

Original Research Article

Improving primary health care workers' knowledge of cervical cancer and visual inspection screening techniques through competency-based training: prospects for expanding coverage in developing countries

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Received: 21 February 2020

Revised: 01 April 2020

Accepted: 07 April 2020

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ABSTRACT

Background: Health workers in resource-poor settings have not demonstrated a comprehensive knowledge of visual staining procedures for cervical cancer screening. This study adopted competency-based training (CBT) to determine if it will improve their knowledge, and potentially expand screening coverage.

Methods: A quasi-experimental (pretest-posttest) design was adopted in this study conducted among primary health care workers in Ethiope-West Local Government Area of Delta State, Southern Nigeria. The participants had a competency-based training following an initial assessment of their knowledge. Data were analysed using SPSS version 22. The main outcome measures were baseline knowledge of cervical cancer, its prevention, and visual inspection screening techniques, as well as the effect of CBT on knowledge.

Results: Participants demonstrated correct knowledge of cervical anatomy/physiology and cervical cancer epidemiology/symptomatology to varying degrees, although their knowledge of visual inspection with acetic acid or Lugol's iodine (VIA/VILI) was grossly inadequate as only half had adequate knowledge. Knowledge of prevention, performance of VIA and VILI, as well as overall knowledge, improved significantly to 100% post-intervention ($p=0.002$, $p<0.001$ and $p=0.003$ respectively). Mean knowledge scores drastically increased among the PHWs between pre-CBT and post-CBT. The lowest mean difference was recorded for knowledge of cervical anatomy/physiology: 17.58 (CI: 8.16 - 27.00); while the highest was for knowledge of VILI/VIA technique: 41.01 (CI: 29.40 - 52.62).

Conclusions: CBT significantly improved knowledge of cervical cancer prevention and visual inspection screening methods (VIA and VILI), indicating a window of opportunity for expanding screening services at primary health care level.

Keywords: Cervical cancer screening, Competency-based training, Health workers, Primary health care, Visual inspection

INTRODUCTION

Cervical cancer ranks among the three highest causes of cancer-related disability-adjusted life years (DALYs) in low and middle-income countries (LMICs), constituting over ten percent of the financial burden of cancers in

these countries.^{1,2} This burden is burgeoning with a 14.5% increase in cervical cancer-associated DALYs in the past decade. In 2012 it accounted for 4% of all DALYs due to cancers, one-fifth of which occurred in Africa, according to the World Health Organisation.³ These were primarily attributable to advanced disease at

which stage most women in low-income countries are diagnosed, when prognosis is dreary and treatment cost escalates, especially among the uninsured.⁴ This is logically unacceptable since cervical cancer is largely preventable. Discovery of human papilloma virus (HPV) paved the way for development of its vaccine as a vital strategy for primary prevention against cervical cancer, though, till date, available vaccines are relatively expensive and unaffordable for a large proportion of the target population in low-resource settings.⁵⁻⁷ However, the disease has a prolonged latent phase which affords ample opportunity for early detection and treatment.

Recommended screening techniques include Pap smear, liquid-based cytology, HPV-DNA testing, visual inspection with acetic acid and visual inspection with Lugol's iodine. Pap smear has been the most popular cervical screening technique for several decades, particularly in developed countries where it has been adopted as a tool for population-based screening, and significant reduction in cancer-related mortality has been documented.⁸⁻¹⁰ However, it is cumbersome and expensive to implement for mass screening in resource-poor settings where trained personnel and infrastructure are not readily available.¹⁰⁻¹² In order to provide for LMICs that were unable to implement or sustain cytology-based population screening, research efforts focused on evaluating cheaper techniques for cervical screening at the turn of the century. The Alliance for Cervical Cancer Prevention (ACCP), a coalition of five different organisations conducted numerous studies in Asia, Africa and South America to determine cervical screening strategies that would be affordable for low-resource settings.⁵⁻¹³ The visual inspection methods - visual inspection with 3-5% acetic acid (VIA), magnified visual inspection with acetic acid (VIA) and visual inspection with Lugol's iodine (VILI)- were subjected to tests of accuracy by comparing them with pap smear, liquid based cytology and HPV-DNA testing. They were found to be of moderate to high accuracy and very feasible for implementation at primary health care level. VIA and VILI can provide high-coverage screening for women at risk because they are easy to perform, are relatively less expensive, and give immediate test results which facilitates instant treatment of positive cases and follow up.⁵⁻⁷

