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Comprehensive Evaluation of Cervical Cancer Screening Modalities: A Comparative Analysis between Liquid-Based Cytology (Pap Smear) and Visual Inspection with Acetic Acid (VIA) with Histopathological Correlation

Dr. Deepika Shukla[1], Dr. Prakati Raj Patel[1], Dr. Puja Singh[*1], Dr. Amar Gangwani[1], Dr. Mohita Pandey[2]

1. Department of Pathology, Bundelkhand Government Medical College, Sagar, M.P.
2. Department of Gynaecology, Bundelkhand Government Medical College, Sagar, M.P.

Correspondence: Dr. Puja Singh

Address: Associate Professor, Department of Pathology, Bundelkhand Government Medical College, Tilli Road, Sagar, M.P, India 470001

Email: dr.pujasingh@gmail.com

Phone: +91.9516094970

ORC ID: 0000-0002-6182-5597

Abstract:

Cervical cancer is a worldwide major health burden. It is a disease that is both common and preventable. Early diagnosis can play a critical role in successful therapy. Thus effective screening techniques, such as Liquid-Based Cytology (LBC) and Visual Inspection with Acetic Acid (VIA) can play an important role. In this study, the efficacy of LBC and VIA are compared against the histopathology findings.

A statistically significant sample of women were enrolled in the study and were examined by both LBC and VIA. Tissue samples were also taken from both VIA-positive and abnormally LBC-positive people. Histopathological investigation of these samples was performed to ascertain the presence and grade of cervical cancer and precancerous lesions (CIN).

The findings suggested that LBC is preferable compared to a routine Pap smear for examination of cervical cytology.

Keywords: Pap Smear, Liquid-based cytology, Visual inspection with acetic acid, Cervical cytology, cervical cancer

Introduction:

Cervical cancer is a major cause of cancer mortality in women. More than 85% of cases and 88% of deaths from cervical cancer occur in developing countries. India alone accounts for one-fourth of the global cervical cancer burden. [1]

Visual Inspection with Acetic Acid (VIA) is a simple, low-cost screening method for cervical cancer that involves the application of acetic acid to the cervix, followed by visual inspection for any aceto-white lesions. [2]

Liquid-based cytology (LBC) is a cervical cancer screening technique where cervical cells are collected with a brush, preserved in a liquid medium, and then processed for examination. LBC

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reduces obscuring factors like blood and inflammation, potentially improving sample quality and diagnostic accuracy compared to conventional Pap smears. [3]

Histopathological examination for all cervical lesions is the gold standard and can be easily used to compare any method of investigation for confirmation of the diagnosis. [4]

As the incidence of cervical pre-cancerous and cancerous lesions is on the rise, the patient's best interest can be secured by comparing the various diagnostic modalities. The present study aims to compare & co-relate the findings of VIA and cytomorphological (LBC and PAP smears) tools of screening against the gold standard test i.e., biopsy.

Material and Methods:

Ethical clearance: The study was conducted after obtaining the institutional ethical clearance from the institutional ethical committee.

Study design: Prospective cohort study.

Sample Size: 302.

Inclusion Criteria: all females in the reproductive, peri-menopausal, and post-menopausal age group with any significant clinical history leading to the diagnosis of pre and cancerous lesions.

Exclusion Criteria: all the women not falling under the above spectrum.

Visual inspection of the cervix was done by applying 5% acetic acid. Liquid base cytology was performed and the staining of the slides was done using Pap stain. Findings of LBC & VIA were then compared against the tissue examination on tissue samples collected by cervical punch biopsy.

Statistical Analysis Used: Sensitivity, Specificity, Positive predictive value, Negative Predictive Value, True Positive and False Positive.

Results:

A total number of 110 women were enrolled in the present study, most of whom belong to the age group 40-49 years. Age-wise distribution is presented in Table 1.

