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Needs for Professional Education to Optimize Cervical Cancer Screenings in Low-Income Countries: a Case Study from Tanzania

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Abstract Cervical cancer is a significant health problem in many developing countries. Due to limited treatment facilities for cancer in Tanzania, a screening referral program was developed between two urban clinics and Ocean Road Cancer Institute (ORCI), the only cancer treatment center in Tanzania. This study aimed to evaluate the effectiveness of the program and to identify opportunities for professional education. The study included 139 patients who were referred to ORCI from the screening clinics of Magomeni and Temeke between January 2015 and May 2016. Abstracted data from the medical records included patient age, screening results, and treatment. Eight nurses performing screening at the three locations were interviewed about their screening experience. Over half of the referrals (51.9%) were false positives. False positive diagnosis was more common among younger patients (35.68 ± 8.6 years) ($p < 0.001$) and those referred from Magomeni (59.8%) ($p < 0.01$) than referrals of older patients (42.46 ± 11.1 years) or those from Temeke (33.3%). Interviews of nurses showed differences among clinics, including resources, experience, and documentation of screening results. The high false positive rates and the variation of accuracy of screening between the two clinics showed a need for professional education of nurses and improvement in the health systems. Continuous education of nurses may increase the effectiveness of cervical screening. Health system enhancement of screening facilities such as provision of Lugol's iodine, more space for screening, and consistency and completion of screening records are needed to increase the accuracy of cervical screening and referrals in Tanzania and other similar low-income countries.

Keywords Cervical cancer · Professional education · Screening · Developing countries

Introduction

Cervical cancer is the fourth most common cancer in women globally. The disease leads to nearly 300,000 annual deaths and is ranked second in cancer-causing deaths for women after breast cancer [1]. Risk for cervical cancer incidence and mortality are significantly higher in developing than developed countries and the highest rates are in sub-Saharan Africa [2]. Tanzania exhibits the sixth highest rate of cervical cancer in the world (54.0 per 100,000 women) [3]. While successes have been made in developed countries with respect to cervical screening using the Papanicolaou (PAP) smear, many developing countries, including Tanzania, have been utilizing visual inspection with acetic acid (VIA) because of the limitations in the local health systems, infrastructures, and human resources [4]. This technique is cost-effective and provides immediate results, allowing for a single-visit approach [5–7].

The Ocean Road Cancer Institute (ORCI) in Tanzania's capital city of Dar es Salaam is the only cancer center that provides chemotherapy and radiotherapy treatment for cancer patients in Tanzania [6]. In addition to treatment, the ORCI has provided cervical screening training for nurses in different areas of Tanzania since 2002 [8–10].

Many of the clinics that perform screening in Tanzania do not have nearly as many treatment resources as ORCI, which

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is why referral to ORCI is required in many situations when patients need treatment after suspected diagnosis of cervical dysplasia or cancer. Therefore, the World Health Organization (WHO) initiated a trial to evaluate the effectiveness of a cervical cancer screening referral program. The trial mandated that two clinics, Magomeni and Temeke, located in the Dar es Salaam area, refer all positively screened patients to the ORCI. The aims of this study were to assess the effectiveness of the WHO referral program and to evaluate the role of nurses in screening and referring to the ORCI.

Methods

Study Setting and Population

This study was conducted in three locations—ORCI and the two clinics of Magomeni and Temeke. While ORCI is a specialty cancer center, Magomeni and Temeke are health centers where cervical cancer screening is part of the maternal health clinics which encompass other services such as reproductive health and family planning.

Not only does ORCI offer cervical cancer screening and cancer treatment for those across the country but it also offers inpatient and laboratory services, palliative care, and cancer research. Of all the cancer patients at ORCI in 2011, over 36% of patients had cervical cancer [9]. In addition to screening patients for cervical dysplasia using VIA, nurses also screen them for cervical infection using visual inspection with Lugol's iodine (VILI). The nurses are able to prescribe medications such as antibiotics, antifungals, and antipain medication, as well as complete polyp removals, cryotherapy, and tissue biopsies.