Competency-based training is a strategy that ensures that trainees gain adequate knowledge, correctly perform all steps required of a task, and are evaluated by standardised tools to ensure they have gained the desired level of mastery.¹⁴⁻¹⁶ This model has been adapted for the training of health workers in visual inspection methods and is reflected in available training manuals.¹⁵⁻¹⁸ By adopting this proven approach, health workers can be practically trained to apply visual inspection methods for regular and timely screening of "at risk women" with at minimal cost.

While previous studies show that health workers have moderate knowledge of cervical cancer and its

prevention, their understanding of its risk factors as well as visual inspection screening techniques is still inadequate.¹⁹⁻²² In addition, several studies in LMICs that involved training of health workers did not explore the effect of training on their knowledge of cervical cancer and its prevention.²³⁻²⁶ Moreover, in the Niger Delta area of Southern Nigeria, there is a dearth of studies on knowledge of cervical cancer and/or its screening amongst health workers; a literature search found no study that has assessed the knowledge of how to perform cervical screening in the region.²⁷ Available studies focused on female staff and students in tertiary institutions of learning which leaves much to be desired since there is a likelihood that existing screening programmes available in few centres in Nigeria may be unsustainable, especially in the light of the weakening health system.^{11,28,29} Training non-physician primary health care workers i.e. nurses and community health extension workers (CHEWs), who are the frontline facilitators and implementers of population-based prevention programmes and healthcare services at the grassroots could equip them with requisite knowledge and skills for cervical screening and prevention.^{19,30} Besides, scaling up their knowledge and skill would offer invaluable prospects for expanding the coverage of screening services at primary care level.

The objective of this study was to determine the effect of competency-based training on primary health care workers' knowledge of cervical cancer and visual inspection screening techniques.

METHODS

Study design, location, population and period

This was a quasi-experimental study (without a control group) with a training intervention conducted amongst primary health care workers (PHWs) in Ethiop-West Local Government Area (LGA) of Delta state, Southern Nigeria, between June and November, 2015.

Sample size and selection technique

Given the small size of PHWs in the LGA, all doctors, nurses, and CHEWs in the study population (26) were recruited.

Study instrument

The study instrument, a self-administered semi-structured questionnaire, was adapted from the training package on VIA and cryotherapy by Johns Hopkins Program for International Education in Gynaecology and Obstetrics (JHPIEGO) titled cervical cancer prevention guidelines For low resource settings and applied to assess the knowledge and reported practice of cervical screening by the health workers.¹⁵ It had six sections with a total of 50 items that assessed socio-demographic characteristics; knowledge of cervical cancer epidemiology,

symptomatology, and prevention; and knowledge of cervical anatomy and how to perform VIA/VILI.

Data collection

The questionnaire was administered as an initial pre-test, and re-administered as post-test after training.

Pre-training phase

With the questionnaire, information was obtained to assess baseline knowledge of the workers.

Training phase (intervention using competency-based training model)

Competency-based training with hands-on sessions and one-to-one supervision was conducted for a total of five days as recommended by JHPIEGO training manual.¹⁵ It focused on relevant anatomy/physiology of the cervix, health education for cervical cancer prevention, counselling for cervical cancer screening, and procedure for performing VIA and VILI. Training was done in collaboration with a team from Marie Stopes International Organisation Nigeria (MSION) using a manual adapted from those of JHPIEGO and Geneva Foundation for Medical Education and Research (GFMER).^{31,32}

Post-training phase

Four months post-intervention, the same workers' knowledge of cervical cancer and its prevention, relevant cervical anatomy/physiology, and how to perform VIA and VILI was re-assessed with the same questionnaire.

Statistical analysis

Correct responses to the different questions on knowledge were expressed in frequencies and percentages and presented in tables.