Table 1: Age wise Distribution

Age Group	Total	CIN	CA Cervix	VIA positive
18-29	05	2	-	2
30-39	35	6	2	24
40-49	58	14	1	32
50-59	12	2	2	2

Almost double the number with a parity of more than 2 is reported as compared to less than equal to 2. A significantly high number of cases were reported for CIN as compared to CA cervix in both categories. Please refer to Figure 1 for the relation with parity.

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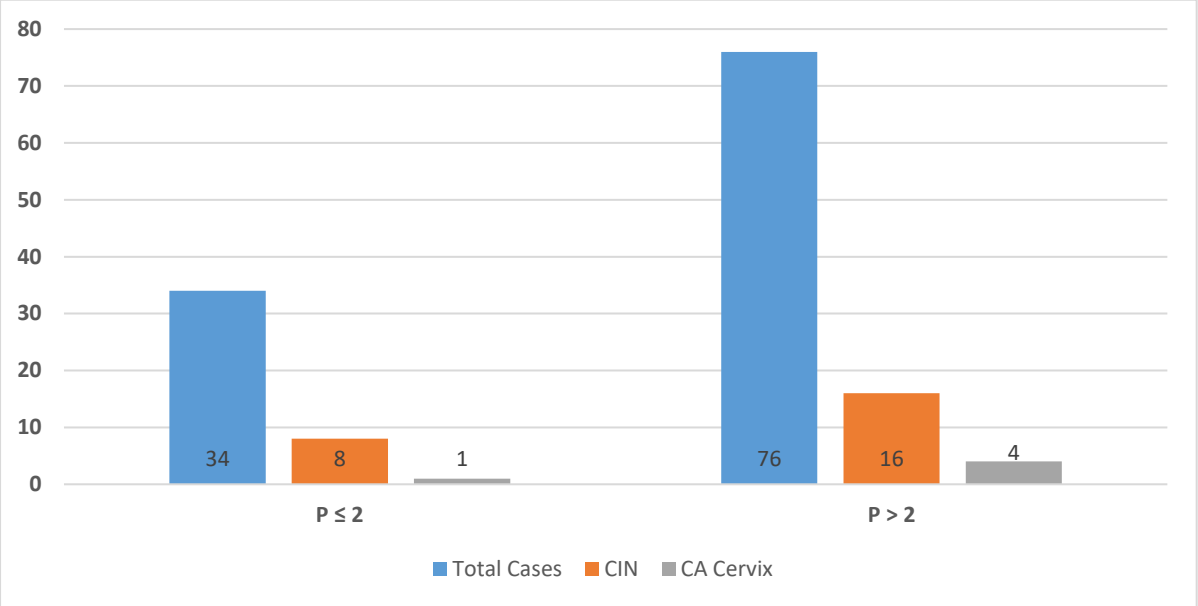
Figure 1: Relation with parity



Upon reviewing the data based on the duration of marriage, the highest number of cases we found for those married for more than 20 years. For this age group CIN reported for 20 cases and CA cervix for 3 cases. Please refer to Table 2 for the distribution of the duration of marriage.

Table 2: Distribution based on Duration of Marriage

Duration of marriage (in years)	Total no. of cases	CIN	CA cervix
<10	2	0	0
11-20	38	4	2
>20	70	20	3

The highest number of cases were arrived with complaints of Abnormal Urine Bleeding (36), followed by Pain in Abdomen (34) and White discharge (28). The highest number of cases with a diagnosis of CIN arrived with complaints of White discharge (8) followed by Abnormal Urine Bleeding (6) and Pain in the Abdomen (4). The highest number of cases with a diagnosis of CA Cervix arrived with complaints of Abnormal Urine Bleeding (4) followed by Post Coital Bleeding (1). Please refer to Figure 2 for distribution according to the Signs and Symptoms.

