Effectiveness of Clinical Training in Influencing the Outcome of Visual Inspection with Acetic Acid in Selected Facilities at a County in Kenya

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Abstract

Background: Cervical cancer remains a major health concern in developing countries, primarily due to the presence of human papillomavirus (HPV) types 16 and 18. Visual Inspection with Acetic Acid (VIA) is a common and affordable screening method, yet its effectiveness is closely tied to the skills and competency of healthcare providers. This study aimed to assess the impact of clinical training on improving VIA screening outcomes for cervical cancer in a county in Kenya.

Methods: Seven government health facilities equipped with cryotherapy machines were selected, with two healthcare providers sampled from each. A six-day VIA training intervention was conducted, combining theoretical instruction with hands-on clinical practice using preceptors to guide trainees. Baseline data were collected using questionnaires, abstraction tools, and observational checklists, followed by pre-and post-tests to measure knowledge and skill improvement.

Results: The training program significantly improved the healthcare providers' knowledge and VIA skills ($p<0.001$). The cervical pre-cancer positivity rate increased from 0.8% at baseline to 14.1% post-intervention, indicating enhanced detection abilities.

Conclusion: VIA is a viable screening method in low-resource settings when healthcare providers are adequately trained. Enhanced provider confidence and competency contribute to better screening uptake and patient outcomes, highlighting the importance of integrating clinical practice with VIA training for sustainable cervical cancer prevention.

Keywords: Visual inspection, acetic acid, cervical cancer screening, Kenya.

Introduction

Cervical cancer prevention in resource-constrained settings relies heavily on effective screening methods, such as HPV testing and visual inspection with acetic acid (VIA), followed by treatment of pre-cancerous lesions through ablative techniques (ACCP factsheet). The disease disproportionately affects low- and middle-income countries, with mortality rates nearly three times higher than those in high-income nations, underscoring the need for targeted prevention strategies. Linking knowledge and prevention initiatives has become a common practice, as highlighted by the Alliance for Cervical

Cancer Prevention (ACCP) (Asgary & Adongo, 2016). While VIA is a viable screening method, its effectiveness is contingent upon the skill and competency of healthcare providers, making training and continuous education essential for its accurate implementation. Thus, a multifaceted approach that integrates effective screening, skilled healthcare delivery, and educational outreach is vital for reducing cervical cancer burden and improving health outcomes for at-risk women.

Cervical cancer is a leading cause of mortality among women worldwide, particularly in sub-Saharan Africa (WHO, 2020). In contrast, its prevalence is significantly lower in developed countries, primarily due to the implementation of cytology screening programs and widespread HPV vaccination (WHO, 2020). The available screening methods in middle- and low-income countries (LMICs) include cytology, visual inspection with acetic acid (VIA), visual inspection with Lugol's iodine, and HPV testing. However, implementing cytology-based tests and programs in LMICs poses considerable challenges, including logistical difficulties, high costs, need for adequate infrastructure, trained laboratory personnel, and requirement for multiple visits (Sankaranarayanan, 2012). These barriers highlight the necessity to explore more feasible and effective screening strategies tailored to the unique contexts of LMICs.

Many governments in low- and middle-income countries (LMICs), along with the World Health Organization (WHO), have endorsed visual inspection using acetic acid (VIA) as a screening method in resource-constrained settings. If the initial results are positive, VIA can be conducted as a standalone test, followed by visual inspection using Lugol's iodine (VILI) (Nessa, et.al 2019). This cost-effective screening method allows visualization of the cervix using acetic acid and is typically succeeded by straightforward treatment procedures for any identified pre-cancerous lesions. Trained healthcare providers administer treatment, and a single-visit approach is often recommended to enhance accessibility and adherence to care (Saleh & Sherif, 2017).

The Kenya Demographic Health Survey (2014) indicated that approximately 13.45 million females aged 15 years and older are at risk for cervical cancer. While three-quarters of women aged 15-49 are aware of cervical cancer, only 14% have undergone cervical cancer examination. Among those screened, 62% underwent a Pap smear, while 32% were examined using visual inspection methods. Furthermore, according to De Sanjose and Holme (2019) there is an urgent need to ensure that women undergoing screening receive accurate diagnosis and appropriate management. Scaling up cervical cancer screening and treatment will be effective and impactful only if timely and correct diagnoses are made, followed by the initiation of suitable management strategies.

An effective Visual Inspection with Acetic Acid (VIA) training program for healthcare providers (HCPs) comprises

four key components: foundational training principles, specific training for VIA, cryotherapy training, and quality assurance and supervision training. Emphasizing clinical or simulated settings, a competency-based model, and a mix of theoretical and practical sessions, this structured approach equips HCPs with the essential skills for accurate cervical cancer screening and treatment (Shastri, 2014). Evidence from Veena (2012) supports the effectiveness of this training framework, demonstrating that even non-healthcare providers can successfully identify pre-cancerous lesions when trained using similar methods. Overall, these strategies enhance HCPs' capabilities, contributing to improved cervical cancer prevention and better health outcomes.