Scoring system for the questions was created as follows: Each correct response was scored one point and each wrong response was scored zero. Knowledge score for each category was totalled and converted to percentage of highest possible score. A score of less than 50% was graded as 'poor' while a score of 50% or above was graded as 'good'. Baseline and post-intervention scores of the PHWs were computed, and the improvement in scores was determined. Chi square test (χ^2) was employed to compare the score grades, and paired t-test was used to determine the effect of training on knowledge of the respondents. Level of statistical significance was set at alpha (α) =0.05 for both tests.

Ethical approval

This was obtained from the Health Research Ethics Committee of the Delta State University Teaching Hospital.

RESULTS

The majority of the workers were below 40 years (61.5%), while half of them had less than ten years' work experience (Table 1).

Table 1: Socio-demographic characteristics of participating health workers (n=26).

Variable	Categories	Frequency (%)
Age groups (in years)	31-40	16 (61.5)
	41-50	8 (30.8)
	51-60	2 (7.7)
	Mean±SD	40.6±6.7
Gender	Female	20 (76.9)
	Male	6 (23.1)
Marital status	Single	3 (11.5)
	Married	20 (77.0)
	Widowed	3 (11.5)
Professional group of health workers	CHEW	7 (26.9)
	Nurse	10 (38.5)
	Doctor	9 (34.6)
Number of years of work	<10	13 (50.0)
	10-19	8 (30.8)
	≥20	5 (19.2)
	Mean±SD	10.8±8.2

At baseline, most of the health workers (84.6%) knew that cervical cancer is the 2nd most common female cancer. Similarly the majority (73.1%) of them knew HPV to be the causal agent. Although well above two-thirds of the PHWs identified 'multiple sexual partners' and 'early sexual exposure' as risk factors, only 57.7% saw 'high parity' as a risk factor. Almost two-thirds recognized 'family history' as a risk factor for cervical cancer, whereas less than a third recognized 'frequent abortions' as a predisposition. Knowledge of 'post-coital bleeding' and 'foul-smelling menses' as symptoms of the disease was accurate amongst 80.8% and 65.4% of the PHWs respectively. Similarly, their knowledge of post-menopausal bleeding was high (76.9%). Almost seven in ten of the PHWs did not know that pain during sexual intercourse is not a symptom. As regards prevention, though 65.4% of the PHWs respectively knew that vaccination can prevent cervical cancer, and the best time to give the vaccine; only 53.8% and 34.6% correctly gave the name of the vaccine and the prescribed doses respectively (Table 2).

Most (92.3%) of the PHWs knew that the lower part of the cervix lies within the vagina. 76.9% correctly reported that the ecto-cervix and endo-cervix meet at the squamo-columnar junction. Correct knowledge about women of child bearing age having two squamo-columnar junctions was observed among 65.4% of the PHWs. Knowledge of where precancerous cells develop on the cervix was accurate among 73.1% of the PHWs. Slightly more than half of the PHWs (53.8%) knew that the endocervix is the upper two-thirds of the cervix, and only 19.2% knew

that the old squamo-columnar junction was further away from the external os than the new squamo-columnar junction. Less than a quarter (23.1%) of PHWs knew that 10% acetic acid is not used for VIA, and that the waiting time after application of acetic acid (before viewing) is not five minutes. Knowledge of aceto-white changes as the positive result for VIA was accurately reported amongst half of the PHWs.

Slightly more than half of the PHWs knew that a darkly stained cervix is not the negative result for VILI, and almost three-fifths did not know that visual methods do not delineate stages of cervical cancer. Only the doctors had a previous training on cervical screening methods. Less than a third of the female PHWs had had cervical screening (Table 3).

Table 2: Health workers’ baseline knowledge of cervical cancer (n=26).

