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Research Paper

Colposcopic Evaluation of Cervix in Symptomatic Women and Its Correlation with Pap Smear Among Patients Attending the Gynecology Outpatient's Department of Maternity Teaching Hospital in Erbil / 2023

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ABSTRACT:

BACKGROUND:

Cervical cancer ranks as the fourth most prevalent cancer globally, posing a significant public health challenge. Early detection is vital to reducing mortality and improving survival outcomes. Pap smear, colposcopy, and histopathological examination are pivotal diagnostic tools in identifying premalignant cervical lesions. While Pap smear is widely used for cervical cancer screening, colposcopy offers a magnified visual assessment of the cervix, and histopathological examination serves as the gold standard for definitive diagnosis.

OBJECTIVE:

This study aimed to compare the diagnostic accuracy of Pap smear and colposcopy against histopathological examination in detecting premalignant and malignant cervical lesions among symptomatic women.

PATIENTS AND METHODS:

A cross-sectional study was conducted at the Gynecology Outpatient Department of Maternity Teaching Hospital in Erbil City, Kurdistan Region, Iraq, from January 1 to August 31, 2023. A total of 150 women presenting with postcoital bleeding, vaginal discharge, or intermenstrual bleeding were enrolled. Cervical cancer symptoms were identified by a senior gynecologist. Colposcopy was performed by a specialist gynecologist, and Pap smears were collected by the researcher. Histopathological examination, serving as the reference standard, was conducted in the hospital laboratory. Diagnostic performance metrics, including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy, were calculated.

RESULTS:

Colposcopy demonstrated a sensitivity of 84.5%, specificity of 100%, PPV of 90.4%, NPV of 65.2%, and accuracy of 82.6%. In comparison, Pap smear showed a sensitivity of 88%, specificity of 94.4%, PPV of 100%, NPV of 70.2%, and accuracy of 88.6%. Pap smear outperformed colposcopy in diagnostic accuracy for detecting cervical lesions.

CONCLUSION:

Pap smear demonstrated superior diagnostic accuracy over colposcopy for cervical lesions. Combined use enhances evaluation of symptomatic women, yet limitations like Pap smear's lower NPV and colposcopy's reduced sensitivity underscore the necessity for integrated diagnostic approaches to optimize cervical cancer detection.

KEYWORDS: Colposcopy, Pap Smear, Symptomatic women, Cervical Cancer.

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Iraqi Postgraduate Medical Journal, 2026; Vol.25 (1): 40-47

DOI: 10.52573/ipmj.2025.155324 *Received: April 13, 2025* *Accepted: June 16, 2025*

INTRODUCTION:

Cervical cancer remains a significant global public health challenge, ranking as the fourth most common cancer among women worldwide [1]. In 2022, an estimated 660,000 new cases and 350,000 deaths were reported globally, with 94% of these deaths occurring in low- and middle-income countries (LMICs). Regions such as sub-Saharan Africa, Central America, and South-East Asia bear the highest burden, highlighting the urgent need for effective preventive measures, including widespread HPV vaccination, robust screening programs, and timely treatment of precancerous lesions. The World Health Organization (WHO) has established ambitious targets for 2030, aiming to vaccinate 90% of girls against HPV by age 15, screen 70% of women with high-performance tests by ages 35 and 45, and ensure 90% of women with cervical disease receive appropriate treatment. Achieving these targets could prevent an estimated 74

million new cases and 62 million deaths by 2120, underscoring the critical importance of early detection and intervention [3].

Persistent infection with high-risk human papillomavirus (HPV) strains, particularly HPV 16 and 18, is the primary etiological factor for cervical cancer, accounting for approximately 70% of cases globally. Sexual transmission is the predominant route of infection, with risk factors including early sexual debut, multiple sexual partners, and exposure to high-risk partners [4]. Additional risk factors such as obesity, poor dietary habits, long-term contraceptive use, smoking, and immunosuppression (e.g., HIV infection) further exacerbate susceptibility to cervical cancer [5]. Although most HPV infections are transient and resolve spontaneously due to immune clearance, a small proportion progress to squamous intraepithelial lesions, which can develop into invasive carcinoma over a period of 10–20 years. This prolonged pre-invasive stage provides a critical window for early detection and intervention, making cervical cancer a largely preventable disease through effective screening programs [6].

