Original article

Visual Inspection with Acetic Acid (VIA) in cervical cancer screening in low resource settings

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Abstract:

Objective: To evaluate the feasibility and validity of visual inspection of the cervix with acetic acid (VIA) for screening cervical intraepithelial neoplasia. ***Materials and Methods:*** In this study, 942 women recruited from gynecology outpatient clinic, were screened using the Papanicolaou (PAP) smear, and VIA. The sensitivity and specificity of both the screening methods were analyzed. ***Results:*** VIA was positive in 29.3%. The sensitivity of VIA (74.16%) was much higher than that of the Pap smear (47.83%). The specificity of VIA (50.00%) was lower than that of the Pap smear (74.16%), resulting in high false-positive rates for VIA. ***Conclusion:*** Visual inspection of the cervix with acetic acid is sensitive for ecto-cervical lesions. The advantage of the VIA method lies in its easy technique, low cost and high sensitivity which are important factors for determining the efficacy of any screening program in developing countries.

Keywords: cervical cancer screening; Papanicolaou (PAP) smear; visual inspection of the cervix with acetic acid (VIA)

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Introduction:

Cervical cancer is the second most common cancer in women, and 80% of these cases occur in underdeveloped countries[1]. It comprises 15% of the cancers diagnosed in women in underdeveloped countries. It kills approximately 270,000 women worldwide each year, with nearly 85% of those deaths occurring in resource-poor settings[2]. While the incidence and mortality rates of cervical cancer have declined in developed countries since the advent of successful screening programs[3-5], there has been no such trend in developing countries. Screening programs were implemented in developing countries since the early 1980's, yet have failed to reduce the mortality rates. The WHO in 2002 estimated that only 5% of women in developing countries are screened appropriately. Likely reasons for failure in screening programs include lack of funding, insufficient access in rural areas where most of the population in developing countries reside, lack of awareness/education as to need for screening, and poor follow-up. About 50% of all cancers occur in developing countries, yet only 5% of resources are spent on the fight against cancer worldwide. India accounts for one-fifth of the world burden of cervical cancer and continues to be the most common genital cancer[1]. In India approximately, 90,000 new cases of cancer cervix occur every year. The incidence in India is 45 per one lakh women[6].

In developing countries as in India, alternative, low-cost and effective early diagnosis
methods are needed. Visual inspection with acetic acid(VIA) is a simple and easy-to-learn method and does not require laboratory equipment. Test results are immediate after administration. VIA is an attractive method for these reasons in underdeveloped countries[7-9]. With suspicious lesions detected,

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women are directed to further treatment[8,10,11]. Visual inspection-based approaches to cervical cancer screening have been extensively investigated in India. The performance characteristics of unaided visual inspection (without acetic acid), also known as ''downstaging'', has been addressed in several studies[12].

The purpose of this study was to test the validity of VIA in cervical cancer screening (sensitivity, specificity, and positive and negative predictive values) and compare it with findings from the Papanicolaou test.

Material and Methods:

This hospital based prospective cohort study was carried out in J N Medical College hospital at Aligarh in the out patient Department of Obstetrics and Gynecology between June 2008 and September 2010. Nine hundred forty two women with inclusion and exclusion criteria were screened for CIN and early cervical cancer.

The study protocol was reviewed and approved by institutional ethical committee and informed consent was obtained from each woman. Relevant obstetric and gynecological history was obtained and recorded.

Inclusion criteria:

All women exposed to early sexual life, with multiple sexual partners, low socioeconomic status, having history of STD's, with foul smelling discharge and with post coital bleeding were included in the study.

Exclusion criteria

Unmarried women, women with frank invasive cancer cervix, women with bleeding per vaginum, and pregnancy were excluded.

All women were subjected for per speculum examination to observe the size and shape of the cervix, the external os identified with pinkish squamous epithelium and reddish columnar epithelium and transformation zone. The pap smear was taken and two samples were taken one from ectocervix and other from endocervix. The pap smear slide was immediately fixed with 90% ethyl alcohol. Later, the slide was sent for cytology in the Department of Pathology, J N, Medical College Hospital, Aligarh. Pap smear reporting was done according to the Bethesda classification . After taking pap smear, the same Women were subjected to visual inspection of the cervix after application of 5% acetic acid. Using a cotton swab soaked in acetic acid was applied on cervix for one minute and then the cervix was carefully inspected for any aceto-white lesions, particularly in the transformation zone.

