OptiLab NVeCam: A Breakthrough in Cervical Cancer Early Detection

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ABSTRACT

Cervical cancer is the third leading cause of cancer related deaths worldwide. death in all cancer cases in the world. Screening for cervical cancer can help prevent it, with methods like Visual Inspection with Acetic Acid (VIA). The VIA examination has traditionally been conducted visually, without the aid of tools, leading to subjective results and a lack of documentation of examination outcomes. Digital technologies such as the "OptiLab NVeCam" aid in VIA implementation. This study aims to evaluate the impact of the " OptiLab NVeCam" on VIA accuracy. It employs a quasi-experimental design with a single-group pre-post test conducted in Java in 2022, involving 71 midwives who perform VIA. The study utilized accidental sampling and analyzed via the Wilcoxon test. Results indicate significant improvement in VIA accuracy using the Digital Colposcope among midwives (p = 0.008). Furthermore, VIA results obtained with the " OptiLab NVeCam " was consistent with validator, demonstrating its efficacy and accuracy in cervical cancer screening. he introduction of " OptiLab NVeCam " addresses these issues in VIA examinations, offering a solution for more accurate and documented screening outcomes.

Keywords: OptiLab NVeCam, cervical cancer, screening, VIA

INTRODUCTION

Cancer is the leading cause of death and a barrier to increasing life expectancy in every country. Cervical cancer is a malignancy that originates in the cervix [1]. Cervical cancer is the third leading cause of death in all cancer cases in the world. Cervical cancer represents 9% of all cancer deaths. The World Health Organization (WHO) calls cervical cancer the number four type of cancer that most commonly affects women and is deadly [2]. In 2020, there were 604,000 new cases and 342,000 deaths worldwide. According to Globocan 2020 data, new cases of cervical cancer in Indonesia reached 36,633 people, an increase from previous years [3].

WHO has recently put out the call to eliminate cervical cancer by 2030 [4]. Cervical cancer can be prevented by primary prevention, namely the administration of the HPV vaccine, and secondary prevention, namely effective cervical cancer screening [1]. Prevention and control of cervical cancer nationwide are also carried out by screening which can reduce mortality due to early cancer stages [5]. Non-screening routinely is associated with delayed cervical cancer findings [6]. Routine screening programs can reduce mortality rates by up to 70%. Screening can be done by Visual Acetate Inspection (VIA) or Papanicolau smear test (Papsmear), which is cervical cytology every 3-5 years [6]. A study showed that the sensitivity of VIA and Papsmear was almost the same at 93.33% and 93.8%. Papsemar's specificity was higher at 72.9% and VIA at 60%. While the accuracy of Papsmear is 77.3% compared to VIA which is 66.7%. However, VIA is an effective type of screening with appropriate sensitivity and specificity. The VIA method is the easiest, most efficient type of screening and can be applied to all health services [8]. VIA is simple, fesible and affordable point of care test, providing immediate results enabling diagnosis and/or treatment to be carried out in the same visit for screen possitive women [9]. The role of VIA in screening of cervical cancer is well established [10]. Visual techniques could help reducing cervical cancer mortality by

decreasing the number of visits between screening and treatment [11]. In Indonesia, visual inspection of the cervix with acetic acid in mainly used as a primary screening method, and a "see and treat" strategy is applied to women with a positive VIA result [12]. Cervical cancer screening "see and treat approach" is a method that is especially suitable for women in developing countries [13]. See and treat method ensures adherence to treatment soon after diagnosis, hence stemming the problem of defaults to appointment and referals [14]. Precancer screening aided by visual inspection with acetic acid (VIA) is an early diagnosis method used to detect the lesions that are high indicators of cancer in women [15]. VIA is an alternative to the above-mentioned methods which is carried out by appliying 5% acetic acid over the cervix and then the acetowhite lesions can be seen with naked eya (without tool). The Problem that arises is that observation by eye (withot tool) can lead to subjective results, thus affecting the accuracy of the exemination results [16].