Objectives

1. To determine the proportion of cervical pre-cancer positivity rate in selected facilities in Embu County prior to intervention.
2. To determine the effectiveness of cervical cancer clinical training
3. To assess the effectiveness of VIA training in identifying pre-cancerous lesions in selected facilities in a county in Kenya.

Literature Review

Tekalegn et al., (2020) explored factors associated with visual inspection with acetic acid (VIA) positivity in cervical cancer screening among women in public hospitals in Oromia, Ethiopia. Given the high global prevalence of cervical cancer, accounting for approximately 6.5% of all cancers in women worldwide and responsible for significant mortality, especially in low- and middle-income countries, early detection through screening can significantly improve survival rates. This research was conducted as a hospital-based case-control study, which included 74 VIA-positive cases and 148 VIA-negative controls. Findings indicated that women with four or more children, a history of post-coital bleeding, previous sexually transmitted infections, multiple sexual partners, and a history of smoking were at increased odds of VIA positivity. The authors recommend targeted follow-up and awareness programs for women with these risk factors to enhance screening and early detection.

In Kampala, Uganda, Namale et al., (2021) assessed cervical cancer screening among female sex workers (FSWs), a high-risk group owing to the elevated rates of sexually transmitted infections such as HIV and HPV. The study found that 6% of the 719 women screened using Visual Inspection with Acetic Acid (VIA) were VIA-positive. Of the 24 biopsied cases, 13 had cervical intraepithelial neoplasia (CIN) grade 2 or 3, and 4 were diagnosed with invasive cervical cancer. HIV prevalence in the group was high (43%), and women with more than 100 lifetime sexual partners or HIV infection were more likely to test positive. The study concluded that VIA's effectiveness is limited, even among trained professionals, and recommended integrating cervical cancer screening into

HIV care to improve early detection and reduce cancer burden for FSWs.

Phoolcharoen et al., (2022) aimed to address the lack of trained medical providers in low- and middle-income countries (LMICs) to perform cervical cancer screening and treatment by organizing hands-on training courses. Conducted across six countries, the courses provided training in essential procedures, such as visual inspection with acetic acid (VIA), colposcopy, cervical biopsy, and loop electrosurgical excision procedure (LEEP). The training, which used low-cost simulation models, significantly increased provider confidence, with 69-76% of participants reporting greater confidence in performing key procedures. This initiative is part of a broader strategy to enhance cervical cancer prevention and treatment capacity in LMICs, ultimately improving access to crucial care in underserved areas.

A study on cervical cancer prevention by Perkins et al., (2023) revealed that nearly all cervical cancers can be attributed to persistent infections with high-risk HPV types, including HPV-16 and HPV-18. Vaccination at ages 9–12 years is projected to prevent over 90% of cervical pre-cancers and cancers. Furthermore, this study found that regular cervical screening with HPV testing and treatment of high-grade squamous intraepithelial lesions are key preventive measures for adults aged 21–65 years. HPV testing alone has 90% sensitivity for detecting pre-cancer, and additional genotyping with cytology helps assess the risk of progression. Management ranges from repeated testing to colposcopy or excisional treatment depending on the risk level. This study suggests that screening and vaccination could greatly reduce the incidence of cervical cancer.

Allahqoli et al., (2022) conducted a systematic review to assess the diagnostic performance of artificial intelligence (AI) technologies in predicting, screening, and diagnosing cervical cancer and pre-cancerous lesions (2022). The study analyzed data from 117 studies and found that AI techniques significantly enhanced the accuracy of cervical cancer screening, with algorithmic accuracies ranging from 70% to 100%. AI showed high accuracy in distinguishing between cancerous and normal Pap smears (80-100%) and demonstrated sensitivity and specificity rates of 71.9% to 98.22% and 51.8% to 96.2%, respectively, for colposcopy. The review concludes that AI can be an effective tool, especially in resource-limited settings, to support doctors in diagnosing cervical cancer and pre-cancerous lesions when combined with human evaluation.