Cervical cancer screening primarily relies on two modalities: Pap smear and colposcopy. The Pap smear, a widely available and cost-effective tool, has been the cornerstone of cervical cancer screening for decades. It enables the detection of premalignant lesions, such as cervical dysplasia, as well as inflammatory conditions at an early stage [7]. However, its diagnostic accuracy is variable, with sensitivity ranging from 53% to 78% and specificity reaching up to 96.8% for high-grade lesions (CIN II and III) [8]. Colposcopy, on the other hand, provides a magnified visual assessment of the cervix, facilitating targeted biopsies and offering immediate results. While colposcopy demonstrates a sensitivity of approximately 60% for cervical intraepithelial neoplasia (CIN), this increases to 90% when combined with cytology. However, its specificity remains relatively low (50%), and its diagnostic accuracy is highly dependent on the expertise of the colposcopist [7,9].

The American Cancer Society (ACS) provides evidence-based recommendations for cervical cancer screening, emphasizing the importance of early detection and prevention. The ACS highlights the use of Pap smear (cytology) as the primary screening tool for identifying precancerous and cancerous cervical lesions, with HPV testing recommended as a co-test for women aged 30 and older, given the central role of HPV in cervical carcinogenesis. For abnormal Pap smear or HPV test results, colposcopy is recommended to visually examine the cervix and guide targeted biopsies, thereby enhancing diagnostic accuracy. Histopathological examination of these biopsies serves as the gold standard for confirming cervical cancer and determining the severity of lesions, which is critical for guiding treatment decisions [8,10].

On the other hand, a study by Arbyn et al. systematically reviewed cervical cancer screening guidelines and practices across 11 countries to identify variations, challenges, and best practices in implementing effective screening programs. Key findings revealed that while Pap smears remain widely utilized, their effectiveness is contingent on sample quality and cytological expertise. In contrast, HPV testing is increasingly adopted due to its higher sensitivity. Colposcopy and histopathology were identified as critical components for definitive diagnosis. The study concluded that tailored, resource-appropriate screening programs, particularly in LMICs, along with standardized guidelines, are essential for improving global cervical cancer outcomes [11].

Despite their widespread use, both Pap smear and colposcopy have inherent limitations, particularly in resource-limited settings. The accuracy of these methods is influenced by technical factors, clinician expertise, and patient adherence. While Pap smear is more accessible, its variable sensitivity poses challenges in detecting early-stage lesions. Colposcopy, although more accurate in symptomatic women, requires specialized training and infrastructure, which are often lacking in LMICs [12]. This gap in diagnostic accuracy and accessibility underscores the need for comparative studies to evaluate the performance of these modalities in real-world settings, particularly in regions with a high cervical cancer burden.

In Iraq, cervical cancer remains understudied, yet available data suggest a growing burden, particularly in regions with limited access to screening and vaccination services. A study conducted in Baghdad highlighted low awareness and utilization of Pap smear screening among women, with only 12% reporting prior screening [13]. Similarly, a study in Erbil identified cultural barriers and inadequate healthcare infrastructure as significant obstacles to early detection efforts [14]. These findings emphasize the need for context-specific strategies to improve screening uptake and diagnostic accuracy in Iraq.

This study aims to compare the diagnostic accuracy of Pap smear and colposcopy against

histopathological examination, the gold standard, in symptomatic women in Erbil, Iraq. By evaluating the sensitivity, specificity, and predictive values of these methods, this research seeks to inform evidence-based screening strategies tailored to the Iraqi context, ultimately contributing to global efforts to reduce cervical cancer morbidity and mortality.

PATIENTS AND METHODS:

This cross-sectional study conducted in gynecology outpatient's department of Maternity Teaching Hospital in Erbil City-Kurdistan region /Iraq through the period of eight months from 1st of January till 31st of August, 2023.

All women with sign & symptoms suspicious for cervical cancer and abnormal pap smear presented to gynecology outpatients department were eligible and invited to participate in the study. **Inclusion criteria include:** Age 18-60 years; women with symptoms like post-coital bleeding, intermenstrual bleeding, vaginal discharge and dyspareunia; and women with a clinically unhealthy cervix like erosions, bleeding on touch, leukoplakia or keratinization; and women with pap smear showing dysplasia. **Exclusion criteria include:** Age less than 18 years and more than 60 years**;** postpartum bleeding; virgin; prior cervical cancer**;** pre-invasive disease of cervix; total hysterectomy; pregnant women; women refused to participate.

study's purpose, procedures, risks, and benefits. Data regarding the demographic characteristics of the sampled women like age, age at marriage and parity history were collected in addition to social and clinical characteristics like socioeconomic status, educational level, contraception, smoking history, family history of cervical cancer and history of sexually transmitted diseases. Moreover, cervical cancer symptoms like post-coital bleeding, intermenstrual bleeding, vaginal discharge and dyspareunia are also recorded.

