Original Article

Diagnostic Accuracy of Visual Inspection with Acetic Acid (VIA) and PAP Smear in Diagnosing Cervical Cancer, Taking Histopathology as Gold Standard

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Abstract

Objectives: To compare the diagnostic accuracy of visual inspection with acetic acid (VIA) and PAP smear in diagnosing cervical cancer, taking histopathology as the gold standard.
Methodology: This Cross-sectional Validation study was conducted in the department of Obstetrics & Gynecology, Combined Military Hospital, Muzaffarabad, from 1st January 2019 to 30th June 2019. A total of 154 sexually active women with contact bleeding if married, cervical erosions, hypertrophied cervix on per speculum examination with a duration of symptoms >1 month and age 20-50 years were included.. All the patients were undergone PAP smear and visual inspection with acetic acid. The results of PAP smear and visual inspection with acetic acid (VIA) were compared with histopathology report.
Results: In this study, sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of VIA smear in diagnosing cervical cancer was 85.53%, 88.46%, 87.84%, 86.25% and 87.01% respectively. The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of PAP smear in diagnosing cervical carcinoma was 84.15%, 81.94%, 84.15% 81.94% and 83.12% respectively.
Conclusion: This study concluded that visual inspection with acetic acid (VIA) is more sensitive and accurate than PAP smear in diagnosing cervical cancer. Since diagnostic values of VIA are comparable to Pap smear, VIA can be used as a good alternative to PAP smear in mass screening of large population.
Keywords: Cervical cancer, PAP smear, Visual inspection, histopathology, sensitivity.

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Introduction

Uncontrolled growth that starts in the cervical epithelium cells is called as cervical carcinoma. There are several causing factors including Human Papilloma Virus (HPV). At the initial stage, normal cells of the cervix progressively acquire pre-cancerous changes, which further turn into cancer.[1] Cervical cancer is a common malignancy among women and is ranked as the third most frequent malignancy worldwide. There is great variation in the incidence of this disease in developed and developing countries. Cervical cancer is ranked as the second most common cancer in developing countries, but its frequency is comparatively very less in developed countries where it is ranked as the tenth most common cancer. It is also considered as the leading cause of deaths related to cancer among women in developing countries. [2]

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Cervical cancer is one of most common cancers and a leading cause of cancer related deaths in sub-Saharan Africa. Several factors make it more vulnerable, [3] like inadequate public health infrastructure and health care facilities, challenging health priorities and persistent poverty. These factors are the main hurdle for large-scale preventive programs for cervical cancer. [4] Pap smear is considered as most common and reliable screening test for cervical cancer, but it requires financial and technical expertise. [4]

Pap smear test remained first line and standard method for screening of cervical cancer for many years. Many studies have shown its efficacy and reliability for the prevention of cervical cancer. Literature has shown that screening with Pap test reduces the cervical cancer incidence by 60-90%, with a reduction in cervical cancer related mortality rate by 90%. [5] Although Pap smear screening has many advantages but its cost, skills to perform the test that is trained cytopatholoist and multistage nature of procedure make it difficult to use in resource lacking health facilities in developing countries. These probable challenges associated with cytology-based programme are triggering factors that prompt for alternative low cost screening technology.

Need for such techniques was fulfilled by visual inspection with acetic acid (VIA). This method can be used as an alternate for PAP smear because its result is available immediately without requiring any laboratory support. [6,7]

The current literature showed a good efficacy of Pap smear as well as VIA in the detection of cervical cancer. Like in a study Manish S, et al found that the sensitivity and specificity of Pap smear and VIA were comparable with 90.48% sensitivity and 81.40% specificity of Pap smear in comparison to the sensitivity of 95.24% and specificity of 44.19% with VIA.[8] Results from a local study showed that VIA had a sensitivity of 93% vs 83% by Pap smear and specificities of 90% and 97% indicating a higher sensitivity VIA as compared to Pap smear. [9]

Although a handsome amount of data is available on diagnostic accuracy of Pap smear and VIA for detection of cervical cancer. However, there is a huge variation in results of these studies. This disparity makes it difficult to identify which method is better. It indicates a need of re-evaluation of the results. Therefore, this study has been planned to compare the diagnostic accuracy of visual inspection with acetic acid (VIA) and Pap smear in screening cervical cancer, taking Histopathology as a gold standard. This will help to improve the practice for proper screening as well as treatment of cervical cancer in order to reduce the morbidity and mortality of our population.

Methodology

After approval from the institutional ethical review committee, a total number of 154 patients presented to the outpatient department of obstetrics & Gynecology, Combined Military Hospital, Muzaffarabad, were enrolled in the study. All the women of 20-50 years of age, sexually active, with contact bleeding, cervical erosions, hypertrophied cervix on per speculum examination with the duration of symptoms >1 month were selected by Non-probability, consecutive sampling. Pregnant females (assessed on ultrasonography), women who already had hysterectomy or treatment for cervical pre cancer or cancer in the past were excluded from the study.