Research Methodology

Research Design

This study adopted an intervention design to evaluate the impact of Visual Inspection with Acetic Acid (VIA) training on enhancing the knowledge and skills of health workers, as well as improving client outcomes in selected hospitals in the county. This study was conducted in three phases across various sites. In the first phase, baseline data on cervical

cancer screening were retrospectively gathered from facility registers over the previous year to determine the positivity rate for pre-cancerous lesions prior to the intervention. Questionnaires and observational checklists were also used to identify gaps in knowledge and performance concerning VIA training. The second phase included both theoretical and clinical instruction, featuring two days of classroom training followed by four days of practical experience in a cervical cancer screening campaign, with each pair of participants matched with a preceptor for personalized guidance. The final phase involved a follow-up period of four months after the training, during which the trained health workers conducted screenings using the VIA method under the mentorship of their preceptors, with observational checklists employed to ensure compliance with established screening standards.

Sampling

The study population consisted of healthcare providers who conduct cervical cancer screenings for women aged 25-49 using the VIA method in maternal and neonatal health care and family planning (MCH and FP) clinics. The sampling was done using a purposeful technique to select seven government health facilities offering VIA services. Two healthcare providers were chosen from each facility, resulting in 14 participants. This selection strategy ensured a comprehensive representation of healthcare providers involved in cervical cancer screening across different types of facilities, such as County Referral and sub-county hospitals and a high-volume dispensary. Inclusion criteria were healthcare providers already involved in VIA screening, while exclusion criteria involved excluding managerial staff to avoid their professional responsibilities influencing participation

Instrument and Data Collection

Data collection involved multiple instruments, including self-administered semi-structured questionnaires, observational checklists, VIA screening tests, and facility records. Questionnaires were developed to capture baseline data on knowledge and training gaps regarding VIA screening and adherence to established guidelines. Checklists were used to observe and assess the proper implementation of the VIA during the clinical training phase. Secondary data were also gathered from health facility records, such as cervical cancer screening and treatment registers, to determine the baseline positivity rate for pre-cancerous lesions before the intervention. Pre- and post-test examinations were conducted during the theoretical training phase to assess knowledge acquisition and skill retention. Instrument validity was ensured by aligning the questionnaires and checklists with the VIA training curriculum and guidelines, whereas reliability was assessed by conducting pilot testing before full implementation.

Data Analysis

Quantitative analysis was employed to evaluate the impact of the VIA training program. Data were cleaned and coded before being entered into the Statistical Package for Social Sciences (SPSS),

version 21.0. Frequency distributions were utilized to illustrate the demographic characteristics of the participants, while cross-tabulation was conducted to analyze the bivariate relationships between variables. Cohen's Kappa coefficient (K) was used to assess the agreement between trainee and preceptor diagnoses during the clinical training phase, highlighting the reliability of the VIA results. This approach to data analysis was chosen to ensure that both descriptive and inferential statistical methods were applied in assessing the effectiveness of the training program.

Ethical Considerations

Ethical approval for the study was obtained from the University of Nairobi-Kenyatta National Hospital Ethics and Review Committee, and a research permit was granted by the National Commission for Science and Technology (NACOSTI). The County Commissioner, the County Ministry of Education, and the County Director of Health also granted permission for the study to be conducted within the county. Informed consent was obtained from all the participants, ensuring that they voluntarily agreed to participate in the study. Confidentiality was maintained by anonymizing data and using secure methods for data storage. Thus, ethical considerations were prioritized throughout the study to ensure that the research was conducted with the utmost respect for participants' rights and well-being

Results

Demographic Data for Health Care Providers

The demographic data of the healthcare providers are summarized in Table 1. Findings showed that 92.9% (n = 13) of the female participants were educated, 78.6% (*n*=11) had diplomas, and 50% of the respondents had been in the same facility for more than five years.

Table 1

Demographic Data for Health Care Providers in the County

Variables	n=14	Percentage
Gender		
Female	13	92.9%
Male	1	7.1%
Cadre		
Nurse	14	100.0%
Highest education level		
Diploma	11	78.6%
Bachelor's degree	2	14.3%
Master's degree	1	7.1%
Religion		
Catholic	7	50.0%
Protestant	7	50.0%
How long have you been in this facility		
Less than 1 year	1	7.1%
1-5 years	6	42.9%
More than 5 years	7	50.0%

The Proportion of Cervical Pre-Cancer Positivity Rate in Selected Facilities in the County Prior to Intervention

Data from the cervical cancer screening and treatment registers of the Ministry of Health were collected retrospectively from seven participating facilities over the past year. Of the 239 VIA screenings conducted, most were performed at the County Referral Hospital, accounting for 29.3%, while one at the Sub County Hospital had the lowest percentage (0.8%). The baseline positivity rate for the pre-cancerous lesions was 0.8%.