Magomeni is located in the Kinondoni District of Dar es Salaam and is approximately 6.4 km from ORCI. This district has a population of about 1,775,049 individuals with 14% of the households being below the poverty line, the lowest of all three districts in Dar es Salaam. Eighty percent of the population in this district are under the age of 50 years. The nurses at the Magomeni screening clinic complete VIA, but do not have Lugol's iodine to test for infection. However, they are able to prescribe medications such as antibiotics, antifungals, and antipain medications [11].

The Temeke clinic is about 9.2 km from ORCI in the district of Temeke. The district's population is approximately 1,368,881 and has the highest poverty rate in the city with 29% of the households below the poverty line. Ninety percent of Temeke residents are under the age of 50 years. Similar to Magomeni, Temeke is stocked to perform VIA, but Lugol's iodine is not available to complete VILI. The nurses at Temeke can treat patients with antibiotics, antifungals, antipain medications, polyp removal, and cryotherapy [11].

Figure 1 displays the process of attaining the patient population for the study. From the 341 patients referred from the two clinics to ORCI between January 2015 and May 2016, only 120 patients from Magomeni and 45 patients from Temeke completed the referral to ORCI. Of these patients, 98 from Magomeni and 41 from Temeke were able to be used for data analysis.

Eight nurses were interviewed including four nurses at ORCI, two at Magomeni, and two at Temeke. The interviewed nurses were the ones who performed cervical cancer screenings at each location during the time of data collection for this study. Information was gathered in relation to their work experience and professional duties along with information about the clinic practices and resources.

Study Design and Data Collection

This study utilized a mixed-method approach with quantitative data abstracted from the medical records of the screening clinics at Magomeni, Temeke, and ORCI and qualitative data obtained from interviewing the nurses at each location.

The identification of patients included in this study was completed through a three-step process: (1) using ORCI registration logbooks to identify those referred from outside clinics, (2) using Magomeni and Temeke records to identify referrals to ORCI, and (3) using ORCI examination forms to determine which referrals from the two clinics were completed. Initially, variables were retrieved from the registration logbooks at ORCI and entered into excel files. The information included unique patient identification numbers, phone numbers, ages of patients, and outside referring clinic names or locations. Patient identification numbers from the registration logbooks were then used to match to their examination forms. Information obtained from these forms included VIA and VILI results, whether or not a biopsy was performed, and which treatment, if any, was given. ORCI biopsy records were used to attain results for those who received a biopsy.

Information was then obtained from the Magomeni and Temeke logbooks and examination forms to document all patients who were referred to ORCI. Patient phone number, age, VIA diagnosis, treatment, if any, and comments related to signs and symptoms were recorded. For those patients who were not in the original sample size as obtained from ORCI, phone numbers were matched to ORCI logbooks and examination forms to gain information on diagnosis and treatment at ORCI.

The qualitative part of the study included observation and training of the cervical cancer screening process as well as interviewing the eight nurses performing the screening at ORCI and the two outside screening clinics. Each nurse at the three clinics whose duties included performing cervical screenings was interviewed about her number of years of practicing nursing, number of years performing cervical

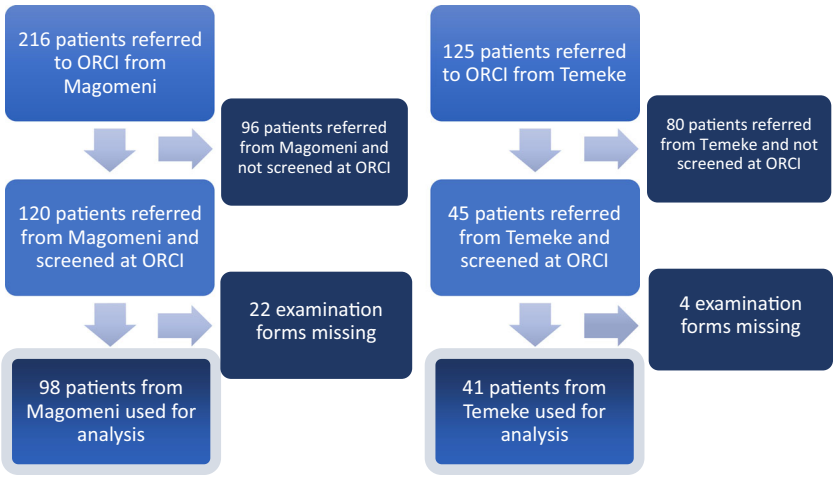

Fig. 1 Study population

screenings, type of training received, how many hours she typically works each day, how many patients she typically sees each day, and her daily job responsibilities. Other information elicited from the interviews pertained to clinic resources, supplies, and treatment available for a diagnosis of dysplasia or suspected cancer lesions.

