

Diagnostic Accuracy of Visual Inspection with Acetic Acid in Diagnosing Cervical Cancer, Taking Histopathology as Gold Standard

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Abstract

Objective: To compare the diagnostic accuracy of visual inspection with acetic acid (VIA) in screening cervical cancer, taking histopathology as the gold standard.

Methodology: This analytical, cross-sectional study was performed at the Obstetrics and Gynecology Department of Nishtar Hospital, Multan, Pakistan, during June 2025 to November 2025. A total of 120 women, aged 45–70 years, with symptoms suggestive of cervical malignancy were analyzed through consecutive sampling. VIA was performed using 5% acetic acid under a 100-watt halogen light. Colposcopy-guided cervical biopsy was taken among females, and histopathology served as the gold standard. Data were analyzed employing IBM-SPSS Statistics, version 26.0. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy of VIA were calculated.

Results: Among 120 women, the mean age was 52.0±5.6 years, and median parity 3.0 (2.0–4.0). Postmenopausal status was positive among 90 (75.0%) females, and 100 (83.3%) were residing in rural areas of residence. VIA, and histopathology were positive in 98 (81.7%), and 97 (80.8%) women, respectively. VIA showed sensitivity, specificity, PPV, NPV, and accuracy of 96.9%, 82.6%, 95.9%, 86.4%, and 94.2%, respectively. Stratified analysis across subgroups revealed sensitivity ranging from 91.7%–100%, and accuracy between 88.6%–96.5%.

Conclusion: The VIA demonstrated high sensitivity, specificity, and diagnostic accuracy when compared with histopathology in detecting cervical cancer among symptomatic women.

Keywords: Acetic acid, cervical cancer, colposcopy, histopathology, parity

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Introduction

Globally, cervical cancer is the 4th most prevalent cancer among females affecting approximately 660,000 new cases and 350,000 deaths annually.¹ Among developing countries, cervical cancer is considered to be the most frequent cause of cancer related mortality among females.²⁻⁴ In the last few decades, especially in developed countries, lots of advancements have been seen for making cervical cancer diagnosis timely and reliable, yet, so much is desired among developing nations.

Pap smear is taken as the most common and reliable

screening tool for diagnosing cervical cancer.⁵ Although, Pap smear screening accompany many benefits, but its affordability, skills needed to conduct the test, and multistage nature of the procedure potentially make it challenging to utilize in resource-constraint healthcare settings.⁶ Visual inspection with acetic acid (VIA) is another common approach that is utilized as an alternate method for a Pap smear as its results are available without delays and laboratory setting.⁷ In a study, 154 sexually active and symptomatic women aged 20-50 years were examined, and histopathology confirmed cervical carcinoma was

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noted in 49.4% of cases. For diagnosing cervical cancer, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy of VIA smear were 85.5%, 88.5%, 87.8%, 86.3%, and 87.0%, respectively.⁸ Another study on 200 women (30-50 years) presenting to the gynecology outpatient department for routine check-ups revealed that the sensitivity and the specificity of VIA were 95.2% and 44.2%, respectively, keeping histopathology as the gold standard.⁹

Existing literature presents wide variations in the reported diagnostic accuracy of VIA in detecting cervical cancer, so, this disparity makes it difficult to conclude whether this method should be used as a screening or not in resource limited settings like Nishtar Hospital, Multan, Pakistan. This study was planned to compare the diagnostic utility of VIA in screening cervical cancer, taking histopathology as the gold standard.

Methodology

This analytical, cross-sectional study was performed at the Department of Obstetrics and Gynecology, Nishtar Hospital, Multan, Pakistan, from June 2025 to November 2025 after obtaining approval from the Institutional Review Board (Ref. No. 8993/NMU, dated: 12-05-2025), and College of Physicians and Surgeons Pakistan (No. CPSP/ERU/OBG-2022-099-11807, dated: March 13th, 2024). A sample size of 120 women was calculated through the OpenEpi sample size calculator, using an anticipated cervical cancer incidence of 49.4%,⁸ sensitivity of 85.5%, and specificity 88.5%, with a 95% confidence level and an absolute precision of 9%. Non probability consecutive sampling was employed. Women aged 45 to 70 years who presented with symptoms suggestive of cervical malignancy such as abnormal intermenstrual bleeding, postcoital bleeding, or pelvic pain lasting for at least three months were included after obtaining written informed consent. Pregnant women confirmed on ultrasonography and those with a previous hysterectomy or prior treatment for cervical precancer or cancer were excluded. Symptom duration was recorded using a structured questionnaire with defined time anchors, and was corroborated with clinical records when available to reduce recall bias.