Table 2

Baseline Cervical Cancer Screening Data Per Facility

Variables	n=239	Percentage (%)
Age		
Below 25 years	23	9.6
25-32 years	54	22.6
33-41 years	77	32.2
42-49 Years	51	21.3
50 years and above	34	14.2
Type of screening		
Initial screening	22	9.2
Routine screening	4	1.7
Not indicated	213	89.1
VIA results		
Negative	231	96.7
Positive	2	0.8
Suspicious	6	2.5
HIV status		
Negative	19	7.9
Not indicated	220	92.1
CRYO done		
N/A	116	48.5
Not indicated	123	51.5
Reason for not doing CRYO		
N/A	117	49.0
Not indicated	122	51.0

The positivity rate for pre-cancerous lesions was computed from baseline data. The results also indicated that negative test results accounted for 96.7% (n=231), whereas the positivity rate for VIA was 0.8%.

Age Proportions of VIA Screening

In Kenya, the recommended age for VIA screening in women is 25–49 years, although this can be adjusted based on the individual's HIV status. Table 3 indicates that cases of pre-cancerous lesions during the baseline study primarily involved women within the 25-49 age range. However, the data also revealed that the

screening guidelines were not consistently followed as women aged 49 years and above were screened. Additionally, women under 25 years of age who underwent screening did not have positive HIV status.

Table 3

VIA Baseline Results Across Age Groups

		Age groups			Total
		Below 25 years	25 - 49 years	50 years and above	
VIA RESULTS	Negative	23	175	33	231
	Positive	0	2	0	2
	Suspicious	0	5	1	6
Total		23	182	34	239

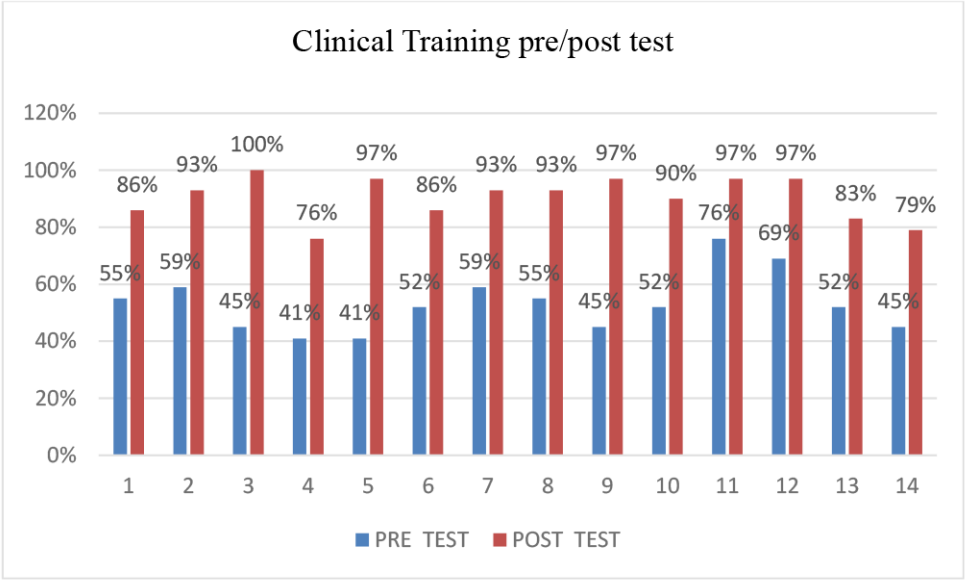
Effectiveness of Cervical Cancer Clinical Training (Intervention Phase)

Participating healthcare workers underwent didactic training for two days, followed by four days of clinical practice, for a total of six days of training. The Ministry of Health's curriculum for visual inspection training was utilized and supplemented by the Jhpiego Cervix Atlas and flashcards. The training covered topics such as the anatomy of the normal and abnormal cervix, human papillomavirus (HPV), significance of cervical cancer screening, eligibility criteria for screening, VIA procedure, cryotherapy, infection control measures during VIA, and community engagement strategies for mobilizing VIA services. A pre-test was administered on the first day of didactic training, followed by a post-test after the training.

The pre-test assessment revealed that the participants had a mean score of 53.3% (SD = 10.18), with scores ranging from a minimum of 41% to a maximum of 76%. In contrast, the post-training assessment demonstrated significant improvement, with the respondents achieving a mean score of 90.5% (SD = 7.43), where scores varied from 76% to 100%. This notable performance enhancement underscores the positive impact of the training program on health care workers. Furthermore, the results from the paired t-test indicated a statistically significant difference ($p < 0.001$) between the pre-and post-training scores, reinforcing the effectiveness of the training intervention at a 95% confidence level.