For every participant, pap smear was implemented by the researcher using the standard technique and a sample was sent to the pathology laboratory for cytological evaluation. Then, colposcopy was performed by senior Gynecologist and a biopsy was taken and sent for histopathological examination for confirming or excluding any pre invasive and invasive changes of the cervix. Interpretation of colposcopy findings was done by Colposcopist through Swede score.

The histopathology for the biopsy specimens was implemented in Erbil Maternity Teaching Hospital Laboratory and the pathologist interpreted the results depending on Bethesda system. Results were categorized as normal, low-grade squamous intraepithelial lesion (LSIL), high-grade squamous intraepithelial lesion (HSIL), or invasive carcinoma.

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics summarized the demographic and clinical characteristics, while the correlation between Pap smear and colposcopic findings was assessed using appropriate statistical tests (chi-square test and Spearman's correlation). Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of Pap smear compared to colposcopy and histopathology were calculated, with a p-value of <0.05 considered statistically significant.

Ethical approval was taken from Iraqi Board of Medical Specialties and an agreement was taken from hospital authorities. Additionally, oral informed consent was taken from women enrolled in the study and confidentiality of their information were assured.

RESULTS:

This study included 150 symptomatic women. The general characteristics of the recruited sample are illustrated in table 1.

Table 1: General characteristics of symptomatic women, N=150.

Variable		No.	%
Age group	18-29	26	17.3
	30-39	58	38.7
	40-49	63	42.0
	50-59	3	2.0
Age at marriage	<18 years	99	66.0
	≥18 years	51	34.0
Parity	Nulliparity	6	4.0
	1-2	45	30.0
	3-4	41	27.3
	≥5	58	38.7
Socioeconomic status	Low	53	35.3
	Middle	97	64.7
Educational level	Un-Educated	22	14.7
	High school	56	37.3
	University	72	48.0
Contraception	Natural	55	36.7
	IUCD	47	31.3
	Pills	48	32
Smoking	Yes	71	47.3
	No	79	52.7
Family history of cervical cancer	Yes	24	16.0
	No	126	84.0
History of sexually transmitted diseases	Yes	91	60.7
	No	59	39.3

1. Distribution of Histopathological Findings

Histopathological examination revealed the following distribution of cervical conditions:

- Cervicitis: 78 cases (52%)
- Koilocytosis: 53 cases (35%)
- CIN1: 33 cases (22%)
- CIN2: 18 cases (12%)
- Invasive Carcinoma: 12 cases (8%)

For analysis, cervical conditions were categorized into two groups:

Non-Invasive (Cervicitis, Koilocytosis, CIN1): 134 cases (89%)

Invasive (CIN2, Invasive Carcinoma): 16 cases (11%)

2. Correlation of cervical CA:

The correlation of the cervical carcinoma in our patients with their demographic characteristics and the presenting symptoms was investigated and a highly statistically significant correlation was illustrated for cervical carcinoma with increased age of women, earlier age at marriage, grand multi-parity, low socioeconomic status, low educational level, IUCD contraception, positive history of smoking and family history of cervical cancer. Yet, no significant influence was observed for the family history of sexually transmitted diseases in the incidence of cervical cancer among the participants of our study. Identically, the presenting symptoms for the recruited women like post coital bleeding, dyspareunia, and intermenstrual bleeding proved a statistically significant correlation with the findings of cancer through the histopathological examination.

3. Diagnostic Performance of Pap Smear: Pap smear results were classified as:

- Normal: 45 cases
- ASCUS (Atypical Squamous Cells of Undetermined Significance): 22 cases
- LSTL (Low-Grade Squamous Intraepithelial Lesion): 30 cases
- HSTL (High-Grade Squamous Intraepithelial Lesion): 20 cases
- Suspicious/Invasive: 33 cases

Using histopathology as the reference, the sensitivity, specificity, PPV, NPV, and accuracy of Pap smear were calculated (Table 2):

Table 2: Diagnostic performance metrics for Pap smear, N=150.