SPSS 24 was used for analyzing the data. The *t* tests and ANOVA were used to compare the quantitative data, while chi-squared tests and logistic regression were used to assess disparities in false positive diagnoses between the two referring clinics before and after controlling for patient age.

The study was approved by the IRB committee of the University of Nebraska Medical Center and the local IRB committee at the Ocean Road Cancer Institute in Tanzania.

Results

Table 1 displays the definitive VIA negative and positive diagnoses at ORCI for those patients referred from Magomeni and Temeke. Magomeni referred a significantly higher proportion of false positive patients (59.8%) than Temeke (33.3%) ($p < 0.01$). The total combined proportion of patients who were inaccurately referred from the two clinics was 51.9% of all referred patients.

A significant difference in age was found between patients who were diagnosed as VIA positive and those diagnosed as negative ($p < 0.001$). Patients diagnosed as false positive were younger (35.68 ± 8.6 years) compared to patients who tested as true positive (42.46 ± 11.1 years) ($p < 0.001$). A significant difference in age was also observed between patients who were referred from the two clinics. Magomeni patients were significantly younger (mean age 37.1 ± 9.4 years) compared to patients from Temeke (mean age 43 ± 11.5 years) ($p < 0.001$).

The odds of a patient being diagnosed as false positive when screened at Magomeni were 3.0 times higher than if screened at Temeke ($p < 0.01$). After adjusting for age, the odds were 2.2 times higher for patients at Magomeni and the effect was marginally significant ($p = 0.06$).

Of the 55 patients diagnosed as false positive from Magomeni, 20 (36.4%) were diagnosed with infection at ORCI. Four of the 13 (30.8%) false positive patients from Temeke were also found to have infection.

Nine of the 37 patients (24.3%) from Magomeni found to be VIA positive at ORCI had biopsies completed. Six of these results were obtained and were all positive for cervical cancer. The other three biopsy results were not found in the biopsy records. Of the 26 patients from Temeke diagnosed as VIA positive, 16 (61.5%) had biopsies. Five biopsy results were discovered and were all positive for cervical cancer. The other biopsy records were not found. An outside hospital completes the pathology for the biopsies so these missing records may be due to lack of reporting results to ORCI. For patients referred to ORCI from clinics in Tanzania other than Magomeni and Temeke, 98 of the 106 medical records were found. About one third of the patients (30.6%) were documented as negative for dysplasia with 11 of the 30 (36.7%) having infections. Sixty-two patients (63.3%) were diagnosed as positive for dysplasia while six patients had inconclusive results.

Qualitative data were gathered through informal interviews with the eight screening nurses from ORCI, Magomeni, and Temeke. All the nurses reported receiving the same initial training on cervical cancer screenings with 2 weeks of classroom and clinical instruction at ORCI. The classes included education on the background of cervical cancer, its causes, prevention, treatment, and counseling surrounding a positive VIA diagnosis. While completing clinical instruction, the nurses shadowed senior experienced nurses and performed the screenings under observation. The nurses also explained that they had not received any continuing education since their initial training.

The nurses at ORCI perform breast and cervical screening 4 days/week, while Magomeni and Temeke nurses reported

Table 1 Definitive VIA negative and positive cases of patients referred from Magomeni and Temeke as diagnosed at ORCI

		Negative (false positive)		Positive (true positive)		Total	*p* Value
Referring Clinic	Magomeni	55	59.8%	37	40.2%	92	$p < 0.01$
	Temeke	13	33.3%	26	66.7%	39	
Total		68	51.9%	63	48.1%	131	

Patients with inconclusive results or those referred from clinics other than Magomeni or Temeke are not included in this table

screening 5 days/week. However, ORCI screens more patients (about 20 to 25 each day) while both Magomeni and Temeke nurses reported performing around 30 cervical screenings each week. ORCI nurses have an average of 9.8 years of experience completing cervical screening. Nurses at ORCI solely work in the breast and cervical cancer screening clinic while nurses at the two outside clinics have additional duties for reproductive health, family planning, and other related activities. ORCI has two exam rooms for VIA screening, while Magomeni and Temeke each has one exam room. At ORCI, these exam rooms are only used for breast and cervical screening, contrasting those at the other two clinics which are used for other various reproductive and gynecological examinations and procedures.

