DOI: https://doi.org/10.53350/pjmhs2023172531

ORIGINAL ARTICLE

Accuracy of Cervical Intraepithelial Lesion Diagnosis by Visual Cervical Examination with Acetic Acid

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Abstract

Introduction: Using acetic acid to inspect the vaginal canal is a simple screening procedure done with the naked eye. During a speculum examination, the cervical transformation zone is painted with acetic acid 3% to 5% or vinegar. It is a simple, cost-effective screening tool that can be used in poor developing countries with high rates of invasive cervical cancer mortality because acetic acid coagulates nuclear proteins, resulting in white discoloration of the transformation zone in CIN and early invasive cancer.

Objective: This study aims to measure the effectiveness of a simple and economical screening test, visual inspection with acetic acid (VIA), for diagnosing cervical intraepithelial lesions in comparison to the gold standard of histopathology using a study population of women attending a gynecology outpatient department.

Study Design: The study used a cross-sectional design to validate the findings.

Study Area: This study was conducted in the Obstetrics & Gynecology Department, Women and Children Teaching Hospital, Dera Ismail Khan.

Study Duration: This study took place between November 2018 and April 2019.

Materials and Methods: The study included 414 women with abnormal vaginal bleeding. Under a good light source, a lubricated Cusco's speculum was introduced into the vagina to evaluate the cervix for gross abnormalities. A cotton swab was used to apply 3% acetic acid to the cervix and acetowhite changes were observed for one minute. Positive results were considered when distinct acetowhite areas were detected, while negative results were considered when light, faint, or doubtful aceto-white areas were detected.

Results: There was a range of age from 18 to 40 years in this study with a mean age of 30.772 years and a mean weight of 71.644 kilograms. For diagnosis of cervical intraepithelial lesions, acetic acid visual examination has shown a sensitivity of 84.38%, specificity of 97.11%, diagnostic accuracy of 95%, PPV of 84.38%, and NPV of 97.11% (p=0.000).

Practical implication: The purpose of this study is to compare the efficacy of a simple and inexpensive screening test, visual inspection with acetic acid (VIA), to the gold standard of histopathology in a study group of women attending a gynecological outpatient service. Cervical cancer is a leading cause of death among women in developing countries, where access to advanced diagnostic tools is limited. If VIA proves to be an effective screening tool, it could be widely implemented in low-resource settings to improve early detection and treatment of cervical cancer.

Conclusion: VIA is considered an appropriate screening alternative for a large population. In contrast to cytology-based programs, it is highly sensitive, low-cost, and yields immediate results.

Keywords: Cervical Cancer; Visual Inspection with Acetic Acid; Screening

INTRODUCTION

Cervical cancer is the most prevalent pelvic cancer and the fourth most frequent cancer among women worldwide, with 604,000 new cases and 342,000 deaths expected in 2020 and 2022 [1]. It is the second most common cancer among women after breast cancer occurred in low and middle-income countries, where approximately 90% of new cases and deaths worldwide occurred [2]. Cervical cancer is frequently discovered in its advanced stages in low- and middle-income nations due to poor awareness of the disease and limited access to preventative measures. Additionally, there are fewer treatment options available for cancerous lesions, which raises the mortality rate from cervical cancer [1, 3]. Cervical cancer is caused by the human papillomavirus (HPV) and can be prevented through vaccination and regular screening. Early detection and treatment can significantly improve survival rates. Seventy (70%) cervical cancers and pre-cancerous cervical lesions are attributed to HPV type 16 and18. There are 15–20years time gap between the peak HPV infection and the peak of cancer incidence but could happen faster & earlier (5–10years) in those with HIV/AIDS. HPV vaccine for girls at age of 9–14 years, screening women starting at 30years with early treatment of the precancer would prevent the invasive cancer [4].

There are different histologic types of cervical cancer. Even if the world figures show low number, in a single report in Ethiopia squamous cell carcinoma of the cervix was 90% of all cases and adenocarcinoma account only for 3.85% of cases [5]. Cervical cancer is diagnosed histologically; surgery, chemotherapy and radiotherapy are the possible modes of treatment based on stage of the disease, patient status, & availability of the modalities [4].

