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A Comparative Study Between Pap Smear and Visual Inspection with Acetic Acid in Screening of Cervical Intraepithelial Neoplasia and Cervical Cancer at a Tertiary Maternity Hospital (Erbil/Iraq)

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Abstract

Background and objectives: Global concern persists over cervical cancer, demanding efficient early detection methods. The aim of the study was to assess the diagnostic efficacy of Pap smear and visual inspection with acetic acid in detecting cervical intraepithelial neoplasia and early cervical cancer.

Methods: This was a cross-sectional, comparative study conducted from the 1st of January 2023 to the 31st of December 2023 at the Maternity Teaching Hospital/Erbil, Iraq, to screen 200 patients, aged between 18-60 years by doing Pap smear and visual inspection with acetic acid for detecting cervical intraepithelial neoplasia and early cervical cancer. The indicators of diagnostic value including sensitivity, specificity, positive and negative predictive values were analyzed.

Results: Pap smear exhibited a sensitivity of 94.12% while visual inspection with acetic acid showed a sensitivity of 82.35%. The specificity of Pap smear was 64.52%, whereas the visual inspection with acetic acid test had a specificity of 25.8%. The positive predictive value of Pap smear was 59.26% compared with 37.84% for visual inspection with acetic acid. In terms of negative predicted value, Pap smear achieved 95.24%, whereas visual inspection with acetic acid reached 72.73%. Finally, the diagnostic accuracy of Pap smear was 75%, whereas visual inspection with acetic acid had an accuracy of 45.83%.

Conclusion: Pap smear and visual inspection with acetic acid tests possess a high sensitivity and, to a lesser extent, specificity, making them effective screening tools for detecting cervical intraepithelial neoplasia and early cervical cancer.

Keywords: Cervical cancer, Screening, Sensitivity and Specificity

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Introduction

Cervical cancer ranks as the third most prevalent type of malignancy in women globally, and accounts for approximately 8% of all women's cancers.[1, 2] In developing countries, it is the most common cancer in women and it is one of the main causes of death from cancers.[3] In Iraq, the incidence rate is estimated at 1.4 per 100,000 women across all age groups, with 193 annual deaths reported in 2020.[4] A study involving 1300 women in the Kurdistan region of Iraq found that only 0.3% of participants had been diagnosed with cervical cancer.[5] Cervical cancer typically begins as a precancerous condition known as cervical intraepithelial neoplasia, which can progress to invasive cancer if untreated.[6] Therefore, early diagnosis is crucial for reducing morbidity and mortality associated with cervical cancer.[7] Cervical cancer screening methods include conventional Pap test, visual inspection with acetic acid (VIA) and Lugol's iodine (VIA/VILI), HPV testing, and liquid-based cytology (LBC).[8] Conventional Pap tests have been crucial for cervical cancer screening, leading to decreased incidence and mortality in countries where the test is widely used.[9] The method is simple, non-invasive, affordable, and effective for detecting precancerous lesions in women. However, its effectiveness depends on the availability of qualified cytopathology services, trained personnel, and reliable follow-up systems.[10] VIA is a cost-effective alternative to the Pap smear for cervical cancer screening, particularly in low-resource settings.[11] It involves applying 5% acetic acid to the cervix, causing precancerous lesions to appear white (acetowhite), detectable in less than two minutes without advanced technology.[12] The sensitivity of the VIA screening test has been reported to be very different in different studies. However, several clinical studies have confirmed the usefulness of VIA in cervical cancer screening.[13] This study aimed to assess the efficacy and diagnostic compatibility of Pap smear and VIA methods in detecting CIN and early cervical cancer.

Patients and methods

A cross-sectional study was performed on 200 women who referred to the colposcopy department at the Maternity Teaching Hospital in Erbil, Kurdistan Region, Iraq from the 1st of January 2023 to the 31st of December 2023. The questionnaire consisted of two main parts. The first part included the sociodemographic information of the patients. While the second part focused on the clinical characteristics of the participants. All patients included in the study were examined in a supine position, using Cusco's speculum. The cervix was inspected for abnormalities and discharge was removed using a saline-soaked cotton swab. Each participant underwent a Pap test following a cervical examination, using Ayre's spatula to collect the sample. A Pap test showing abnormal squamous cell lesions of unspecified severity (ASCUS) or more severe lesions was considered positive. Afterward, a VIA test was conducted by applying 5% acetic acid to the cervix and observing for bleaching. A positive VIA test led to an immediate cervical biopsy. Positive Pap test results led to biopsies being scheduled for a later visit. Inclusion criteria encompassed non-pregnant women aged 18-60 without active cervical disease, who attended the colposcopy department, and consented to participate. Exclusion criteria included those with active vaginal bleeding, ongoing invasive cervical cancer treatment, non-cooperation with follow-up.Data analysis was performed using SPSS version 21. Frequencies and percentages were calculated for categorical variables. Diagnostic value indicators such as specificity, sensitivity, and predictive values for VIA and Pap smear were analyzed. The study received approval from the Research

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Protocol Ethics Committee of the Kurdistan Higher Council of Medical Specialties (No.55, January 22,2023). Written informed consent was obtained from all participants after explaining the study procedures. Participants were assured of anonymity and confidentiality and had the right to withdraw at any stage.