Parameter	Value
Sensitivity	88.2%
Specificity	94.4%
Positive Predictive Value (PPV)	100%
Negative Predictive Value (NPV)	70.2%
Accuracy	88.6%

4. Diagnostic Performance of Colposcopy:

Colposcopy findings were classified as:

- Normal: 30 cases
- Inflammatory Changes: 40 cases
- Abnormal Findings (Erosion, Congestion, Hypertrophy): 80 cases

Using histopathology as the reference, the sensitivity, specificity, PPV, NPV, and accuracy of colposcopy were calculated (Table 3):

Table 3: Diagnostic performance metrics for colposcopy, N=150.

Parameter	Value
Sensitivity	84.5%
Specificity	100%
Positive Predictive Value (PPV)	90.4%
Negative Predictive Value (NPV)	65.2%
Accuracy	82.6%

5. Cross-Tabulation of Pap smear against Histopathology:

The cross-tabulation of Pap smear results against histopathology is shown in tables 4 and figure 1:

Table 4: Cross tabulation of Pap smear against Histopathology, N=150.

Histopathology	Pap Smear Normal	Pap Smear Abnormal	Total
Non-Invasive	**40**	**94**	**134**
Invasive	**5**	**11**	**16**
Total	**45**	**105**	**150**

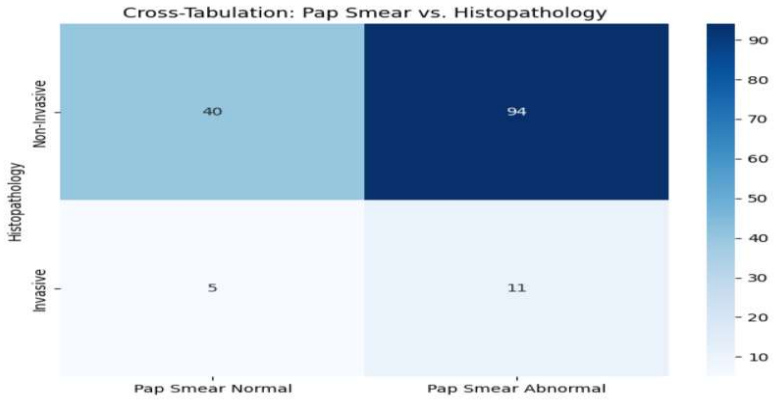

Figure 1: Heat map demonstrate the crosstabulation of pap smear against histopathology.

6. Cross-Tabulation of Colposcopy against Histopathology:

The cross-tabulation of Colposcopy results against histopathology is shown in tables 5 and figure 2:

Table 5: Cross tabulation of colposcopy against Histopathology, N=150.

Histopathology	Colposcopy Normal	Colposcopy Abnormal	Total
Non-Invasive	30	104	134
Invasive	0	16	16
Total	30	120	150

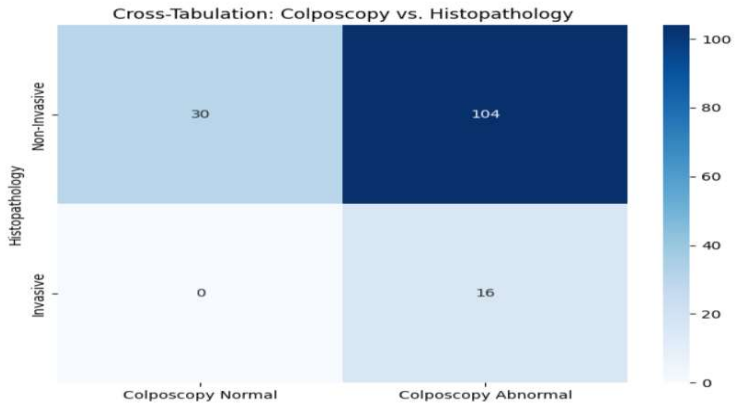

Figure 2: Heat map demonstrate the crosstabulation of colposcopy against histopathology.