There are several risk factors associated with cervical cancer. Age of the woman (40–49 years),multiparity more than two times, starting sexual intercourse before the age of 20 years, having multiple sexual partners, HIV infection, cigarette smoking, illiteracy, low socioeconomic status,& prolonged use of combined oral contraceptive pills [6,7].

Implementing the multiple levels of prevention (vaccination, screening, and treating the precancers) and early treatment of the invasive lesion are very important for prevention [1]. Vaccination against the human papillomavirus (HPV) has been shown to be highly effective in preventing cervical cancer, and regular screening can detect precancerous lesions early on, allowing for prompt treatment and prevention of progression to invasive cancer. However, it is important to also prioritize access to affordable and timely treatment for those who do develop invasive cervical cancer. This approach has been proven to significantly reduce the incidence and mortality rates of various types of cancer, including cervical cancer. Therefore, it is crucial for healthcare systems to prioritize and invest in these preventive measures. In addition, educating the public about the importance of these prevention methods and encouraging regular check-ups can also significantly reduce the incidence of invasive cancers.

Pap smear screening has markedly reduced mortality from cervical cancer in developed countries [2]. However, despite the effectiveness of Pap smear screening, many women in developing countries still lack access to this life-saving test. Furthermore, in low-resource settings, VIA is seen as an appealing alternative to cytology-based screening. It is a straightforward and cost-effective procedure that is acceptable to both women and providers. VIA has been found to have a high sensitivity and specificity in

detecting cervical cancer and precancerous lesions. However, it requires proper training and quality control measures to ensure accurate results. VIA is a simple and quick procedure that involves the application of acetic acid to the cervix, which helps to identify precancerous lesions. It has been found to be effective in reducing cervical cancer mortality rates in areas where access to screening and treatment is limited.

Rationale: Visual inspection with acetic acid (VIA) is a low-cost, low-tech technique that has been proven to be a useful diagnostic tool in developing nations and remote regions with difficult access to healthcare facilities. By contrasting the results of VIA with those of a Pap test and human papillomavirus (HPV) testing, the survey will determine the accuracy of VIA and its capacity to detect cervical pre-cancerous lesions. This will shed light on how well VIA works as a screening tool for women in rural and remote areas who might have trouble getting medical care. A subset of women will undergo both a Pap test and an HPV test, and the outcomes will be compared to help prove the validity of the data from the survey.

Objective: The purpose of this study is to compare the efficacy of a simple and inexpensive screening test, visual inspection with acetic acid (VIA), to the gold standard of histopathology in a study group of women attending a gynecological outpatient service. Cervical cancer is a leading cause of death among women in developing countries, where access to advanced diagnostic tools is limited. If VIA proves to be an effective screening tool, it could be widely implemented in low-resource settings to improve early detection and treatment of cervical cancer.

MATERIAL AND METHODS

The study was caried out to measure the effectiveness of visual inspection with acetic acid (VIA) for diagnosing cervical intraepithelial lesions in patients with abnormal vaginal bleeding in the Department of Obstetrics & Gynecology, Women and children teaching Hospital, Dera Ismail Khan. For this purpose, a sample of 414 patients were taken by non-probability consecutive sampling technique using sensitivity and specificity calculator. The patients were included in the study based on age, marital status, history of pelvic pain and abnormal vaginal bleeding. Those patients who had undergone hysterectomy, Pelvic inflammatory disease, and undergone treatment for cervical intraepithelial neoplasia or cervical cancer were excluded. Demographic information (age and weight) about the patients was collected. Informed consent was obtained from each patient, ensuring confidentiality and that there was no risk to them. The procedure was performed by gynecology residents of 3rd year and above who were well trained in VIA. To assess the cervix for gross abnormalities, lubricated Cusco's speculums were inserted under good light in lithotomy position. A cotton swab was used to apply 3% acetic acid to the cervix and observe for changes in acetowhite. Positive results were obtained if any distinct acetowhite areas were observed, while negative results were obtained if there were no light, faint, or doubtful acetowhite areas. All women underwent a colposcopy-directed biopsy. The tissues were sent for histopathological assessment. Performa records VIA (positive/negative) and histopathology (positive/negative) results, as well as diagnostic accuracy based on operational definitions.

Data Analysis: Data was entered and analyzed through SPSS version 22. Mean ± standard deviation was calculated for all quantitative variables like age and weight. For qualitative variable like age groups, frequency (%) was used. Sensitivity, specificity, Positive predictive value, Negative predictive value and diagnostic accuracy for visual inspection under acetic acid against histopathology was calculated by using 2 X 2 model.