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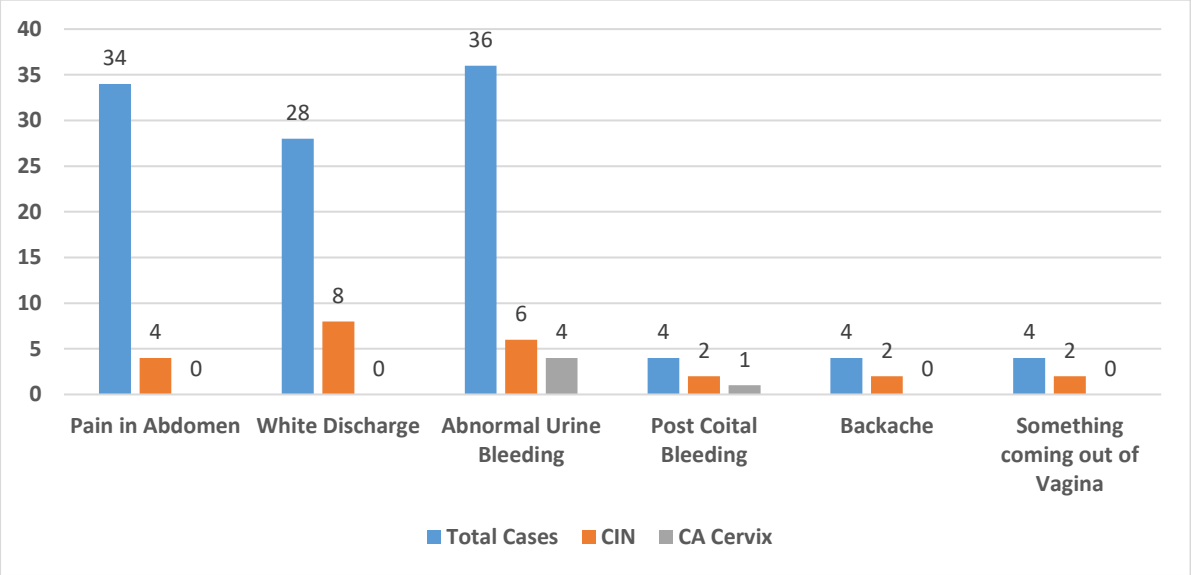
Figure 2: Distribution of cases according to Signs/Symptoms



The most common diagnoses made using Pap's smear were Negative for intraepithelial changes for malignancy (36), ASCUS (20), and Acute inflammatory smear (18). However, the only cases corroborated against CA Cervix were for ASCUS (1), H-SIL (2), and Carcinoma Cervix (2). Please refer to Table 3 for the distribution of findings of Liquid-based cytology with Pap's smear findings.

Table 3: Distribution of findings of Liquid-based cytology with pap's smear

S. No	Pap's smear finding	Number of Cases	CA Cervix
1	Acute erosive cervicitis	4	
2	ASCUS	20	1
3	H-SIL	10	2
4	Acute inflammatory smear	18	
5	L-SIL	14	
6	Negative for intraepithelial changes for malignancy (NILM)	36	
7	Carcinoma Cervix	2	2
8	Atypical glandular cells of undetermined significance (AGUS)	0	
9	ASC-H	4	
10	Bacterial vaginosis	2	

CNSC with Koilocytes (34) was the most common biopsy finding. Closely followed by CNSC without Koilocytes (32) and mild dysplasia (18). Refer to Figure 3 for the distribution of biopsy findings.