At enrollment, age, gravida, parity, menstrual status, and area of residence were noted for all females. All examinations were performed by a consultant gynecologist with at least 5-year experience in colposcopy and VIA screening. VIA was performed in a

standardized manner using sterile cotton swabs soaked in five percent acetic acid, which were applied to the cervix for about one minute. The cervix was then examined under a halogen light source of one hundred watts fixed on a wall mounted colposcopy stand to ensure uniform brightness and clear visualization. A VIA test was interpreted as positive when sharp and distinct acetowhite areas with well defined margins reaching the squamocolumnar junction were seen. To control interobserver variation, the test was read independently by two gynecologists, and in case of any disagreement, the opinion of a senior consultant was considered final. Each woman subsequently underwent a colposcopy guided cervical biopsy during the same visit to avoid variation between the screening and confirmatory steps. The biopsy was performed using a standardized punch biopsy instrument manufactured by Kaiser Surgical Company, Germany. The tissue samples were immediately placed in 10% formalin and sent to the Institutional Department of Pathology for evaluation. All histopathological examinations were performed by a single consultant pathologist (>5 years' experience) who was not having information about VIA results. Slides were examined under a Leica DM500 microscope, and reports were categorized according to the Bethesda System as malignant, which included low grade and high grade squamous intraepithelial lesions and invasive carcinoma, or non malignant, which included chronic cervicitis, atrophy, or reactive epithelial changes. For internal quality assurance, 10% of the histological samples were cross checked by another senior pathologist who was unaware of the VIA findings.

Statistical analysis was performed using IBM-SPSS Statistics, version 26.0. Continuous variables such as age and parity were expressed as median with interquartile range (IQR) after assessing normality using the Shapiro Wilk test, while categorical variables were presented as frequencies and percentages. Sensitivity, specificity, PPV, NPV, and overall diagnostic accuracy of VIA were calculated using histopathology as the gold standard. Diagnostic performance was further evaluated across different strata including age group, parity, menstrual status, and area of residence for sub-groups to control effect modification on the diagnostic accuracy.

Results

In a total of 120 women, the mean age was 52.0±5.6 years, ranging between 37.0 to 58.0 years. The median parity status was 3.0 (IQR 2.0-4.0), ranging between 0

to 6. Residential affiliation was rural among 100 (83.3%) women. Table-I is showing details about the characteristics of females studied.

Table I: Characteristics of females studied. (n=120)

Characteristics	Frequency (%)
Age (years)	<50 35 (29.2)
	≥50 85 (70.8)
Parity	0-2 44 (36.7)
	>2 76 (63.3)
Menstrual status	Pre-menopause 30 (25.0)
	Post-menopause 90 (75.0)
Residence	Rural 98 (81.7)
	Urban 22 (18.3)
VIA	Positive 98 (81.7%)
	Negative 22 (18.3%)
Histopathology	Positive 97 (80.8%)
	Negative 23 (19.2%)

Using histopathology as the reference standard, VIA demonstrated a sensitivity of 96.9%, specificity 82.6%, PPV 95.9%, NPV 86.4%, and an overall diagnostic accuracy of 94.2% (Figure-I). Stratified analysis showing performance of VIA with reference to histopathology findings is shown in table-II.

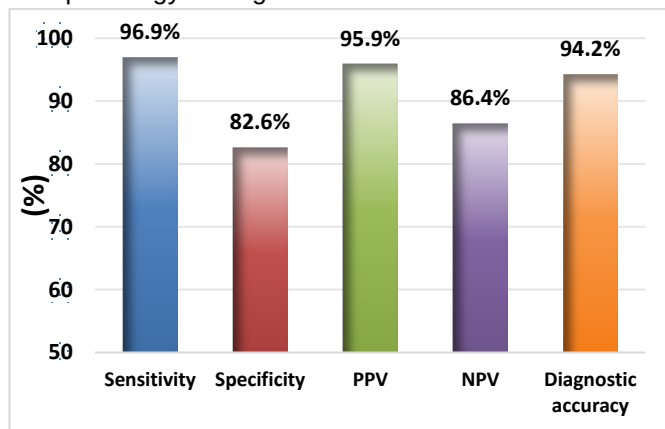


Figure-I: Diagnostic performance of VIA (n=120)