The main program of the Indonesian Ministry of Health is to launch a health transformation with six pillars of health transformation. The first pillar is primary care transformation, the strengthening of preventive efforts in primary services including the expansion of early detection including cervical cancer screening [17]. The implementation of VIA in primary services such as Primary Health Care or midwife clinic has been carried out so far with the eyes alone without tools to capture images of the cervix. The results of the examination can be subjective. They can differ between officers depending on the sharpness of the midwife's eyes. Observation techniques with ordinary eyes can differ between examiners because they are influenced by eye acuity, midwife experience and training that has been attended [18]. Based on this fact, digital technology is needed to solve accuracy problems in cervical cancer screening examinations with VIA. Therefore, the need for better visualization during VIA has prompted researchers to innovate and to look out for strategies to improve the sensitivity of VIA [19]. Digital technology as a tool to improve the accuracy of cervical cancer screening is indispensable in the field of obstetrics [20]. Theoretical studies on the use of digitalization of medical devices, "Teropong Digital", as a digital technology are indeed needed in cervical cancer screening. Based on Force Field Analysis, "Teropong Digital" has several advantages compared to other digital tools that have the potential to be used in cervical cancer screening [21]. " Teropong Digital" envolve into "OptiLab NVeCam" The purpose of this study is the acquisition of "OptiLab NVeCam" which can improve the accuracy of VIA results. Accuracy can also be measured by the suitability between one's observations compared to observations by experts (gold standards). "OptiLab NVeCam" innovation can help improve the accuracy of cervical cancer screening results, especially in primary health care facilities in Indonesia.

MATERIAL AND METHOD

This research consists of two stages. The first stage aimed to evaluate differences in examination resuts before and after using " OptiLab NVeCam ". The study employed a quasi-experimental design with a one-group pre-post test. Seventy-one midwives from Yogyakarta and Central Java, Indonesia, who performed VIA services participated in the study. Initially, midwives conducted VIA examinations without tools (pre-test), followed by examinations using " OptiLab NVeCam " (post-test).

In the second stage, the research aimed to compare the VIA results of the midwives' examinations with those of validators. Validators were midwives who had undergone standardization as VIA trainers, possessing educational backgrounds in midwifery and over 20 years of work experience. The study was conducted in 2022 in the Special Region of Yogyakarta and Central Java, Indonesia. Data were analyzed using Wilcoxon tests to assess differences and validate the efficacy of " OptiLab NVeCam" in improving VIA examination accuracy.

RESULTS AND DISCUSSION

In this study, there were 71 midwives participating as respondents and one validator. The respondents were selected from the provinces of Yogyakarta and Central Java. Volunteers who were willing to undergo VIA testing were recruited for the study. These volunteers were women who agreed to participate voluntarily in the VIA examinations.

Characteristics of Respondents

Table 1. Characteristics of respondents

Characteristic	Frequency (n=71)	%
Age		
>35 years	56	79
20-35 years	15	21
Education Level		
Diploma III	4	6
Applied Bachelor	28	39
Midwifery Profession	35	49
Magister	4	6
Working Area		
Yogyakarta	41	58
Central Java	30	42
Workplace		
Midwife's Clinic	34	48
Primary Health Care	34	48
Hospital	3	4
Work Experience		
1-2 years	5	7
3-5 years	7	10
6-10 years	6	8
>10 years	53	75

The majority of respondents in the study were aged over 35, comprising 79% of the sample. The highest level of education among respondents was professional education in midwifery, accounting for 49%. Professional education typically represents an advanced program equivalent to undergraduate education or can be pursued by midwives who have completed academic programs such as undergraduate, master's, or doctoral degrees [22]. The statement suggests a correlation between higher levels of education and greater ease in receiving information and innovations, thereby increasing knowledge. Conversely, lower levels of education may impede access to and assimilation of knowledge. In an investigation conducted in Kuwait, education level emerged as the sole variable significantly linked to inadequate knowledge. This highlights the critical role education plays in shaping individuals' understanding and awareness, particularly in the context of receiving and benefiting from information and innovations [23].

Most midwives in the study primarily work in Yogyakarta, comprising 58% of the sample. It is noteworthy that an equal percentage of midwives, 48%, work in clinics and primary health care settings, which are considered first-level health care facilities. A smaller proportion of midwives have roles in hospitals. Additionally, midwives may practice independently in places other than clinics or primary health care settings, as well as in various health service facilities not specified as midwife clinics, primary health care centers, or hospitals [22]. The midwives involved in the research predominantly have over 10 years of

work experience, accounting for 75% of the sample. This extensive tenure is crucial as it correlates closely with the depth of experience gained in performing their duties. Experienced health workers are generally perceived as more adept at fulfilling their responsibilities. Over time, professionals refine their skills, adapt to various tasks, and become more proficient in their work environments. Given these factors, the midwife respondents in this study can be regarded as capable of interpreting screening results with greater accuracy. Their substantial work experience likely enhances their ability to handle and interpret data effectively, contributing to the reliability of the study's findings.