Figure 1

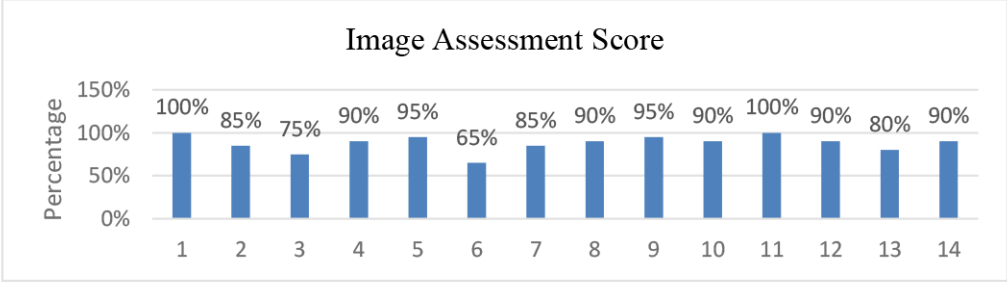
VIA and Cryotherapy Training Pre/Post-Test Performance



A midcourse evaluation was conducted on the second day of the didactic training. Twenty cervixes with different diagnoses were displayed on the screen, allowing healthcare providers to assess each case and individually document their management plans. The average score is 87.9%, with the highest and lowest scores reaching 100% and 65%, respectively.

Figure 2

Image Assessment Score for Midcourse Evaluation



This midcourse evaluation highlights the importance of incorporating pictures and images of various VIA findings; however, it is crucial to recognize that these cervical images cannot replace hands-on clinical practice with actual patients. The results

align with those of WHO (2015), which indicate that when training materials are varied and diverse, learners are less likely to feel bored or overwhelmed by excessive information. Nevertheless, while photos and other teaching aids play a valuable role in enhancing learning, they cannot replace the impact of real human interaction on reinforcing knowledge. Jhpiego has created images of different cervixes in VIA to support training in this area.

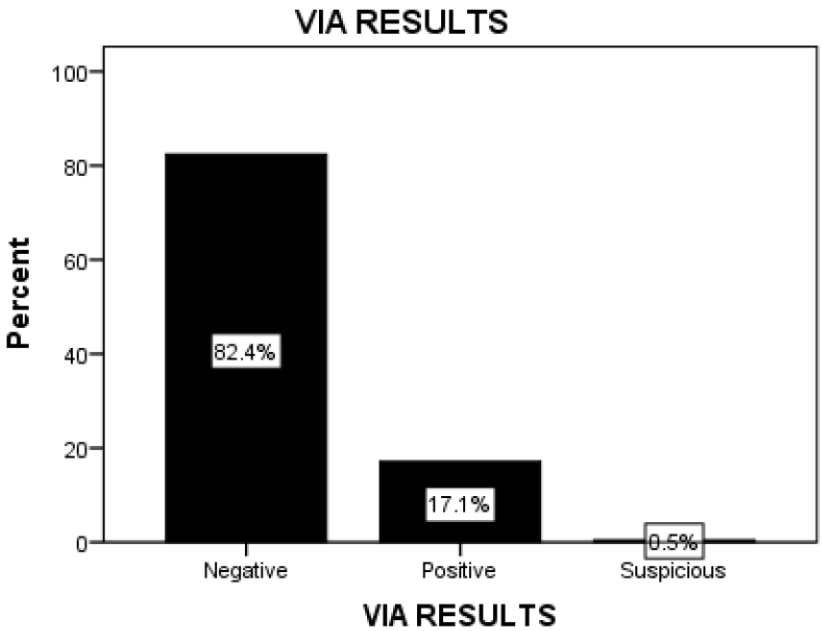
Clinical Campaign Phase/ Clinical Campaign

VIA Results During Clinical Campaign

During the four days of clinical training and practice, participants screened women under the guidance of preceptors, with each preceptor supervising two healthcare providers. From the conclusion of the clinical training, 216 women were screened. Among them, 36 women had pre-cancerous lesions, all of whom were eligible for treatment with cryotherapy. Additionally, one woman presented with findings suspicious of cancer. The results are illustrated in Figure 3, indicating a positivity rate of 17.1% for the pre-cancerous lesions.

Figure 3

VIA Results During Clinical Campaign



Cohens Kappa Coefficient During Clinical Training

The study employed Cohen's Kappa coefficient (k) to assess the level of agreement on VIA results between the participants and the preceptors during the intervention phase. The agreement ranged from moderate to perfect (0.5 – 1) over the four days of the clinical campaign and practice. On day one, the agreement was moderate (k=0.5), while days two and three demonstrated nearly perfect agreement (k=0.8 and k=0.9, respectively). Day four achieved perfect agreement with a k value of 1.