		Histopathology as Gold Standard	
		+ve	-ve
Visual Inspection under Acetic Acid	+ve	True Positive (TP) (a)	False Positive (FP) (b)
	-ve	False Negative (FN) (c)	True Negative (TN) (d)

$$\text{Sensitivity (True Postive Rate)} = \frac{\text{TP}}{\text{TP} + \text{FN}}$$

$$\text{Specificity (True Negative Rate)} = \frac{\text{TN}}{\text{FP} + \text{TN}}$$

$$\text{Positive Predicted Value} = \frac{\text{TP}}{\text{TP} + \text{FP}}$$

$$\text{Negative Predicted Value} = \frac{\text{TN}}{\text{TN} + \text{FN}}$$

$$\text{Accuracy} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{FP} + \text{FN} + \text{TN}}$$

Effect modifiers like age and weight were controlled by stratification. Post stratification using diagnostic accuracy was calculated, p ≤0.05 was considered statistically significant.

RESULTS

A sample of 414 patients with abnormal vaginal bleeding were considered for the study with age ranging from 18 to 40 years. The mean age and weight of these patients are provided in table 1. The age was further divided into groups of 18 to 30 and 31 to 40 years. The age group from 18 to 30 years contained 231 (58.8%) patients while age group from 31 to 40 years consisted of 183 (44.2%) patients as shown in table 2.

Table 1: Mean ± SD of age and weight.

Demographic Variables	Mean + S.D
Age (Years)	30.772 ± 4.02
Weight (Kg)	71.644 ± 6.01
Sample size (n)	414

Table 2: Frequency and %age of patients according to age group

Age group (years)	No. of Patients	%age
18-30	231	55.8%
31-40	183	44.2%
Total	414	100%

Table 1 provides study's sample age ranging from 18 to 40 years with mean age of 30.772+4.02 years and mean weight of 71.644+6.01. Table 2 shows the Visual inspection of cervix with acetic acid diagnose 6.8% and histopathology diagnose 6.5% patients with cervical intraepithelial lesion. In Table-IV and V, visual inspection of the cervix with acetic acid showed a sensitivity of 84.38%, and specificity of 97.11%, respectively, as well as diagnostic accuracy of 95%, positive predictive value (PPV) of 84.38%, and negative predictive value (NPV) of 97.11% for diagnosis of cervical intraepithelial lesion. A comparison between visual inspections of the cervix with acetic acid versus histopathology for diagnosis of cervical intraepithelial lesions is shown in Table-Vi, VII, VIII, and IX. In Tables-Vi, VII, VIII, and IX, we show the stratification of cervical intraepithelial lesions according to age and weight.

On examination of patients for cervical intraepithelial lesions, 28 (6.7%) patients had lesion on visual inspection of cervix with acetic acid while 386 (93.3%) patients had no lesion. The biopsy of these patients was sent to laboratory for histopathology testing for diagnosis. The results shown in table 3 indicated that 24 out of 28 patients who had been diagnosed with cervical lesions by visual inspection, also had cervical cancer by histopathology report. Whereas 4 patients were diagnosed as having lesions by visual inspection of cervix with acetic acid but found negative by histopathology test. While the rest of 387 patients were not diagnosed as having cervical cancer through histopathology test.

Table 3 provides the comparative results of Visual inspection with acetic acid (VIA) and Histopathology test. The two tests were performed on a sample of 414 patients. Out of 414 patients, 28 (6.7%) patients had lesions and 386 (93.3%) patients had no lesion with VIA. Out of 28 patients with lesions, 24 patients were found to have cervical cancer by histopathology testing while 4 patients were found negative under histopathology test. The remaining 386 patients having no lesions on VIA out of which 3

were found positive while 383 were found negative by histopathology testing.