Discussion

This study indicates that VIA provides a strong

diagnostic performance in the detection of cervical lesions compared with histopathology as the reference standard with sensitivity 96.9%, specificity 82.6%, PPV 95.9%, NPV 86.4%, and overall diagnostic accuracy 94.2%. These findings support VIA use as a practical and reliable screening tool in low resource settings. The sensitivity observed in this study is consistent with the results reported by Aslam and colleagues,¹⁰ who found VIA sensitivity at 97.7%, and specificity 84.3% when validated against cervical biopsy as the gold standard in a cohort of 476 women. David and associates,¹¹ also documented VIA to have demonstrated sensitivity of 94.7%, and specificity 88.0%, with accuracy of 93.2%. These findings highlight the effectiveness of VIA in identifying true positive (TP) cases, thereby reducing the potential missed opportunities for early intervention. A large cohort of 500 women from Karachi,¹² found VIA sensitivity as 93.5%, specificity 95.8%, and diagnostic accuracy as 95.6%. Some others have also found a slightly lower sensitivity (82.6%), and specificity (83.2%) of VIA in their analysis.¹³ The reduced sensitivity, and specificity in some studies could be attributed to the inclusion of relatively younger females (20 to 50 years), and possible operator variability, whereas this study remained focused on a more homogeneous population of symptomatic females, and maintained strict procedural and operational uniformities.¹⁴

The present study also demonstrated a PPV of 95.9%, indicating that most women testing positive by VIA were confirmed to have disease on biopsy. This PPV was slightly higher than the 83.3% reported by Yasmin and coworkers,¹³ and the 38.2% reported by Aslam et al.¹⁰ The variation may reflect the higher pre-test probability of disease in the present cohort since all participants were symptomatic and referred for evaluation of possible cervical malignancy, thereby increasing the yield of TP results.

The high diagnostic accuracy of VIA in this study also

Table II: Diagnostic performance of VIA across clinical and demographic subgroups, taking histopathology as the gold standard. (n=120)

Characteristics	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Diagnostic accuracy (%)
Age (years)	<50 91.7	81.8	91.7	81.8	88.6
	≥50 98.6	83.3	97.3	90.9	96.5
Parity	0-2 100	86.7	93.5	100	95.5
	>2 95.6	75.0	97.0	66.7	93.4
Menstrual status	Pre-menopause 97.4	84.6	97.4	84.6	95.6
	Post-menopause 95.0	80.0	90.5	88.9	90.0
Residence	Rural 97.5	83.3	96.3	88.2	94.9
	Urban 94.1	80.0	94.1	80.0	90.9

corresponds with findings by Gupta and associates,¹⁵ who observed an accuracy of 97.7% in their comparative analysis of VIA and histopathology in 265 women. Both studies demonstrated that VIA could be nearly equivalent to histopathology in diagnostic value when performed by trained examiners under standardized illumination. The current findings are also compatible with the results of a large-scale meta-analysis reporting pooled VIA sensitivity of 80%, and specificity of 92%.¹⁶

When comparing the findings with regional studies, Naz and colleagues at Jinnah Postgraduate Medical Centre, Karachi,¹⁷ reported a 72.8% positive agreement between VIA and Pap smear in 217 women, while another study from Lahore,¹⁸ showed 22% VIA positivity and 10.8 percent Pap smear abnormality, with VIA demonstrating higher detection rates. Poomtavorn and Suwannarurk in Thailand,¹⁹ found VIA sensitivity as 59.4%, and specificity 76.2% among females with atypical squamous cells and low-grade squamous intraepithelial lesions. Their lower sensitivity could be related to the inclusion of pre-selected cytologically abnormal females and a relatively higher diagnostic threshold for positive VIA interpretations. This study maintained strict inclusion criteria and objective assessment, which likely improved the precision of VIA outcomes.