The sample size of 154 cases was calculated with a 95% confidence level, 10% desired precision for sensitivity of 80.0%[10] and specificity of 30.0%[10] in diagnosing cervical cancer by VIA and taking the expected percentage of cervical carcinoma as 33.33%.[10]

Informed written consent was taken from each woman. All these patients underwent for Pap smear test and a sample was taken for Pap smear using a conventional disposable wooden Ayres spatula; scrape the cervix around the entire transformation zone and smearing the cells onto a labeled glass slide. The smear is fixed with 95% ethyl alcohol for 20-30 minutes and the presence or absence of cervical cancer was noted. The presence of atypical squamous cells (ASC) and atypical glandular cells was taken as positive.

After completing the Pap smear, VIA was done and it involved gentle application of 5% acetic acid using cotton swab to avoid bleeding. After 1-2 minutes a naked eye evaluation was performed under 100-watt illumination. The transformation zone was carefully checked for any dense non movable acetowhite areas in the mucosa and presence or absence of cervical cancer was noted. The result was taken positive in presence of sharp distinct well-defined, acetowhite areas with margins touching the squamocolumnar junction. After this, all patients were undergone biopsy and histopathology report was interpreted from institutional pathology laboratory. The results of PAP smear and visual inspection with acetic acid (VIA) were

Compared with histopathology report. All this data (age, duration of symptoms, parity, marital status, menopausal status, cervical carcinoma on PAP smear, VIA and histopathology) was recorded on a specially designed proforma.

Collected data was analyzed through computer software SPSS 25. Quantitative variables were presented as mean and standard deviation. Qualitative variables like were presented as frequency and percentage. A 2×2 contingency table was used to calculate sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of visual inspection with acetic acid (VIA) and PAP smear in diagnosing cervical cancer, taking histopathology as gold standard.

Results

The mean age of the study sample was 37.23 ± 7.60 years. The majority of the patients 95 (68.69%) were between 36 to 50 years of age. The mean duration of symptoms was 5.18 ± 2.03 months. Majority of the patients had a duration of symptoms of less or equal to 6 months in 112 (72.73%) patients. Most 104 (67.53%) of the women in the study were multiparous. And mostly121 (78.57%) women were in pre-menopause stage as elaborated in table I.

VIA supported the diagnosis of cervical carcinoma in 74 (48.05%) patients. Histopathology confirmed cervical carcinoma in 76 (49.35%) cases where as 78 (50.65%) patients revealed no cervical Carcinoma. In 74 VIA positive patients, 65 (True Positive) had cervical carcinoma and 09 (False Positive) had no cervical carcinoma on histopathology. Among, 80 VIA negative patients,
11 (False Negative) had cervical carcinoma on histopathology whereas 69 (True Negative) had no cervical carcinoma on histopathology.

PAP smear supported the diagnosis of cervical carcinoma in 82 (53.25%) patients. Histopathology confirmed cervical carcinoma in 82 (53.25%) cases whereas 72 (46.75%) patients revealed no cervical carcinoma. In 82 PAP positive patients, 69 (True Positive) had cervical carcinoma and 13 (False Positive) had no cervical carcinoma on histopathology. Among, 72 PAP negative patients,
13 (False Negative) had cervical carcinoma on histopathology whereas 59 (True Negative) had no cervical carcinoma on histopathology as shown in table II.

Overall sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of VIA smear in in diagnosing cervical cancer was 85.53%, 88.46%, 87.84%, 86.25% and 87.01% respectively. Overall sensitivity, specificity,

Table I: Distribution of Demographic Information

Characteristics	N	%
Mean Age (years)		
Mean ± SD	37.23 ± 7.60	
Categories of Age (years)		
20-35	59	38.31
36-50	95	68.69
Mean duration of symptoms		
Mean ± SD	5.18 ± 2.03 months	
Categorization of duration of symptoms		
≤ 6 Months	112	72.73
> 6 Months	42	27.27
Parity		
Primi-parous	50	32.47
Multiparous	104	67.53
Menopause status		
Pre-menopause	121	78.57
Post-menopause	33	21.43

Table II: Cross tabulation of VIA and Pap smear

	Positive result on Histopathology	Negative result on Histopathology	Total
Results on the basis of VIA			
Positive	65	9	74
Negative	11	69	80
	76	78	154
Results on the basis of Pap smear			
Positive	69	13	82
Negative	13	59	72
Total	82	72	154

Table III: Accuracy of VIA and Pap smear

Validation Statistic	Value
Results for VIA	
Sensitivity	85.53%
Specificity	88.46%
Positive Predictive Value	87.84%
Negative Predictive Value	86.25%
Accuracy	87.01%
Results for Pap smear	
Sensitivity	84.15%
Specificity	81.94%
Positive Predictive Value	84.15%
Negative Predictive Value	81.94%
Accuracy	83.12%

positive predictive value, negative predictive value, and diagnostic accuracy of PAP smear in diagnosing cervical carcinoma was 84.15%, 81.94%, 84.15% 81.94%, and 83.12% respectively as given in detail in table III.