Results

Table (1) showed the socio-demographic distribution of patients screened for cervical cancer. The majority of participants were aged between 30 to 49 years, comprising 133 (66.5%) individuals. Most were married for over 21 years, accounting for 84 (42%) participants. Parity distribution showed 117 (58.5%) had 1-4 children. Education-wise, 68 (34%) were illiterate. Natural contraception was used by 78 (39%). A vast majority, 196 (98%), were non-smokers. A family history of cervical cancer was present in 1 (0.5%) woman. Marriages occurred after the age of 18 in 112 (56%) of the cases. Most of the participants were housewives, accounting for 168 (84%), and had a middle socio-economic status, representing 104 (52%).

Table (1): Socio-demographic data of participants screened for cervical cancer

Patient characteristics		Frequency	Percent
Age group	18-29	35	17.5%
	30-39	69	34.5%
	40-49	64	32%
	≥ 50	32	16%
Duration of marriage	≤ 10	54	27%
	11-20	62	31%
	> 21	84	42%
Parity	0	15	7.5%
	1-4	117	58.5%
	≥ 5	68	34%
Education	Illiterate	68	34%
	Primary school	64	32%
	High school	43	21.5%
	Higher education	25	12.5%
Contraception	None	47	23.5%
	Natural	78	39%
	IUCD	38	19%
	Pills	37	18.5%
Smoking	Yes	4	2%
	No	196	98%
Family history cervical cancer	Yes	1	0.5%
	No	199	99.5%
Age at marriage	< 18	88	44%
	≥ 18	112	56%
Occupation	Housewife	168	84%
	Employee	32	16%
Socio-economics	Low	85	42.5%
	Middle	104	52%
	High	11	5.5%

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Clinical features varied with 59 (29.5%) patients experiencing postcoital bleeding, the most common symptom observed. Dyspareunia was noted in 52 (26%), followed by vaginal discharge in 44 (22%). Intermenstrual bleeding, postmenopausal bleeding, and abdominal pain were observed in 28 (14%), 21 (10.5%), and 8 (4%) patients, respectively Table (2). Table (3) showed that mild acute cervicitis was the most prevalent diagnosis based on the Pap smear results, observed in 75 patients (37.5%), followed by moderate acute cervicitis in 57 patients (28.5%). Positive Pap tests, including ASCUS, low grade squamous intraepithelial lesion (LSIL) and high grade squamous intraepithelial lesion (HSIL), were reported in 13 (6.5%), 12 (6%) and 3 (1.5%) individuals respectively. In terms of biopsy results, a notable 152 patients (76%) did not undergo biopsy because their screening tests were negative. Chronic cervicitis and CIN-I were each found in 15 patients (7.5%). This was followed by acute cervicitis in 14 women (7%). CIN-II and endocervical polyps were each reported in 2 individuals. In the present study, the VIA test in 200 patients showed that 161 (80.5%) patients had negative results, while 39 (19.5%) patients had positive results. The VIA test results are illustrated in Figure (1). The study revealed that one case of CIN-I was not detected by Pap smear. Biopsies showed that two cases reported as HSIL, five as ASCUS and seven as LSIL, were actually CIN-I. Additionally, one ASCUS and one HSIL report were confirmed as CIN-II upon biopsy, Table (4). When comparing VIA with colposcopy-guided biopsy results, it was observed that VIA missed 2 cases of CIN-I and one case of CIN-II, Table (5). Pap smear exhibited a sensitivity of 94.12%, while VIA showed a sensitivity of 82.35%. The specificity of Pap smear was 64.52%, whereas VIA had a specificity of 25.8%. The PPV of Pap smear was 59.26% compared with 37.84% for VIA. In terms of NPV, Pap smear achieved 95.24%, whereas VIA reached 72.73%. Finally, the diagnostic accuracy of Pap smear was 75%, whereas VIA had an accuracy of 45.83%, Table (6).