VIA provides a rapid, inexpensive, and feasible screening method that could be conducted at the bedside without sophisticated equipments.^{20,21} In resource-constraint settings such as Pakistan where cytology and HPV DNA testing are not widely available, VIA-based screening may facilitate timely detection and treatment of these cases, which could ultimately results in related morbidity and mortality.^{22,23}

This study had few limitations including the inclusion of only symptomatic women attending a tertiary care hospital which could have introduced a higher disease prevalence than the general population, leading to overestimation of predictive values. The use of consecutive sampling may have introduced selection bias. The sample size, though adequate for preliminary validation, may have limited subgroup analysis, which should be explored further in multicentric studies with larger cohorts. The interpretation of VIA remains inherently subjective and operator-dependent.

Conclusion

The VIA demonstrated high sensitivity, specificity, and diagnostic accuracy when compared with

histopathology in detecting cervical cancer among symptomatic women. The findings affirm that VIA is a reliable, low-cost, and easily implementable screening tool for cervical cancer, particularly valuable in low-resource settings.

References

1. World Health Organization. Cervical Cancer. Accessed on 18th December 2025. Available from: <https://www.who.int/news-room/fact-sheets/detail/cervical-cancer>
2. Niyodusenga A, Musoni E, Niyonsaba S. Comparative study of Pap smear test and VIA test in cervical carcinoma screening among women aged over 20 years. *Rwanda J Med Health Sci*. 2020;3(1):21-29. doi: 10.4314/rjmhs.v3i1.4
3. Ferreira da Silva I, Ferreira da Silva I, Koifman RJ. Cervical Cancer Treatment Delays and Associated Factors in a Cohort of Women from a Developing Country. *J Glob Oncol*. 2019;5:1-11. doi: 10.1200/JGO.18.00199
4. Zhang S, Xu H, Zhang L, Qiao Y. Cervical cancer: Epidemiology, risk factors and screening. *Chin J Cancer Res*. 2020;32(6):720-728. doi: 10.21147/j.issn.1000-9604.2020.06.05
5. Mumtaz PV, Kanphade RD. Supervised classification approach for cervical cancer detection using Pap smear images. *Int J Med Eng Inform*. 2022;14(4):358-368. doi: 10.1504/IJMEI.2022.123930
6. Win KP, Kitjaidure Y, Hamamoto K, Aung TM. Computer-assisted screening for cervical cancer using digital image processing of pap smear images. *Appl Sci*. 2020;10(5):1800. doi: 10.3390/app10051800
7. Sinha P, Srivastava P, Srivastava A. Comparison of Visual Inspection with Acetic Acid and the Pap Smear for Cervical Cancer Screening. *Acta Cytol*. 2018;62(1):34-38. doi:10.1159/000484036
8. Adnan Z, Khan AA, Nayyar S, Nayyar A, Anwar Z, Ahsan S. Diagnostic accuracy of visual inspection with acetic acid (VIA) and Pap smear in diagnosing cervical cancer, taking histopathology as gold standard. *J Soc Obstet Gynaecol Pak*. 2021;11(1):36-40. Available from: <https://jsogp.net/index.php/jsogp/article/view/446>
9. Manisha S, Bagde N, Shrivastava D. Visual inspection of cervix with acetic acid: An alternative to cytology and colposcopy in early screening of cervical cancer in low-resource setup. *J Datta Meghe Inst Med Sci Univ*. 2017;12(1):32-34. doi: 10.4103/jdmimsu.jdmimsu_19_17
10. Aslam S, Wasim AZ, Javed L, Wasim T. Visual inspection with acetic acid-an acceptable option in screening of cervical cancer. *Ann King Edward Med Uni*. 2018;24(S):879-883. doi: 10.21649/akemu.v24iS.2574
11. David J, Joshi V, Jebin Aaron D, Baghel P. A Comparative Analysis of Visual Inspection With Acetic Acid, Cervical Cytology, and Histopathology in the Screening and Early Detection of Premalignant and Malignant Lesions of the Cervix. *Cureus*. 2022;14(9):e29762. doi: 10.7759/cureus.29762
12. Khan M, Sultana SS, Jabeen N, Arain U, Khans S. Visual inspection of cervix with acetic acid: a good alternative to pap smear for cervical cancer screening in resource-limited setting. *J Pak Med Assoc*. 2015 Feb;65(2):192-195. Available from: <https://pubmed.ncbi.nlm.nih.gov/25842557/>
13. Yasmin S, Munir T, Javaid A, Yasin KF, Hassan J. Comparison of diagnostic accuracy of papanicolaou (PAP) Smear and visual