Table 3: Comparison of visual inspection with acetic acid versus histopathology for diagnosis of cervical intraepithelial lesion

Visual inspection with acetic acid (VIA)	Histopathology (Gold Standard)		Total
	Yes	No	
Yes	24 (TP)	4 (FP)	28
No	3 (FN)	383 (TN)	386
Total	27	387	414

Chi square = 308.93, P value = 0.000
TP = True positive; FP = False positive; FN = False negative; TN = True negative

Table 4: Sensitivity, Specificity, Diagnostic Accuracy, PPV and NPV of visual inspection with acetic acid for diagnosis of cervical intraepithelial lesion

	Formula	Result
Sensitivity	$\frac{TP}{TP+FN}\times 100 = \frac{24}{(24+3)}\times 100$	88.88 %
Specificity	$\frac{TN}{FP+TN} = \frac{383}{(4+383)}\times 100$	98.96 %
Positive Predicted Value	$\frac{TP}{TP+FP}\times 100 == \frac{24}{24+4}\times 100$	85.71 %
Negative Predicted Value	$\frac{TN}{TN+FN}X100 = = \frac{383}{383+3}X100$	99.22 %
Accuracy	$\frac{TP+TN}{TP+FP+FN+TN}X100 = \frac{24+383}{24+4+3+383}$	98.30 %

DISCUSSION

Lung and breast cancer cause millions of early deaths in women, but cervical cancer is the most hazardous since it is exclusively detected in females. The reproductive system of a woman consists of the cervix, uterus, vagina, and ovaries. Cervical cancer develops at the vaginal entrance to the uterus [8]. Cervical cancer is commonly caused by sexually transmitted human papillomavirus (HPV) and is more common in poor and middle-income nations [9]. The detection of cervical cancer relies heavily on screening. An ideal screening test is one that is least incursive, simple to do, agreeable to the patient, inexpensive, and successful in diagnosing the disease process in its early incursive stage, when treatment is simple. Cervical cancer is the most frequent type of cancer in women globally. It is the fourth most frequent cancer in women and the second most prevalent cancer in developing nations, accounting for around 7.9% of all female cancers [10]. Cervical cancer is the fourth most frequent cancer in the world, accounting for around 7.9% of all female malignancies. 90% of which happens in developing nations [10, 11] cervical carcinoma, unlike many other cancers, is avoidable by numerous screening tests that detect and treat premalignant stages. Another popular method used in the developing countries is VIA application. In various see-and-treat programs, females with cervical lesions, which are identified by VIA, are immediately treated with cautery or cryotherapy. The current study was conducted at the Department of Obstetrics and Gynecology, Women and Children Teaching Hospital, Dera Ismail Khan, to assess the efficiency of visual inspection with acetic acid (VIA) for identifying cervical intraepithelial lesions in patients with abnormal vaginal bleeding. A sample of 414 patients was drawn for this purpose using the non-probability sequential sampling approach and a sensitivity and specificity calculator. The research included participants based on their age, marital status, a history of pelvic discomfort, and irregular vaginal bleeding. Patients who had had a hysterectomy, pelvic inflammatory illness, or therapy for cervical intraepithelial neoplasia or cervical cancer were excluded. The patients' demographic information (age and weight) was gathered. Each patient provided informed permission, ensuring anonymity and assuring that they were not at danger. The surgery was carried out by gynecology residents in their third and fourth years who had received extensive training in VIA. Lubricated Cusco's speculums were inserted under adequate light in the lithotomy position to check the cervix for gross abnormalities. Using a cotton swab, 3% acetic acid was applied to the cervix and acetowhite levels were measured. Positive findings were achieved if any definite acetowhite spots were visible, but negative results were obtained if no light, dim, or questionable acetowhite patches were spotted. All the ladies had a colposcopy-guided biopsy. The tissues were transported to be histopathologically examined. VIA (positive/negative) and histology (positive/negative) findings, as well as diagnostic accuracy based on operational criteria, are recorded by Performa. Our findings indicate that VIA can successfully screen the majority of instances of cervical pre-cancer and malignancy. In our study, 28 (6.8%) of the women got good VIA scores, whereas 386 (93.2%) had negative results. [11] discovered that positive findings were obtained in 9.08% of instances and negative results were obtained in 90.92% of cases. In another study, [12] found that positive cases accounted for 13% of all instances, whereas negative cases accounted for 87%. Using VIA, [9] discovered that 14.9% of instances were positive and 85.1% were negative. Because of the lack of established criteria for positive outcomes, this significant range in rate is related to the varied criteria utilized in different investigations. In comparison to most prior research, VIA was shown to be very sensitive and specific in the current investigation. In my investigation, acetic acid visual examination of the cervix demonstrated sensitivity of 88.88%, specificity of 98.96%, a positive predictive value (PPV) of 85.71%, a negative predictive value (NPV) of 92.22%, and accuracy of 98.30% for the identification of a cervical intraepithelial lesion. In a research by [9], the sensitivity was 66.7%, the specificity was 91%, the positive predictive value was 46.1%, the negative predictive value was 95.9%, and the accuracy was 88.5%. [11] Verma A. et al. [2] discovered sensitivity of 74.12%, specificity of 92%, PPV of 20%, and NPV of 99.1% in a comparable test.