Knowledge component	Correct response. Frequency (%)
Epidemiology	
Cervical cancer as the second most common female cancer	22 (84.6)
Cervical cancer, the commonest cause of cancer death in females	6 (23.1)
HPV as the cause of cervical cancer	19 (73.1)
Route of transmission of causative organism for cervical cancer	19 (73.1)
Risk factors	
Multiple sexual partners	21 (80.8)
Early sexual exposure	18 (69.2)
High Parity	15 (57.7)
Family history of cervical cancer	17 (65.4)
Use of hormonal contraception	17 (65.4)
Smoking	17 (65.4)
Frequent abortions	8 (30.8)
Poor hygiene	15 (57.7)
Nulliparity	18 (69.2)
Symptoms	
Bleeding after sex	21 (80.8)
Bleeding after menopause	20 (76.9)
Foul smelling menses	17 (65.4)
Vaginal itching	18 (69.2)
Menstrual pain	19 (73.1)
Pain during sex	8 (30.8)
Prevention	
Can vaccine prevent cervical cancer?	17 (65.4)
Name of vaccine	14 (53.8)
Recommended number of doses of HPV vaccine	9 (34.6)
Best time for giving HPV vaccine	17 (65.4)
Methods of cervical screening (Pap smear)	15 (57.7)
Who should be screened	19 (73.1)
How frequently women should screen	8 (30.8)
Can cervical cancer be cured if detected early?	24 (92.3)

Sum of correct and incorrect knowledge scores across rows equals 100%.

Table 3: Health workers’ baseline knowledge of relevant cervical anatomy and VIA/VILI (n=26).

Knowledge component	Correct response among PHWs. Frequency (%)
Basic cervical anatomy	
IUCDs are inserted through the cervix	25 (96.1)
The lower part of cervix lies within the vagina	24 (92.3)
The endocervix is the upper two thirds of the cervix	14 (53.8)
The ectocervix and endocervix meet at the squamo-columnar junction	20 (76.9)
Women of childbearing age have two squamo-columnar junctions	17 (65.4)
The old Squamo-columnar junction is closer to the external os than the new one	5 (19.2)
The area where pre-cancerous cells develop is called transformation zone	19 (73.1)

Continued.

Knowledge component	Correct response among PHWs. Frequency (%)
VILI and VIA	
The correct position in which women are placed to perform visual cervical screening	22 (84.6)
10% acetic acid is applied to perform VIA	6 (23.1)
5 minutes wait is required after applying acetic acid before viewing	6 (23.1)
VIA positive result gives aceto-white changes	13 (50.0)
The negative result for VILI is a darkly stained cervix	14 (53.8)
Visual methods helps to see stages of cervical cancer	11 (42.3)
Sum of correct and incorrect knowledge across rows equal 100%.	

Table 4: Composite knowledge of cervical cancer before and after intervention.

Knowledge component	Frequency (%)	
	Baseline n ₁ =26	Post-intervention n ₂ =26
Knowledge of epidemiology and symptomatology		
Poor	5 (19.2)	0 (0.0)
Good	21 (80.8)	26 (100.0)
	$\chi^2=3.540^*$, p=0.060	
Knowledge of cervical cancer prevention		
Poor	10 (38.5)	0 (0.0)
Good	16 (61.5)	26 (100.0)
	$\chi^2=10.029^*$, p=0.002	
Knowledge of relevant cervical anatomy and physiology		
Poor	5 (19.2)	0 (0.0)
Good	21 (80.8)	26 (100.0)
	$\chi^2=3.540^*$, p=0.060	
Knowledge of VIA and VILI		
Poor	13 (50.0)	0 (0.0)
Good	13 (50.0)	26 (100.0)
	$\chi^2=14.769^*$, p<0.001	
Total knowledge score		
Poor	6 (23.1)	0 (0.0)
Good	20 (76.9)	26 (100.0)
	$\chi^2=4.710^*$, p=0.030	

*Continuity correction; Poor <50%, Good: 50-100%.

Table 5: Mean percentage knowledge score before and after competency-based training.

	Mean±SD	Mean difference	95% CI of the difference	
			Lower	Upper
Pair 1 Knowledge of epidemiology/symptomatology	Percentage score before training	63.27±18.86		
	Percentage score after training	81.73±8.48	18.46	12.06 24.87
Pair 2 Knowledge of prevention	Percentage score before training	63.28±31.12		
	Percentage score after training	94.75±10.67	31.46	19.94 42.99
Pair 3 Knowledge of anatomy/physiology	Percentage score before training	68.12±25.64		
	Percentage score after training	85.70±13.41	17.58	8.16 27.00
Pair 4 Knowledge of VIA/VILI	Percentage score before training	46.16±33.43		
	Percentage score after training	87.17±12.74	41.01	29.40 52.62
Pair 5 Total knowledge	Percentage score before training	61.71±22.12		
	Percentage score after training	86.36±8.12	24.65	17.39 31.92

Each Pair= Pre- and post-training knowledge score (1: disease epidemiology/symptomatology; 2: prevention; 3: relevant anatomy and physiology; 4: VIA and VILI; 5: Total); CI=confidence interval.