Table 4

*Cross Tabulation of 'Agree with Preceptor' * 'VIA Results' (Average over the 4 days)*

Count

		VIA RESULTS			Total
		Negative	Positive	Suspicious	
AGREEMENT WITH PRECEPTOR	Negative	171	3	0	174
	Positive	7	34	0	41
	Suspicious	0	0	1	1
Total		178	37	1	216

Probability of agreement (P_o) = 206/216

= 0.9537

Probability of random agreement (P_e) = 0.6964

Cohen's kappa (K) = 0.8475

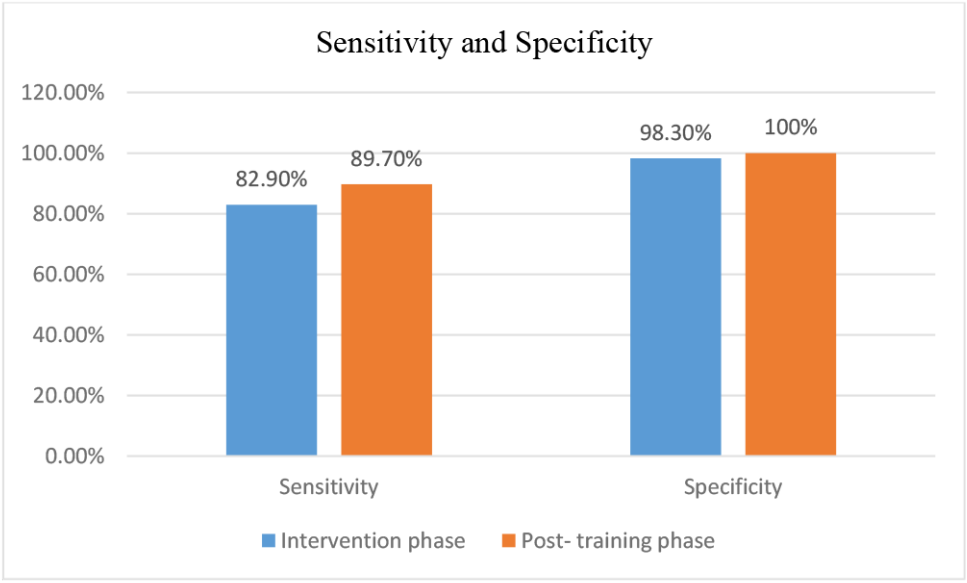
Sensitivity and Specificity of VIA Results

Figure 4 illustrates the sensitivity and specificity over four days of clinical training during the intervention phase. The data shows that both sensitivity and specificity percentages improved as the training progressed, highlighting the significant role of preceptors in enhancing clinical training outcomes.

Figure 4

Comparison of Sensitivity and Specificity in Intervention and Post-training Phase

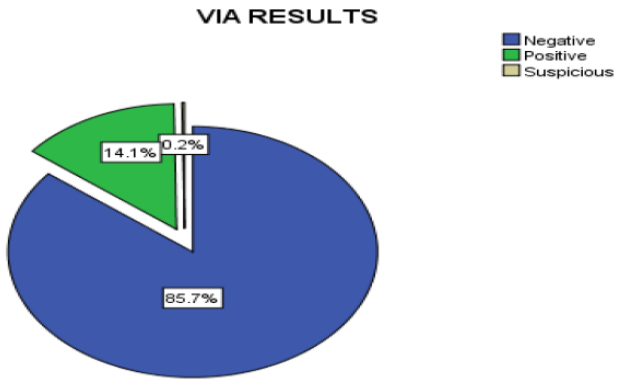
Effectiveness of VIA Training on Identification of Pre-Cancerous Lesions in Selected Facilities at the County



The gold standard for Visual Inspection with Acetic Acid (VIA) screening is the healthcare provider's proficiency in identifying acetowhite lesions on the cervix, which signifies pre-cancerous changes. These lesions are characterized by their dense white appearance, origin from the squamocolumnar junction (SCJ), and clearly defined borders. As illustrated in Figure 6, during the four-month follow-up phase after training, the positivity rate for the sampled population was 14.1%, with suspicious cases of cancer recorded at 0.2%.

Figure 5

Post Training VIA Results



Age of Women Screen Post-Training Phase

Table 5 reveals that most women screened using Visual Inspection with Acetic Acid (VIA) in the post-training phase were aged 25 to 32 years, while VIA-positive cases spanned from 19 to 49 years. This indicates that healthcare providers (HCPs) effectively adhered to the national age-related screening guidelines, which emphasize targeting women in specific age brackets for optimal cervical cancer detection. The focus on the 25–32 age group aligns with the World Health Organization recommendations for early screening. Additionally, the presence of positive cases in women outside this primary age range emphasizes the importance of monitoring a broader demographic, enhancing early detection efforts, and reflecting on HCPs' commitment to comprehensive cervical cancer prevention strategies.