Reporting of test outcome

In the study, test was reported as positive, negative and inconclusive VIA test.

Positive test: Visualization of the dense acetowhite lesion with sharp margins located in the transformation zone, close to squamo-coloumner junction (SCJ).

Negative test: If no acetowhite lesions were observed on the cervix polyps protruding from cervix, bluish white in color, nabothian cysts which appear as button like areas as whitish area or pimples, dot like areas present in the endocervix which were due columnar epithelium staining with acetic acid; if there were shiny pinkish white, cloudy white or bluish white, faint patchy or doubtful lesions with ill defined, indefinite margins or irregular, acetowhite lesions resembling geographical lesions away from the SCJ.

If VIA turns out to be positive the patient was subjected to further investigations such as colposcopy and guided biopsy.

Statistical analysis

The results of visual inspection of cervix with acetic acid (VIA) were correlated with that of pap smear on the basis of sensitivity, specificity and positive and negative predictive value.

Results:

Of the 942 women who participated, 45.5% were 31 to 40 years of age and 38.9% were 20 -30 years; the mean (SD) age was 34.52±2 years. All (100%) were married, 53.33%

were married when they were 15 years or younger, and 39.61% married between the ages of 18 and 20 years.

In the observations made after the application of the acetic acid, VIA was negative in 79.7% of the women and positive in 29.3% of the women (Table 1). Similarly, 80.10% of the women had negative smear test results and 18.89% had positive smear test results. When the Papanicolaou test results were classified according to the Bethesda System, 42.89% of the women had normal smear test results, 38.22% of them had an inflammatory smear, 2.12% had Atypical Squamous Cells of Undetermined Significance (ASCUS), 0.42% had Atypical Glandular cell of Undetermind Significance (AGUS), 9.13% had Low Grade Squamous Intraepithelial Lesion (LSIL), and 7.22% had High Grade Squamous Intraepithelial Lesion (HSIL) (Table 1). Using the Papanicolaou test, the sensitivi-

Table 1: Distribution of VIA and Papanicolaue Test Results

	No.	%
VIA		
Negative	666	70.7
Positive	276	29.3
Total	942	100.0
Papanicolaou Test		
Negative	764	81.1
Positive	178	18.9
Total	942	100.0
Bethesda System		
Normal	404	42.89
Inflammatory Lesions	360	58.04
AGUS	4	0.42
ASCUS	20	2.12
LSIL	86	9.13
HSIL	68	7.22
Total	942	100.0

Abbreviation: VIA, visual inspection with acetic acid.

ty of VIA was 74.16% and specificity was 50.00%. The positive predictive value (PPV) of VIA was 47.83%, and its negative predictive value (NPV) was 75.78% (Table 2).

Table 2: Sensitivity and Specificity of VIA versus Papanicolaou Test Outcome

	PAPANICOLAOU TEST		
VIA	**Positive**	**Negative**	**Total**
Positive	132	144	276
Negative	46	144	190
Total	178	288	464

Abbreviation: NPV, negative predictive value; PPV, positive predictive value, VIA, visual inspection with acetic acid.

Sensitivity: 74.16%; PPV, 47.83%; specificity, 50.00%; NPV, 75.79%.

Discussion:

In our study VIA was positive in 29.30%, which is almost comparable to studies by Tayyeb et al, 28.9%[9],Belinson et al[13] , 27.3%, and Doh et al[14], 21.7% (Table 3).