Discussion

Main burden of cervical cancer is in developing countries and about 80% of the cases occur in these countries. The main reason of this disproportionate burden of cervical cancer in such countries is lack of well-organized screening programs. Frequently repeated and organized cytological screening programs have significantly reduced the burden of cervical cancer in developing countries. [11,12] Preinvasive and preclinical diagnosis of carcinoma cervix is the ultimate goal of screening for carcinoma cervix.

These cytological based organized programs are associated with the financial burden, logistic and technical barriers etc in low resource countries. Pap smear is being used as a screening tool for cervical cancer for years. [13] but high incidence of cervical cancer in developing countries shows lack of effectiveness of Pap smear test. [14] Main reason might be lack of resources and facilities to carry out this test and the steps involved in this test. [15]

Along with financial and technical difficulties, recent studies have shown a higher rate of up to 30% of false positive reports from Pap smear. [16] To overcome these drawbacks visual inspection with acetic acid (VIA)" was proposed as an alternate screening test to diagnose cervical cancer. [17] Some randomized control trials prove VIA as significantly efficient screening test having ability to reduce mortality rate in women having cervical cancer. [18]

In this present study, sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of VIA in diagnosing cervical cancer was 85.53%, 88.46%, 87.84%, 86.25% and 87.01% respectively. These results for VIA are in very much agreement with previous studies, like study by Huy NVQ, et al, found sensitivity, specificity, accuracy, positive predictive value (PPV) and negative predictive value (NPV) of VIA for cervical cancer as 88.8%, 43.8%, 63.4%, 51.2% and 83.3%, respectively. [19] In another study Khan M et al, found sensitivity, specifically, positive predicted value, negative predicted value of visual inspection of the cervix after acetic acid application as 93.5%, 95.8%, 76.3%, 99%, and the diagnostic accuracy was 95.6%. [20]

In this present study, the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of PAP smear in diagnosing cervical carcinoma was noted to be 84.15%, 81.94%, 84.15% 81.94%, and 83.12% respectively. But there is variation in the results of this present study and studies in the literature for PAP smear. The literature shows less sensitivity and specificity along with accuracy for PAP smear in comparison to this present study. Like Bhattacharyya AK, et al found sensitivity of VIA 89% (versus PAP Smear-52%) and specificity of VIA 87% (versus pap smear-95%). The accuracy VIA was 87% compared to pap smear-93%. [21] Similar results indicating high accuracy has been found for VIA in other studies like in a local study, the sensitivity of VIA was 93% and of Pap smear was 83%. Corresponding specificities were 90% and 97%. [9]

The reason for these variations in the diagnostic value of Pap smear and VIA in different studies may be due to considering different diagnostic criteria, difference in considering the positive tests results and differences in the studied population. The findings of this study and other studies indicate that the main limitation of VIA is its low specificity, which can lead to higher rates of referral and performing more colposcopy procedure in patients. On the other hand, it is a low cost, simpler and easier method than Pap smear, and does not require complicated laboratory facilities. Therefore, it can be recommended for primary screening program in low resource settings. [22]

Delay in diagnosis of cervical cancer may be resulted due to lack of implementation of effective and implementable screening programs. This can lead to reporting of advanced cases of cervical cancer. The diagnosis of cervical cancer at CIN or early stage may help in effective treatment and encouraging results. VIA may be the best alternate screening tool where Pap smear could not provide adequate coverage for large population due to lack of infrastructure and resources for cytological screening. [23]

Many aspects of VIA make it an appealing approach for use in low-resource settings. In most cases, costs associated with launching and sustaining VIA screening are lower than those associated with other methods. VIA is a relatively simple, easy-to-learn approach.

Conclusion

According to the results of this study visual inspection with acetic acid has better sensitivity and specificity as well as accuracy than Pap smear for diagnosis of cervical cancer. VIA can be combined with Pap smear to improve the efficacy of screening procedures in detection of pre- cancerous and cancerous lesions of the cervix. So, it is recommended that visual inspection with acetic acid (VIA) should be used routinely instead of PAP smear for accurate identification of cervical carcinoma in order to reduce morbidity and mortality.

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