Post-intervention, all the PHWs had good knowledge of all components. Although only 19.2% of PHWs had good knowledge of the disease epidemiology/symptomatology, and relevant cervical anatomy prior to the competence-based training, the difference in knowledge post-intervention was not significant ($p=0.060$). Initially, good knowledge of cervical cancer prevention and performance of VIA/VILI was documented among 61.5% and 50.0% of the PHWs respectively, and the subsequent improvement for these aspects was statistically significant ($p=0.002$ and $p<0.001$ respectively). Overall, a significant difference in total knowledge scores before and after CBT was detected ($p=0.030$). There was no statistically significant association between socio-demographic variables and overall knowledge (Table 4).

The lowest mean difference was in scores for knowledge of cervical anatomy/physiology, 17.58 (CI: 8.16-27.00); while the highest was in knowledge of VILI/VIA scores, 41.01 (CI: 29.40-52.62). Mean pre-test overall knowledge score was significantly lower than that of post-test by 24.65 (CI: 17.39 - 31.92) (Table 5).

DISCUSSION

At baseline, the majority of workers had good knowledge of cervical cancer epidemiology/symptomatology and cervical anatomy/physiology. Knowledge of these aspects of cervical cancer is quite pertinent in determining the background readiness of the PHWs for cervical screening and cancer prevention as well as serving as a foundation for further training.

Knowledge of HPV as a cause of cervical cancer, though observed to be good in a substantial number (73.1%) of the workers, was lower than a finding of over 80% from a similar study conducted among PHWs in Turkey.¹⁹ Knowledge of HPV as the causative agent for cervical cancer serves as the fulcrum for health education about primary and secondary prevention of the disease, hence the gap in the baseline knowledge of PHWs in this study ought to be bridged. However, the higher level of knowledge from the Turkish study could be due to the relatively superior composition of their medical staff-doctors, nurses and midwives- as against doctors, nurses and community health extension workers (CHEWs) in this study.¹⁹

On the average, the health workers in this study had good knowledge of important risk factors, however, over two-fifth did not know that high parity was a risk factor of cervical cancer. Identified gaps in baseline knowledge necessitate periodic assessment of the knowledge of health workers as this would invariably influence their practice of cervical prevention. Correct knowledge of major risk factors among the PHWs in this study was not quite different from that reported for the Turkish PHC workers, midwives from all levels of health care in Abidjan (Ivory Coast), and female health workers in a tertiary institution in Sokoto (Northern Nigeria). All three

studies found knowledge of ‘multiple sexual partners’ as a risk factor to be at least 80%.^{19,28,33} In contrast, a study of 27 health workers in Haiti reported 57.7%, which is much lower than 80.8% observed among PHWs in this study.²⁰ An even more strikingly different result was obtained in a study amongst 100 nurses in a secondary level facility in India that found that only 11.5% knew ‘multiple sexual partners’ to be a risk factor.²² Good knowledge of ‘early sexual exposure’, another risk factor, was found in 69.2% of the PHWs in this study and compares better than 11% found amongst Pakistani nurses and interns, and also slightly higher than the 65% found among Turkish PHWs.^{19,21} Proportion of health workers with correct knowledge of post-coital and post-menopausal bleeding as symptoms of cervical cancer was high in this study, probably, because these are common clinical presentation that health workers are likely to have encountered in their clinical practice. Good baseline knowledge of risk factors and symptoms could serve as a premise for improving skills for health education and promotion towards cervical cancer prevention.

