submit a soft and hard copy of research findings to the hospital's IRC.

Thank you

SIAYA COUNTY REFERRAL HOSPITAL
MEDICAL
14 JUL 2021
SUPERINTENDENT
P.O. BOX 144-40600, SIAYA

Dr. Liech Adoyo
MEDICAL SUPERINTENDENT
SIAYA COUNTY REFERRAL HOSPITAL

Centre of Quality Health Care

Appendix XIII: Approval Letter from Bomet County

DEPUTY MEDICAL SUPERINTENDENT
LONGISA COUNTY REFERRAL HOSPITAL
P. O. Box 34 - 20402, LONGISA
Date 16/7/2021

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF BOMET

DEPARTMENT OF MEDICAL SERVICES & PUBLIC HEALTH

Director of Cancer Research & specialized Services
P.O. Box 19 - 20400
Bomet

REF: CGOB/MS/GEN.CORR. /2021

16th July, 2021

Rosemary Lusike Wepukhulu

REF: PERMISSION TO CONDUCT RESEARCH

This is to infrm you that your request to conduct a study in Bomet County titled "Clinical Management of Lymphedema Secondary to Breast Cancer Treatment by Health care providers in selected Hospital in Western Region Kenya"has been approved.

Through this letter, you are allowed to visit Bomet County facilities to collect data on the same.

While conducting your study, you are reminded to adhere to ethical considerations related to research as provided by the law and NACOSTI regulations.

I take this opportunity to wish you well as you conduct your study.

Sincerely

16 JUL 2021

Dr. Ronald Kibet (MMED, MBchB)
Director of Cancer Research & specialized Services

Appendix XIV: Approval Letter from Logisa County Referral Hospital

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF BOMET

DEPARTMENT OF MEDICAL SERVICES & PUBLIC HEALTH

Director of Cancer Research & specialized Services
P.O. Box 19 - 20400
Bomet

REF: CGOB/MS/GEN.CORR. /2021 — 16th July, 2021

Rosemary Lusike Wepukhulu

REF: PERMISSION TO CONDUCT RESEARCH

This is to infrm you that your request to conduct a study in Bomet County titled "Clinical Management of Lymphedema Secondary to Breast Cancer Treatment by Health care providers in selected Hospital in Western Region Kenya"has been approved.

Through this letter, you are allowed to visit Bomet County facilities to collect data on the same.

While conducting your study, you are reminded to adhere to ethical considerations related to research as provided by the law and NACOSTI regulations.

I take this opportunity to wish you well as you conduct your study.

Sincerely

COUNTY GOVERNMENT OF BOMET
DIRECTOR OF MEDICAL SERVICE & ADMINISTRATION
16 JUL 2021
Sign.....
P.O. Box 19 - 20400, BOMET

Dr. Ronald Kibet (MMED, MBchB)
Director of Cancer Research & specialized Services

References

1. Krok-Schoen JL, Oliveri JM, Kurta ML, Paskett ED (2015). Breast cancer-related lymphedema: risk factors, prevention, diagnosis and treatment. Breast Cancer Management 4: 41-51.
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