Distribution of pre test and post test results of VIA Examination

The VIA examinations were conducted in two stages: initially without tools (pre-test) and subsequently using " OptiLab NVeCam " (post-test). The following indicators were observed during the examinations: **Acetowhite** (This indicates areas of the cervix that turned white after the application of acetic acid, suggesting possible precancerous changes), **Color Change other than Acetowhite** (This includes any non-white color changes observed on the cervix after acetic acid application, which could indicate different stages of cervical abnormalities) and **Cervical Erosion** (The presence of erosion or ulcers on the cervix, which can vary in appearance and size).

Table 2. Distribution of pre test and post test results of VIA Examination

VIA Examination result	Pre Test (Without tools)		Post Test (OptiLab NVeCam)	
	n=71	%	n=71	%
Score 3 (3-indicator view)	5	7	7	9,9
Score 2 (2-indicator view)	7	9,9	6	8,5
Score 1 (1-indicator view)	24	33,8	27	38
Score 0 (no indicator of screening results appears)	35	49,3	31	43,7

The results of cervical cancer screening, conducted both without tools (visual inspection) and with the "OptiLab NVeCam" tool, revealed differences in the indicators observed during the examination. The screening results were categorized into scores based on the number of indicators present: **Score 3**: This score indicates the presence of all three indicators—acetowhite areas, discoloration other than acetowhite, and erosion. Observations without tools 7% and bbservations with "OptiLab NVeCam" 9.9%. The use of the "OptiLab NVeCam" showed a higher percentage (9.9%) of detecting all three indicators compared to observations without tools (7%). **Score 2**: This score indicates the presence of two out of the three indicators. There is no specific percentage given for observations without tools, but typically, it might be implied that it's less than 9.9%. **Score 1**: This score indicates the presence of only one indicator, typically the most common being acetowhite areas. The percentage of observations identifying at least one indicator (score 1) was higher when using "OptiLab NVeCam" (38%) compared to observations without tools. The use of "OptiLab NVeCam" in cervical cancer screening demonstrated an improvement in detecting multiple indicators associated with cervical abnormalities. It notably enhanced the identification of acetowhite areas, discoloration other than acetowhite, and erosion, leading to more comprehensive and accurate screening results compared to visual inspection alone.

Table 3. Differences in average results of VIA examination

VIA Examination Results	Mean	Mean Difference	p-value
Without tools (naked eye)	0,74		
		0,10	0,008
" OptiLab NVeCam"	0,84		

The average score of observation results for cervical cancer screening without tools was 0.74, whereas observations using " OptiLab NVeCam " achieved a higher average score of 0.84. Statistical analysis revealed a significant difference with a p-value of 0.008, indicating that the presence of "OptiLab NVeCam" had a notable impact on the observed indicators during cervical cancer screening. This statistical significance underscores that "OptiLab NVeCam" influenced the detection and observation of cervical cancer screening indicators. The higher average score in observations with the tool suggests improved accuracy and detection of cervical abnormalities such as acetowhite areas, discoloration other than acetowhite, and erosion. The findings highlight the efficacy of "OptiLab NVeCam" in enhancing the precision and reliability of cervical cancer screening results compared to visual inspection alone. This technological advancement proves beneficial in clinical practice, potentially leading to earlier detection and improved management of cervical health.