Table 5

Age Groups and VIA Results

Age		VIA RESULTS			Total
		Negative	Positive	Suspicious	
	Below 25 years	12	1	0	13
	25-32 years	143	26	1	170
	33-41 years	141	25	0	166
	42-49 years	76	9	0	85
Total		372	61	1	434

The study utilized Cohen's Kappa coefficient (k) to assess the agreement between participants and preceptors regarding VIA results during the four-month follow-up period. Cohen's Kappa statistics indicated a perfect agreement, with a value of k = 0.9, as presented in Table 6 below.

Table 6

Cross Tabulation of Agreement of VIA Findings between Participants and Preceptors Post Training

		VIA RESULTS			Total
		Negative	Positive	Suspicious	
AGREEMENT WITH PRECEPTOR	Negative	365	0	0	365
	Positive	7	61	0	68
	Suspicious	0	0	1	1
Total		372	61	1	434

Probability of agreement (P_o) = 427/434

= 0.9839

Probability of random agreement (P_e) = 0.7429

Cohen's Kappa (K) = 0.9374

Discussion

The study aimed to assess the cervical pre-cancer positivity rate in selected facilities within the County, serving as a benchmark for the effectiveness of Visual Inspection with Acetic Acid (VIA) diagnosis. According to DHIS 2016 data for this county, the pre-cancerous positivity rate was 1%. A retrospective analysis of one year's baseline data collected from the seven participating facilities revealed a lower positivity rate of 0.8%, significantly below the 5-10% standard rate documented by the World Health Organization across various studies.

The demographic data indicated that most cervical cancer screeners were female nurses. This emphasizes the need to involve other healthcare professionals, such as clinical officers and doctors working with women in comprehensive care and gynecology clinics, to ensure that a larger VIA-eligible population is screened across multiple hospital sites. Notably, prior to the intervention, baseline data revealed that the County Referral Hospital in this county conducted most VIA screenings, accounting for 70 cases (29.3%). However, this resulted in a low positive rate of just 0.8% for pre-cancerous lesions, reflecting the limited uptake of cervical cancer screening. The baseline data showed that clients with pre-cancerous lesions were primarily aged between 25 and 49 years. Among those with suspicious cancer results, 83.3% (n=5) fell within this age group, while 16.7% (n=1) were over 50 years of age.

These findings align with those of Saleh et al. (2017), which indicated that most women who volunteered for cancer screening were aged 35–40 years. Inconsistencies in the baseline data

included the screening of women outside the recommended age range of 25-49 years and lack of information regarding the HIV status of those under 25. Since the squamocolumnar junction begins to recede into the endocervix after age 49, VIA may yield less definitive results beyond this age. Furthermore, women under 25 are generally more capable of eliminating HPV infections through immune mechanisms, which may prevent progression to the pre-cancer stage. Therefore, screening women under 25 years of age without specific indications may not be an efficient use of resources.

During the intervention phase, the didactic training included both a pre-test and post-test, revealing a significant improvement in learning, as indicated by a t-test result of < 0.001 at a 95% confidence level. The mean pre-test score was 53.3%, with a minimum score of 41%, whereas the post-test mean score was 90.5%, with a minimum score of 76%. On the second day of training, the participants underwent a midcourse image evaluation involving 20 projected images, which required them to identify VIA diagnoses and management plans. The mean score for this evaluation was 87.9%, with scores ranging from 65% to 100%. This midcourse evaluation underscores the importance of using images to represent various VIA findings.

However, it is crucial to note that these images cannot replace clinical practice in real patients. They serve to create a mental reference for understanding the squamocolumnar junction, identifying acetowhite lesions, and recognizing cervixes with or without lesions and those suspicious of cancer. In addition, the images aid in classifying lesions that are eligible for treatment. These findings align with those of Poli et al., (2015), who suggested that diverse training materials enhance engagement and reduce learner fatigue; however, it is essential to remember that while visual aids are beneficial for learning, they cannot replace the essential role of real human interactions in reinforcing knowledge.

During the clinical campaign phase, the overall performance metrics indicated a sensitivity of 82.92% and a specificity of 98.25%. Following the training, sensitivity improved to 89.7%, with specificity reaching 100%. These results align with the findings of Bhattacharyya et al., (2015) who emphasized that the involvement of preceptors contributes to delivering reliable outcomes for clients screened for cervical cancer. During the training phase, 17.1 percentage of women tested positive for pre-cancerous lesions. This aligns with the World Health Organization's assertion that the proportion of positive screens identified by newly trained healthcare providers typically ranges between 25% and 35% in previous studies. This discrepancy may be attributed to the tendency of newly trained healthcare providers to categorize whitest lesions on the cervix as acetowhite.