In our study with VIA, results for sensitivity and specificity were 74.16%, and specificity of 50.0% which is almost comparable to studies shown in Londhe et al[15] as sensitivity

72%, and specificity 54% (Table 4). Other studies were showing the sensitivity of 71% and specificity of 74% in Belinson et al[13], and sensitivity of 67%

Table 3: Results of VIA for Other Countries

Author(s) (Year)	VIA Positive (%)	Country	No. of Women
Londhe et at (1997)	52.96	India	372
Ardahan et al (2011)	9.7	Turkey	350
Belinson et al (2001)	27.3	China	1977
Denny et al (2002)	18.1	Africa	2754
Tayyeb et al (2003)	28.9	Pakistan	501
Goel et al (2005)	12.5	New Delhi	400
Doh et al (2005)	21.7	Cameroon	4813
Present study (2011)	29.3	Aligarh(India)	942

and specificity of 83.0% in Denny et al[16], in the Johns Hopkins' Program for International Education in Reproductive Health (JHPIEGO)[11], sensitivity was 77% and specificity was 64%. Additional results from other studies are listed in more detail in Table 4. When the studies made by using acetic acid in the recent years are examined, it is seen that the sensitivity of VIA is between 60% and 95.7% and its specificity is between 30.4% and 98%[9,17-19]. Decreasing VIA specificity means a risk of increased false-positive patient ratio. For this reason, treatment may be recommended for some women who have no neoplasm or have a low-stage disease. Despite such risks, VIA is still the most cost-efficient prognostic method for the underdeveloped countries. In our study, similar to the findings of some other studies (Table 4) made in other countries, VIA sensitivity was high, as noted in the outcomes of the comparisons of VIA and Papanicolaou test results. This finding highlights the importance of training and experience for the clinicians who are completing the visual evaluations. In our study, VIA specificity was low, as noted in the outcomes of comparing VIA with Papanicolaou test results, perhaps in part because inflammatory lesions become aceto-white. Also, several other variables affect the performance of VIA as the light source, which should be white and condensed and the training and experience of the observer. The reasons behind the VIA specificity being high or low in different researches could be the personnel completing the VIA assessment, clinical criteria not properly used, differences between the research populations, and women with inflammatory conditions included in some but not all of the studies[14,18,20-22] . In our study, when the VIA and Papanicolaou test results were compared, PPV (47.83%) was low and NPV (75.79%) was high, which means that when a test is negative, the women can go home reassured that she is not likely to have

Table 4: Comparison of Sensitivity and Specificity of VIA with Other Studies

Author(s)	Country	No. of Women	Sensitivity	Specificity
Megevand et al (1996)	South Africa	2426	65	98
Londhe et al (1997)	India	372	72	54
Zimbabwe University JHPIEGO (1999)	Zimbabwe	2203	77	64
Denny et al (2000)	Africa	2944	67	83
Belinson et al (2001)	China	1977	71	74
Tayyeb et al (2003)	Pakistan	501	93.9	30.4
Wu et al (2003)	China	1997	70.9	74.3
Bhatla et al (2004)	India	100	87.5	63
El – Shalakany et al (2004)	Egypt	2049	85.5	96.8
Ghaemmahani et al (2004)	Iran	1200	74.3	94
Sankaranarayanan et al (2004)	India	18675	60.3	86.8
Goel et al (2005)	New Delhi	400	96.7	36.4
Vuyst et al (2005)	Nairobi (Kenya)	853	73.3	80.0
Shastri et al (2005)	Mumbai (India)	4039	59.7	88.4
Doh et al (2005)	Cameroon	4813	70.4	77.6
Eftekhar et al (2006)	Iran	200	95.7	44.0
Sodhani et al (2006)	India	472	86.7	90.7
Chumwonathayi et al (2008)	Thailand	648	60.0	93.9
Cagle et al (2009)	China	1839	69.5	89.0
Ardhahan et al (2011)	Turkey	350	82.4	50
Present study	India	942	74.16	50.0

a neoplastic cervical lesion; eliminating the need for follow-up visits. However, the low PPV of VIA does present the problem of many false positives, discouraging the see-and-treat method. However, PPV is dependent on incidence and if a see-and-treat method were implemented in a high-risk population with a high incidence of cervical cancer, the qualities of the VIA test may improve. Therefore, the "see-and-treat" method with VIA could be accepted by patients in developing countries like India.

Conclusion:

VIA is an adequate and acceptable screening method for cervical cancer. Furthermore, in low-resource areas like India, VIA can be better than cytology for its ease of use and low cost. Cytology based screening programmes are difficult to organize owing to limited infrastructure, trained personnel, and funds. Our results outline the potential benefits of using VIA based screening at all levels of health care systems in developing countries. There is therefore, the time has come, to integrate VIA based screening programs at the primary care level of health services, and to downstage cancer cervix in our country.

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