Table (2): Distribution of clinical features of participants screened for cervical cancer

Clinical features	Yes	No
Postcoital bleeding	59 (29.5%)	141 (70.5%)
Dyspareunia	52 (26%)	148 (74%)
Vaginal discharge	44 (22%)	156 (78%)
Intermenstrual bleeding	28 (14%)	172 (86%)
postmenopausal bleeding	21 (10.5%)	179 (89.5%)
Abdominal pain	8 (4%)	192(96%)

Table (3): Distribution of participants according to Pap smear and biopsy results

	Frequency	Percent
Pap smear		
Normal	3	1.5%
Mild acute cervicitis	75	37.5%
Moderate acute cervicitis	57	28.5%
Severe acute cervicitis	22	11%
ASCUS	13	6.5%
Inflammation	11	5.5%

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Erosive cervicitis	4	2%
LSIL	12	6%
HSIL	3	1.5%
Biopsy		
No biopsy	152	76%
Chronic cervicitis	15	7.5%
Acute cervicitis	14	7%
Endocervical polyp	2	1%
CIN-I	15	7.5%
CIN-II	2	1%

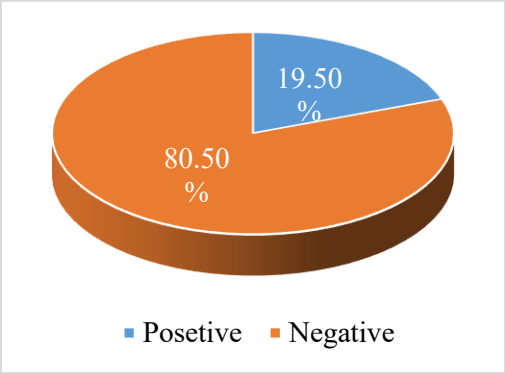

Figure (1): Distribution of participants according to VIA results

Table (4): Agreement between Pap smear and results of colposcopy-guided biopsy

Histopathology	Pap smear		
	ASCUS	LSIL	HSIL
Acute cervicitis	3	2	
Chronic cervicitis	4	3	
CIN-I	5	7	2
CIN-II	1		1

Table (5): Agreement between VIA and results of colposcopy-guided biopsy

	Histopathology				
VIA	Acute cervicitis	Chronic cervicitis	CIN-I	CIN-II	Endocervical polyp
Positive	10	13	13	1	2
Negative	4	2	2	1	

Table (6): Diagnostic value of Pap smear and VIA

Test	Sensitivity	Specificity	PPV	NPV	Accuracy
Pap smear	94.12%	64.52%	59.26%	95.24%	75%
VIA	82.35%	25.8%	37.84%	72.73%	45.83%

Discussion

Most women screened in this study were under the age of 50, with the 30-39 age group being the most frequent. Similar age demographics were reported in studies by Bhattacharyya et al. and AieshaKhatun et al., where the majority of positive cases were also under 50. [14,15] The marital duration of most patients reviewed exceeded 10 years, the finding was consistent with studies by Shukla et al. and Khalil et al. The economic status of most patients was medium, aligning with findings from studies by Basanna et al. Additionally, over 90% of the patients were multiparous, consistent with observations in another study, indicating a prevalence of multiparity among women participating in the screening studies. [16-19] Based on the findings, it was determined that over 70% of the patients either used natural family

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planning methods or did not use any contraceptive methods at all. This finding aligns with the observations from other studies.[17,19] However, another study showed a variation, where most patients utilized reliable contraceptive methods, suggesting that cultural and social differences might influence these choices.[20] Additionally, two significant factors for cervical cancer are the age at marriage and marital status.[21] The present study revealed that 56% of the patients were married after the age of 18, while 46% were married before18, consistent with age trends observed in other studies.[15, 22] The most common clinical symptoms among patients were postcoital bleeding and dyspareunia. Similar findings were reported in a study by David et al. The current study revealed that 14% of the women had positive Pap smear results, while 19.5% had positive VIA test results. [23] These findings differ from those by Vahedpoor et al., who found 21% positivity for Pap test and 50.5% for VIA, as well as from Niyodusenga et al. study, who reported higher positivity rates of 40% for Pap test and 47.5% for VIA.[2,24] These discrepancies could likely be due to differences in the test sensitivity and other characteristics. In the present study, the Pap test showed higher sensitivity (94.12%) compared with the VIA test (82.35%), indicating fewer false negatives, agreeing with the Yasmin et al. study (84.35% for the Pap test and 82.61% VIA test). However, a study reported higher sensitivity for VIA.[22,15] The specificity of the Pap test was also superior at 64.52% versus 25.8% for VIA, supported by findings from Jain et al. study (88.22% for Pap test and 55.55% for VIA). [25]Although a study noted higher specificity for VIA.[15] Additionally, the Pap test had a PPV of 59.26%, which is higher than VIA's 37.84%, agreeing with findings from another study.[15] Finally, the NPV for the Pap test was 95.24% and for the VIA test was 72.73%, indicating a higher NPV for the Pap test. This is consistent with a study where the NPV for the Pap test was also higher than that for the VIA test.[26]

Conclusions

The results of this study confirm that both Pap smear and VIA tests possess high sensitivity and, to a lesser extent, specificity, making them highly effective as screening tools for cervical cancer. These tests are precise and cost-effective, and their diagnostic value is nearly equivalent, facilitating timely detection and treatment of the disease. Given their high efficacy, these tests can be widely utilized in diverse and resource-limited settings.

Conflict of interest

The authors declare no conflict of interest.

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