- inspection using acetic acid (VIA) in screening of cervical carcinoma, taking biopsy as gold standard. *Professional Med J*. 2020; 27(4):863-869. doi: 10.29309/TPMJ/2020.27.04.34
14. Macios A, Nowakowski A. False Negative Results in Cervical Cancer Screening-Risks, Reasons and Implications for Clinical Practice and Public Health. *Diagnostics (Basel)*. 2022;12(6):1508. doi: 10.3390/diagnostics12061508
 15. Gupta J, Joshi V, Meena A, Yadav N, Mittal A. Comparison of diagnostic efficiency of visual inspection of cervix with acetic acid and histopathological evaluation. *Res J Med Sci*. 2024;18(10):604-608, doi: 10.36478/makrjms.2024.9.604.608
 16. Sauvaget C, Fayette JM, Muwonge R, Wesley R, Sankaranarayanan R. Accuracy of visual inspection with acetic acid for cervical cancer screening. *Int J Gynaecol Obstet*. 2011;113(1):14-24. doi: 10.1016/j.ijgo.2010.10.012
 17. Naz U, Naseeb S, Shuja S. Concordance between visual inspection with acetic acid test and pap smear in detection of cervical cancer. *J Surg Pak (Int)*. 2016;21(1):18-22. Available from: [https://old.jsp.org.pk/Issues/JSP%2021%20\(1\)%20January-March%20%202016%20PDF/Shazia%20Naseeb%20OA.pdf](https://old.jsp.org.pk/Issues/JSP%2021%20(1)%20January-March%20%202016%20PDF/Shazia%20Naseeb%20OA.pdf)
 18. Naz U, Hanif S. Agreement between visual inspection with acetic acid and Papanicolaou's smear as screening methods for cervical cancer. *J Coll Physicians Surg Pak*. 2014;24(4):228-31. Available from: https://applications.emro.who.int/imemrf/J_Coll_Physicians_Surg_Pak/J_Coll_Physicians_Surg_Pak_2014_24_4_228_231.pdf
 19. Poomtavorn Y, Suwannarurk K. Accuracy of visual inspection with acetic acid in detecting high-grade cervical intraepithelial neoplasia in pre- and post-menopausal Thai women with minor cervical cytological abnormalities. *Asian Pac J Cancer Prev*. 2015;16(6):2327-31. doi: 10.7314/apjcp.2015.16.6.2327
 20. Bharti A, Hansda R, Bala R, Kumar A. To determine the diagnostic accuracy of visual inspection of cervix with acetic acid as a screening tool to detect preinvasive cervical cancer - A meta-analysis. *J Family Med Prim Care*. 2025;14(7):2619-2627. doi: 10.4103/jfmpc.jfmpc_1606_24
 21. Shiktira D, Kwari DY, Iwuchukwu FA, Pius S, Kwari SD, Olugbenga B, et al. Diagnostic Accuracy of Visual Inspection with Acetic Acid and Pap Smear Cytology in Detecting Premalignant Lesions of the Cervix at a District Hospital. *Jewel J Med Sci*. 2025;5(1):1-14. doi: 10.56167/jjms.2024.0501.01
 22. Mughal M, Rashid M, Usman M, Khurshid K, Noreen A. Diagnostic accuracy of visual inspection of cervix using lugol's iodine for detecting cervical carcinoma taking histopathology as a gold standard: Visual Inspection of Cervix Using Lugol's Iodine. *Pak J Health Sci*. 2022;3(7):199-202. doi: 10.54393/pjhs.v3i07.330
 23. Vahedpoor Z, Behrashi M, Khamsehchian T, Abedzadeh-Kalahroudi M, Moravveji A, Mohmadi-Kartalayi M. Comparison of the diagnostic value of the visual inspection with acetic acid (VIA) and Pap smear in cervical cancer screening. *Taiwan J Obstet Gynecol*. 2019;58(3):345-348. doi: 10.1016/j.tjog.2019.03.010