Knowledge of cervical cancer prevention was modest, similar to the Ivorian study where only 42% knew about prevention.³³ Earlier studies among Cameroonian nurses (35.5%) and Haitian health workers (33.3%) reported comparably lower rates of awareness of HPV vaccine than in this study where marginally above half knew about HPV vaccine.^{20,27} The explanation for the shortfall may well be the perennial poor funding for primary health care in low and middle-income countries, with limited opportunities for training on cervical cancer prevention. Moreover, HPV vaccines are relatively expensive and inaccessible, and therefore little known at PHC level in developing countries. The level of awareness of cervical screening methods, particularly pap smear, among PHWs (57.7%) was somewhat higher than the 40% reported from the Pakistani study of nurses and interns. On the other hand, it was markedly lower than the 90.6%, 80%, 88%, and 70% observed in Sokoto (Northern Nigeria), Uganda, India and Turkey respectively.^{19,21,22,28,34}

This may not be unconnected to difference in setting, as some of these studies were conducted in tertiary facilities, which are expected to have established screening services. Nevertheless, the Turkish study was conducted among primary health workers which makes the low awareness of Pap smear found in our study indicative of a huge deficit in the capacity for cervical cancer prevention in our locality. Majority of PHWs in this study knew that all sexually active women should be screened for early lesions which are amenable to cure. This finding indicates previous knowledge gained, probably while in school, and should be a motivation to promote implementation of preventive services by these workers.

Knowledge of prevention and how to perform VIA and VILI was quite low amongst the PHWs. This lack of awareness of VIA and VILI amongst most PHWs in this study is congruent with findings of the Ivorian study.³³

The deficiency in knowledge of visual methods reflects the need for training, in order to align with World Health Organisation (WHO) recommendations for screening methods more suited to primary healthcare. It is particularly important to target PHWs for training on cervical cancer prevention and screening, since most women of reproductive age are likely to have contact with only this cadre of health care workers during the period of life when they could benefit maximally from screening. Moreover, the good knowledge of basic cervical anatomy and physiology that are useful for performing visual inspection methods recorded among majority of the PHWs would give tremendous impetus to training activities centred on VIA and VILI.

All the PHWs, except the doctors in this study had no prior training on any method of cervical screening and hence, had never carried out cervical screening for any patient. This relative lack of previous training and practice of cervical screening in these PHWs is a far cry from the recommendations of the National Cervical Cancer Policy.³⁵

Only 3 in 10 of the female health workers in this study had ever screened though they were all within the recommended age range for screening: 25 to 65 years.³⁵ The rates of self-screening amongst female health workers in several other studies were also low: 10%, 19% and 20% in Sokoto, Uganda and Abidjan respectively.^{28,33,34} This low uptake of cervical screening among health workers implies that screening among the lay population would be very far from the desired WHO target of 80% coverage.⁶

It may be deduced that lack of training on any method of cervical screening amongst the PHWs in this study is responsible for their low cognisance of the need to counsel women to be screened. This assumes greater significance when viewed against the backdrop that ignorance of cervical cancer reduces the demand for screening services amongst the general population, and continues to sustain the high burden of the disease in Nigeria.^{36,37} The foregoing highlight the need for regular awareness-creation and capacity-building targeted particularly at PHWs. Post-intervention assessment revealed significant improvement in knowledge, and was most pronounced for knowledge of 'prevention' and 'performance of VIA and VILI', in keeping with a study carried out in south-west Nigeria that reported significant improvement in knowledge of health workers following training. This desirable outcome, in both studies, could be attributed to the small number of trainees, and the model of training which involved didactic lectures and hands-on practical demonstrations.³⁸

CONCLUSION

The workers in this study became equipped with the necessary technical know-how, and the improvement serves as a premise for policies instituting competency-

based training in VIA and VILI for PHWs, a potential springboard for scaling up affordable and sustainable cervical cancer screening services at PHC level, and expanding coverage in Nigeria and other developing countries.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Health Research Ethics Committee of the Delta State University Teaching Hospital

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Cite this article as: Umuago IJ, Obiebi IP, Eze GU, Moeteke NS. Improving primary health care workers' knowledge of cervical cancer and visual inspection screening techniques through competency-based training: prospects for expanding coverage in developing countries. *Int J Community Med Public Health* 2020;7:1637-44.