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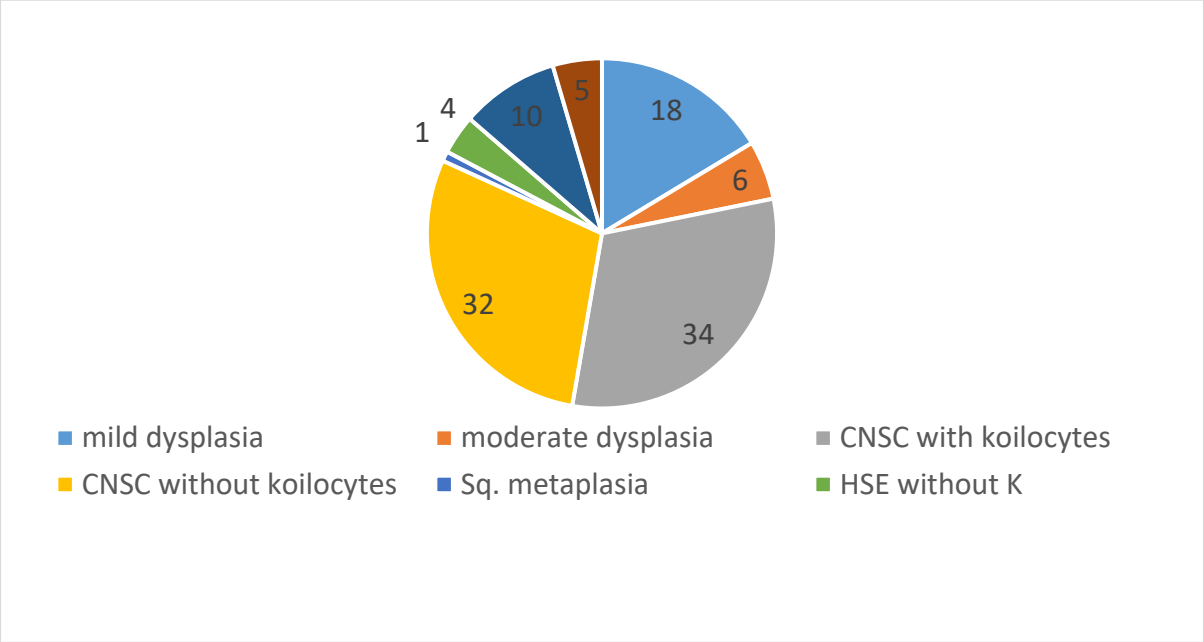
Figure 3: Distribution of Biopsy Findings



Discussion:

In the present study, a high incidence of CIN was found in the age group of 40-49 years. Similar were the findings of studies done by Bhattacharyya AK [5]. However, for studies done by David J [6] and Jeyakumar [7] age group with a high incidence of CIN was > 35 years.

The incidence of cervical cancer & CIN rose with a parity > 2. Studies done by Tekalegn Y [8], Yohannes T [9], and Jensen KE [10] showed similar increases with parity > 3, > 4, and > 2 respectively.

In this study, those married for more than 20 years had the largest percentage of CIN cases (28%) and CA cervix instances (4.28%). These findings are similar to the study of David J [6].

The most common complaint of patients was abnormal uterine bleeding, followed by abdominal pain. The least number of patients (4) complained of prolapse, post–coital bleeding, and backache. Similar findings were reported by studies done by Köse FM [11], Fowler JR [12], Šarenac T [13], and Mishra GA [14].

Liquid-based cytology findings showed the maximum number of negative for intraepithelial changes in malignancy (32.7%). The second common diagnosis obtained was that of atypical squamous cells of undetermined significance (16.36%) and acute inflammatory smear. No cases of atypical glandular cells of undetermined significance were found in the present study. The findings were similar to many other studies. [15 -17] Although most of the studies also obtained AGUS cases.

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The sensitivity of VIA (72%) came out to be more than LBC (63.8%) whereas Specificity (89%) & PPV (92%) of LBC were much more specific than VIA (specificity- 63% & PPV-76%). These findings are similar to many other studies. [18,19].

The histopathological examination was performed in all the 110 cases. The highest cases were of non-keratinizing squamous cell carcinoma and the least number of cases were that of mild dysplasia.

The findings suggest that LBC is better than VIA but when used in combination they can aid in diagnosing and screening cervical lesions, especially in third-world countries like India.

Conclusion:

The most effective prevention strategy for cervical cancer is the systematic screening of women through an organized program along with treatment and follow-up of the screen-detected precursor lesions. In this, Both VIA & PAP smears can play an important role.

Limitations: The study should be multicenter. The number of cases should be increased for better results. Additionally, the patient frequently forgets to pick up the report and may not be found again for follow-up.

Conflict of interest:

The authors declare no conflict of interest.

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