DISCUSSION:

The aim of cervical cancer screening tests is to precisely separate women with high-risk from those with low-risk disease and to reduce the false negative results to reach the goal of early detection and management with lowering of mortality rates taking in consideration the cost-effectiveness. In the current study, maximum patients (42%) belonged to age group 40-49 year, which matches the observation of recent Indian study by Rampuria S. in 2023, in which third of the recruited females belonged to age group 41-50 [15]. Though, unlike our findings, the maximum patients of a similar studies by Indu et al, Kalyankar et al, Shaki et al and Thobbi et al, were in the age group of 31-40 years [16-19]. This could be explained by the fact that our patients may present with symptoms lately, though it may be the appropriate age for presenting as many studies considered women age between 40 -50 years as the common age for cervical cancer and its precursor lesions occurred 5 to 10 years earlier [20]. On the other hand, about two thirds of our participants married earlier than 18 years of age, which goes with the traditional norms of our society and similarly reported in studies of analogous society like Rampuria study in India [15].

Histopathological examination revealed that 52% of cases had cervicitis, followed by koilocytosis (35%), CIN1 (22%), CIN2 (12%), and invasive carcinoma (8%). When categorized, 89% of cases were non-invasive (cervicitis, koilocytosis, CIN1), while 11% were invasive (CIN2, invasive carcinoma). These findings are consistent with prior research indicating that cervicitis and low-grade lesions are more prevalent than high-grade or invasive lesions in symptomatic women [21]. The correlation analysis demonstrated that cervical carcinoma was significantly associated with older age, early marriage, grand multiparity, low socioeconomic status, low educational level, IUCD use, smoking, and a family history of cervical cancer. The association for histopathology with age at marriage supporting previous studies by Kushtagi et al, Sherwani et al, Manjith et al, Verma et al, and Kaveri et al who elucidated the increment in the severity of CIN with increase in the duration of marital life [22-24,16,25]. However, no significant association was found with a history of sexually transmitted diseases, contrasting with some studies that have linked HPV infection, a major cause of cervical cancer, to sexually transmitted infections [26]. Symptoms such as post-coital bleeding, dyspareunia, and intermenstrual bleeding were significantly correlated with histopathological findings of cancer, underscoring their clinical relevance in identifying high-risk patients.

The diagnostic performance of Pap smear was evaluated, with results showing a sensitivity of 88.2%, specificity of 94.4%, PPV of 100%, NPV of 70.2%, and accuracy of 88.6%. These results are comparable to those reported by Lee et al. (2020), who found a sensitivity of 85% and specificity of 92% for Pap smear in detecting cervical abnormalities [27]. However, the high PPV in this study suggests that abnormal Pap smear results are highly indicative of true pathology, while the relatively lower NPV highlights the need for adjunctive tests in cases of normal results. Colposcopy, on the other hand, demonstrated a sensitivity of 84.5%, specificity of 100%, PPV of 90.4%, NPV of 65.2%, and accuracy of 82.6%. The high specificity and PPV of colposcopy align with findings by Garcia et al. (2019), who reported that colposcopy is highly reliable for identifying abnormal cervical lesions [28]. However, the lower sensitivity and NPV

compared to Pap smear suggest that colposcopy may miss some cases, particularly early or subtle lesions.

Cross-tabulation of Pap smear and colposcopy results against histopathology revealed that Pap smear identified 94 out of 134 non-invasive cases and 11 out of 16 invasive cases as abnormal, while colposcopy identified 104 non-invasive and all 16 invasive cases as abnormal. These findings underscore the complementary roles of Pap smear and colposcopy in cervical evaluation, aligning with previous studies that have demonstrated Pap smear as an effective initial screening tool for detecting abnormalities, while colposcopy offers a more definitive and detailed assessment of suspicious lesions, thereby enhancing diagnostic accuracy and guiding appropriate clinical management [29]. This dual approach is supported by the World Health Organization, which recommends combining cytology and colposcopy for optimal cervical cancer screening in resource-limited settings [30].

CONCLUSION & RECOMMENDATIONS:

This study underscores the importance of demographic and clinical risk factors in identifying women at higher risk for cervical carcinoma. The high diagnostic accuracy of Pap smear and colposcopy, particularly when used together, reinforces their value in the evaluation of symptomatic women. However, the limitations of each method, such as the lower NPV of Pap smear and the lower sensitivity of colposcopy, highlight the need for integrated diagnostic strategies. Future studies should explore the role of HPV testing and advanced imaging techniques to further improve diagnostic accuracy and patient outcomes.

Authorship Contribution Funding:

The author, Aveen Arsalan, is the sole contributor to this work. Arsalan conceived the study, designed the methodology, conducted the research, analyzed the data, and wrote the manuscript in its entirety.

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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