CONCLUSION

It is concluded that VIA is a suitable primary screening alternative for a large population. Its high sensitivity, low costs and immediate results overcome the problem of loss-to-follow-up that occurs in cytology-based program. As in Pakistan, no systemic screening schedule has ever been planned and this screening method will be very helpful in early detection and treatment of cervical pre-cancerous lesion and reduced maternal mortality and morbidity.

REFERENCES

1. Gebresilasie SF, Zegeye A. Accuracy of VIA for the diagnosis of cervical cancer and associated factors among women attending cervical cancer screening at Hawassa university comprehensive specialized hospital, southern Ethiopia: Institutional based cross sectional study. Annals of Medicine and Surgery. 2022;84:104873.
2. Huy NVQ, Tram NVQ, Thuan DC, Vinh TQ, Thanh CN, Chuang L. The value of visual inspection with acetic acid and Pap smear in cervical cancer screening program in low resource settings–A population-based study. Gynecologic oncology reports. 2018;24:18-20.
3. Shrestha AD, Neupane D, Vedsted P, Kallestrup P. Cervical cancer prevalence, incidence and mortality in low and middle income countries: a systematic review. Asian Pacific journal of cancer prevention: APJCP. 2018;19(2):319.
4. Gabutti G, d'Anchera E, De Motoli F, Savio M, Stefanati A. Human papilloma virus vaccination: Focus on the italian situation. Vaccines. 2021;9(12):1374.
5. Hailu HE, Mondul AM, Rozek LS, Geleta T. Descriptive Epidemiology of breast and gynecological cancers among patients attending Saint Paul's Hospital Millennium Medical College, Ethiopia. PloS one. 2020;15(3):e0230625.
6. Putri AR, Khaerunnisa S, Yuliati I. Cervical cancer risk factors association in patients at the gynecologic-oncology clinic of Dr. Soetomo Hospital Surabaya. Indonesian Journal of Cancer. 2019;13(4):104-9.
7. Sharma P, Pattanshetty SM. A study on risk factors of cervical cancer among patients attending a tertiary care hospital: A case-control study. Clinical Epidemiology and Global Health. 2018;6(2):83-7.
8. Tehranian A, Ghahghaei-Nezamabadi A, Motiei Langeroudi M, Aghajani R. Comparison of Visual Inspection Methods Using Either Acetic Acid Solution or Lugol's Iodine Solution with Colposcopy in

Screening of Cervical Cancer: A Cross Sectional Study. Journal of Obstetrics, Gynecology and Cancer Research. 2022;8(1):53-6.
9. El Sokkary HHAH. Comparison between Pap smear and visual inspection with acetic acid in screening of premalignant cervical intraepithelial lesion and subclinical early cancer cervix. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2017;6(1):54-60.
10. Honarvar Z, Vaziri Nasab Kermani S, Karami Robati F. Comparison of sensitivity and specificity of Papanicolaou test, visual inspection of cervix with acetic acid (VIA) and colposcopy in cervical cancer screening in patients with secondary immunodeficiency. Indian Journal of Gynecologic Oncology. 2021;19:1-6.
11. Verma A, Kashyap M, Gupta A, Kaur D. Evaluation of Visual Inspection after Acetic Acid/Cervicography as an Alternative to Colposcopy for Detection of Cervical Intraepithelial Neoplasia. Journal of South Asian Federation of Obstetrics and Gynaecology. 2022;14(4):435-9.
12. AieshaKhatun N, Gudi SN. A Comparative Study of Visual Inspection with Acetic Acid and Papsmear in Screening Cervical Intraepithelial Neoplasia. Sch Int J Obstet Gynec. 2021;4(6):241-9.