Table 2 displays additional information regarding patients and staff at Magomeni and Temeke.

Discussion

This study revealed the following interesting observations. First, the study found that although Magomeni and Temeke referred many patients to ORCI, a large proportion of these patients were inaccurately diagnosed and therefore unnecessarily referred. Over half of the patients who were diagnosed as VIA positive at the two outside clinics received a negative diagnosis at ORCI, which could increase unnecessary anxiety, cost, and time for the patients and nurses [12, 13]. ORCI would also be affected, over-utilizing already limited resources and taking time away from patients with a potentially greater need.

The positive predictive values (PPVs) of the VIA test for patients from Magomeni and Temeke were 40.2 and 66.7%, respectively. The total PPV for both clinics was found to be 48.1%. This is similar to other research completed in Egypt which discovered VIA to have a PPV of 52% [14]. Since those who received a negative diagnosis at the outside clinics did not have a follow-up exam, negative predictive values were not available.

Our study showed that many patients who were thought to be VIA positive at the outside clinics of Magomeni and Temeke were diagnosed with infection at ORCI. ORCI completes the VILI exam, testing for infection, but neither Magomeni nor Temeke are stocked with Lugol's iodine, the solution needed to perform the test. Therefore, the assessment completed at these clinics only includes VIA, eliminating the chance to detect infection. The nurses at all three clinics reported the necessity of completing a VILI test for each woman in order to better decipher between a suspected lesion and an infection. Providing Lugol's iodine for outside clinics could improve the precision of referrals for cervical cancer screening. This recommendation is in agreement with a previous study from El Salvador, which found that without a separate test for infection, a patient with a cervical infection was more likely to receive a false positive VIA diagnosis than those without an infection [15].

Many similarities were found between the clinics of Magomeni and Temeke. Each clinic has two nurses who are certified in cervical cancer screenings. If both nurses have to

Table 2 Descriptive information for the Magomeni and Temeke patients and staff

	Magomeni				Temeke			
Patient age	Range	Mean	Median	Standard deviation	Range	Mean	Median	Standard deviation
	21–68	37.283	35	9.296	22–73	44.71	43	12.409
Staff information								
Average years working as a nurse	32				18.5			
Average years completing cervical cancer screenings	5.5				1.5			
Job responsibilities	Cervical and breast cancer screenings, family planning, supervise the women and children's clinic				Cervical and breast cancer screenings, annual physical exams, CTC clinic counseling			

miss work, patients will be turned away as there will be no one else there to screen them. These clinics also each have one room that is used to perform screening as well as to complete other examinations and procedures. If the exam room is used for other purposes, patients will have to come back another day to be screened. Nurses at both clinics expressed a desire for more trained staff and additional rooms for screening.

Although the clinics of Magomeni and Temeke have similar limitations, it was discovered that patients referred from Magomeni were more likely to be misdiagnosed as positive than those from Temeke. One difference in resources that could explain this finding is that Temeke is equipped to perform polyp removal and cryotherapy, while Magomeni is not. Discussions with the nurses from Magomeni revealed that they strongly wish to be able to treat patients with cryotherapy, in order to provide a single-visit approach which would decrease referrals and loss to follow-up at ORCI. In addition, Magomeni nurses reported that, at times, they have had to make their own VIA solution using sterile water. ORCI and Temeke order their 5% acetic acid rather than make it, which could result in differences between their results and those of Magomeni. Research from other developing countries where VIA is completed has suggested utilizing the same solution; thus, ordering acetic acid would be recommended for Magomeni to increase consistency among clinics [16].