The introduction of "OptiLab NVeCam" in cervical cancer screening significantly influences the observed indicators compared to screening without tools. This device incorporates a camera and a lamp designed to capture detailed images of the cervix. The captured images are then displayed on a cellphone, laptop, or computer screen, enabling clearer interpretation of the screening results by healthcare providers. The design of "OptiLab NVeCam" enhances the examination process by providing clearer visual information, which contributes to more accurate observations of cervical abnormalities such as acetowhite areas, discoloration other than acetowhite, and erosion. This technological aid improves the reliability and effectiveness of cervical cancer screening compared to visual inspection alone. In Indonesia, visual inspection of the cervix with acetic acid (VIA) is widely utilized as a primary screening method. A "see and treat" strategy is often applied to women who receive a positive VIA result, enabling immediate intervention and management for those identified with precancerous or cancerous conditions. The integration of "OptiLab NVeCam" not only enhances the diagnostic capabilities during VIA examinations but also supports prompt decision-making in treatment and follow-up care, thereby potentially improving outcomes for women undergoing cervical cancer screening in Indonesia and similar settings. [12]. Cervical cancer screening "see and treat approach" is a method that is especially suitable for women in developing countries [13]. See and treat method ensures adherence to treatment soon after diagnosis, hence stemming the problem of defaults to appointment and referals [14] . Precancer screening aided by visual inspection with acetic acid (VIA) is an early diagnosis method used to detect the lesions that are high indicators of cancer in women [15]. VIA is an alternative to the above-mentioned methods which is carried out by appliying 5% acetic acid over the cervix and then the acetowhite lesions can be seen with naked eya (without tool) [16]. VIA is simple, fesible and affordable point of care test, providing immediate results enabling diagnosis and/or treatment to be carried out in the same visit for screen possitive women [9]. The role of VIA in screening of cervical cancer is well established [10]. Visual techniques could help reducing cervical cancer mortality by decreasing the number of visits between screening and treatment [11]. In this study a visual techniques used is "OptiLab NVeCam".

"OptiLab NVeCam" aims to facilitate easier interpretation of screening results for midwives. However, it's noted that observations without tools resulted in a higher percentage for scoring 2 indicators. Deviations from this distance could potentially bias the results if not properly adhered to during examinations. In standard visual inspection without tools, a 5% acetic acid is applied to the cervix followed by a 1-minute waiting period. The cervix is then examined for any abnormal changes under a 100-Watt incandescent light source. Post-application, "OptiLab NVeCam" is used to visualize the cervix. The difference in observation outcomes could be attributed to variations in camera positioning relative to the cervix during examinations. Ensuring midwives are trained to correctly use "OptiLab NVeCam" at the

specified focal length is critical for obtaining accurate screening results. This standardized approach helps mitigate biases and enhances the reliability of cervical cancer screening processes, ultimately improving diagnostic accuracy and patient care outcomes [24]. OptiLab NVeCam has been utilized in various studies, demonstrating its effectiveness in visualizing VIA examination results. This technology plays a crucial role in enhancing mothers' understanding and awareness of cervical cancer. By providing clear and detailed images of the cervix during VIA examinations, OptiLab NVeCam improves the educational experience for mothers. These visual aids help healthcare providers explain and illustrate any abnormalities detected, fostering a better understanding of cervical health and potential risks. Moreover, the visual documentation provided by OptiLab NVeCam enables healthcare professionals to engage in more informative discussions with mothers regarding prevention strategies, follow-up care, and the importance of regular screenings. This enhanced communication empowers mothers to make informed decisions about their health and encourages proactive measures against cervical cancer. Overall, the integration of OptiLab NVeCam in VIA examinations not only enhances diagnostic accuracy but also serves as an educational tool to increase mothers' knowledge and awareness about cervical cancer, promoting better health outcomes and early intervention strategies [25].

Comparison VIA Examination

This section presents a comparison of VIA examination results between respondents using "OptiLab NVeCam" and validator. The accuracy and appropriateness of the VIA examination results are illustrated in the table 4:

Table 4. Comparison VIA Examination Results

VIA Examination Results	Frequency (n=71)	%
Suitable	69	97,2
Not suitable	2	2,8

Accuracy can be assessed by comparing one's observations to those of experts (considered the gold standard). The findings of this study indicate that nearly all cervical cancer screening results using " OptiLab NVeCam" by midwives corresponded to the validated screening results by validators. The matching percentage of cervical cancer screening results reached 97.2%. Therefore, it can be concluded that the accuracy of "OptiLab NVeCam " in cervical cancer screening is high. "OptiLab NVeCam" proves effective in enhancing the precision of cervical cancer screening results using the VIA method [21]. The advantage of using OptiLab Nvecam is that it is able to display clearer images of the cervix so as to increase the accuracy of the examination results for making diagnoses, can be used for learning media and clearer documentation of examinnation results.

CONCLUSION

" OptiLab NVeCam" is an innovative medical device used for cervical cancer screening examinations. This tool has been proven to provide accurate results in VIA examinations. Previously, VIA examinations in primary health facilities relied solely on visual observation (without tools), leading to subjective results and a lack of clear documentation. The introduction of "OptiLab NVeCam" addresses these issues in VIA examinations, offering a solution for more accurate and documented screening outcomes.

ACKNOWLEDGEMENT

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