The post-training phase of the study, which involved mentorship and follow-up of healthcare providers, revealed a pre-cancerous lesion positivity rate of 14.1% among 434 screened women. This

rate aligns with the WHO's standard of 5-10%. While only 0.2% of women were suspected of having cancer, appropriate referrals were made. Of those with pre-cancerous lesions, 63.9% underwent cryotherapy, 4.9% required postponement due to conditions such as PID, and 31.1% did not receive treatment due to the lack of functional cryotherapy machines. This treatment rate fell short of the WHO recommended 90%, primarily due to the absence of a screen-and-treat approach in some facilities (WHO 2017, WHO 2019). This study emphasizes the importance of this approach as it can prevent women from being lost to follow-up. Notably, no adverse events were reported among the patients treated with cryotherapy.

Conclusion

This study emphasizes the crucial role of effective training for healthcare providers in equipping them with skills to effectively diagnose VIA. The diagnosis can be VIA-positive, VIA-negative, or suspicious for cancer. Proper diagnosis for every woman screened is essential in the fight against cervical cancer as women diagnosed with pre-cancerous lesions can be treated early enough before pre-cancer progresses. Women diagnosed with lesions suspicious for cancer can either be referred for further management or start early interventions depending on the level of care where the diagnosis is performed. The baseline data revealed a low rate of pre-cancer positivity, which points to significant training gaps among providers. Although many healthcare workers have received on-the-job training in VIA, the quality of this training is questionable, as many trainers themselves lack proficiency in the technique, leading to inconsistencies in the skills passed on.

Furthermore, the training failed to incorporate essential skills in cryotherapy, rendering the VIA training incomplete. For healthcare providers to confidently screen and treat patients, both screening and treatment modalities must be integrated into the training programs. A successful strategy against cervical cancer depends on the effective implementation of both primary and secondary preventive measures. In the context of secondary prevention through VIA, accurate diagnosis and management are vital to reduce the morbidity and mortality associated with cervical cancer, especially in developing countries.

This study highlights the significance of healthcare providers in comprehending the anatomy and physiology of a normal cervix and its variations to better understand abnormalities. The didactic phase focused on detailed training in the Visual Inspection with Acetic Acid (VIA) procedure, cryotherapy, and strategies for community engagement to promote awareness of cervical cancer screening within healthcare facilities. The use of Jhpiego cervix flashcards during training played a crucial role in helping participants visualize concepts such as the squamo-columnar junction, VIA-negative cervix, cervix with pre-cancerous lesions, and identifying cases suspicious for cancer, along with treatment eligibility. Participants found it much easier to interpret results when interacting with real patients. However, it is essential to note

that cervical images should never replace actual patients during the clinical practice phase of cervical cancer screening. To foster confidence in diagnosing women, preceptors encouraged healthcare providers to assess the cervix and make their own diagnosis, followed by a joint examination and final diagnosis with the preceptor. The moderate to near-perfect agreement in Cohen's Kappa coefficient between preceptors and healthcare providers from the clinical campaign phase to the post-training phase indicated that VIA skills and diagnostic accuracy improved with practice. Since VIA interpretation is subjective and relies on the provider's skills, regular technical supervision is vital to uphold standards among healthcare providers.

Additionally, healthcare providers should consistently screen women using VIA to prevent skill deterioration over time. The study concludes that clinical training, which is the most demanding aspect of VIA training, is essential for developing skills and clinical competency, ideally under the guidance of a preceptor. The recommended training duration aligns with the ACCP guidelines, suggesting 5-10 days for both didactic and clinical training to ensure the effectiveness of skills and competencies. The data collected throughout the study demonstrated a notable increase in VIA uptake following healthcare provider training, indicating that enhanced confidence in screening skills facilitates better mobilization among providers.

Recommendations

i. Health facilities and government health departments should enhance capacity building for Visual Inspection with Acetic Acid (VIA) by training more healthcare providers in both VIA and cryotherapy. This approach will facilitate effective diagnosis and management while promoting a single-visit model.

ii. The Ministry of Health (MOH) should revise the VIA training curriculum to a minimum of six days, encouraging the use of cervical flashcards and images. The curriculum should also include a practical clinical training component supervised by preceptors at a ratio of at least 2:1 (one preceptor for every two participants). Preceptors should be certified and competent by VIA practitioners.

iii. Health facilities should receive support from the Ministry of Health and other stakeholders in acquiring cryotherapy and thermal ablation machines. This support will bolster a single-visit approach for screening and managing pre-cancerous lesions. Additionally, other supplies necessary for VIA screening should be provided to ensure the sustainability of the VIA programs.

iv. Training on cervical cancer screening using VIA and treatment with cryotherapy or thermal ablation should be integrated into the pre-service curriculum for nurses, clinical officers, and doctors, particularly in low-income and middle-income countries.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

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