Magomeni referred significantly younger patients than those referred from Temeke, despite the fact that Magomeni's population is slightly older than Temeke [11]. Additionally, younger patients were more likely to be false positive. This conflicts previous meta-analyses from various low- to middle-income countries which report the accuracy of VIA decreases with the age of the patient [5, 17]. Reasoning for this difference may be due to the small sample size and the young study population in compilation with Magomeni's limited resources.

The nurses at ORCI have the most experience in cervical cancer screening, both in the number of years performing screenings and the number of patients they have screened. This is essential for establishing ORCI as the "gold standard" for VIA diagnosis in Dar es Salaam and is congruent with research identifying experience as an indicator of increased accuracy for VIA [5, 18]. All eight nurses reported the same training, but none have had any continuing education or refresher courses. Therefore, the original training received is more recent for nurses at Temeke than for those at Magomeni. Mandating continuing education could greatly increase the staff's skills, especially those of the nurses at outside clinics who screen a lower number of patients each week and therefore have less practice. This recommendation is in agreement with past research conducted in other developing countries that recommended the need for periodic supervision and supplemental training in order to increase accuracy of screening [16].

An unexpected finding from this study was the proportion of patients referred to ORCI who did not go for confirmation screening. Of the 216 patients referred to ORCI from Magomeni, 96 (44%) did not go for screening. The findings from Temeke were even more shocking—80 (64%) of the 125 patients referred to ORCI did not follow through. When discussing this information with the nursing staff, they felt that the patients were either unable to follow up for financial or personal reasons or did not go to ORCI out of fear. One recommendation would be for the nurses to provide counseling after a patient is found to be VIA positive. This would include explaining the results and their potential impact, as well as providing reassurance and encouragement to be screened at ORCI. A notification system could also be initiated in order to make ORCI aware of their incoming referrals.

A major strength of this study includes the fact that our study was the first to assess a cervical cancer referral program in sub-Saharan Africa, a region greatly affected by cervical cancer. The study evaluated the referral program in Tanzania which utilizes the well-established and high-quality institution of ORCI. The medical records provided reasonable information to complete the aims of our study. Other strengths of the comprehensive nature of the study include the fact that the study included information on patients, their follow-up, and tracking as well as the feedback of the nurses who examined and referred the patients.

One limitation of the study is the small sample size. Of the 165 patients from Magomeni and Temeke registered as having been screened at ORCI between January 2015 and May 2016, only 139 examination forms were obtained or completed. The other forms may have been misplaced or were never filled out. Registration logbooks before January 2015 are in poor condition and would have caused inaccurate data collection as many pages are missing or illegible. The inconsistency of the charting and filing of the medical records also caused some unforeseen changes to the study. Not only did this limit the sample size but it also lessened the number of variables evaluated.

Resources are a problem in many developing countries and Tanzania is no exception. The lack of staff, space, and supplies could be affecting the high rates of false positive cancer screenings. The most cost-effective strategy for this problem seems to be providing Magomeni and Temeke with Logol's iodine. This would allow a test for infection and could prevent the many women sent to ORCI who were mistaken as VIA positive. Training current or hiring new staff and creating additional spaces for screening may not be as feasible due to limited financial resources.

In summary, this study shows that although a cervical cancer screening referral program can be beneficial for a community like Dar es Salaam, Tanzania, it is important to evaluate such programs for accuracy, validity, and consistency of diagnosis. This evaluation of the ongoing program in Tanzania

revealed that the clinics of Magomeni and Temeke have referred a large proportion of false positive patients to ORCI. Recommendations for improving the accuracy of referrals include professional education for the nursing staff performing screenings. Nurses should receive continuing education and subsequent practical assessments to maintain their credentials. Refresher courses for nurses who perform screenings could improve uniformity of exams across clinics and ensure that nurses are up-to-date with screening methods. This study also revealed the high proportion of patients who are referred to ORCI but do not go for screening. Future studies should further investigate this finding, including the barriers preventing patients from receiving confirmation screening. Improvement in the consistency and completion of medical records as well as the storage of screening information could assist future research studies and potentially have a positive impact on patient care. Additionally, outside clinics should consistently provide referral forms for the patient to send to ORCI. This would aid in the efficiency of the referral process, as well as inform the health care providers at ORCI of the patient's condition.

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