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Original article

Correlation between pap smear, colposcopy, and histopathology among women with unhealthy cervices – A retrospective study

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Abstract

Background: Cervical cancer is a major cause of morbidity and mortality among women, making early detection crucial. The Pap smear, colposcopy, and histopathology are key diagnostic tools used to identify cervical abnormalities. The Pap smear is a common screening test, but it may not always provide conclusive results. Colposcopy, used after an abnormal Pap smear, allows for closer examination of the cervix and guides biopsy for histopathological analysis. Histopathology remains the gold standard for diagnosing cervical lesions. ***Objective:*** To assess the correlation between pap smear results, colposcopy findings, and histopathological outcomes in women with abnormal cervixes. ***Methodology:*** A total of 56 women with abnormal cervical conditions were included. Data were collected on age, clinical diagnosis, human papillomavirus (HPV) status, Pap smear results, colposcopic findings, and histopathological diagnoses. The correlations between the diagnostic methods were analyzed using appropriate statistical tests. ***Results:*** The mean age of the participants was 36.21 ± 7.30 years. The most common clinical diagnoses were vaginal discharge (53.6%) and unhealthy cervix (21.4%). HPV was positive in 28.6% of cases. Pap smear results showed that 57.1% of women had negative findings, 35.7% had ASCUS, and 3.6% had HSIL. Colposcopy revealed CIN in 53.6% and squamous metaplasia in 28.6%. Histopathology indicated cervicitis in 75.0% and CIN in 25.0%. Significant correlations were found between colposcopy and histopathological findings ($p = 0.001$). ***Conclusion:*** The study highlights the importance of using multiple diagnostic tools—Pap smear, colposcopy, and histopathology—to accurately assess and detect cervical abnormalities early. The strong correlation between colposcopy and histopathology suggests that colposcopy may be a more dependable method for detecting CIN, particularly in women with abnormal screening results.

Keywords: Colposcopy, PAP smear, Histopathology, Cervix

Introduction:

Cervical cancer is one of the most prevalent gynecological malignancies worldwide and a leading cause of mortality among women. An unhealthy cervix refers to a range of chronic cervical lesions, including chronic cervicitis, endocervicitis, cervical erosions, lacerations, polyps, and leukoplakia. Even when a Pap smear result is negative, these lesions can harbor premalignant conditions that may

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go undetected.[1]

The Pap smear remains the gold standard for cervical screening; however, the screening protocol also recommends colposcopy and colposcopically directed biopsy of the cervix. Colposcopy is an optical technique that allows for the visualization of the lower female genital tract under bright illumination and stereoscopic vision. This simple, non-invasive outpatient procedure helps determine the location, size, and extent of abnormal cervical lesions, guiding biopsy site selection and informing appropriate treatment decisions.[2-8]

Colposcopy complements cytology, where cytology (Pap smear) is the laboratory method, and colposcopy is the clinical method for detecting cervical abnormalities. Colposcopy is not merely an intermediate step between cytologic screening and histologic diagnosis; it plays a crucial role in confirming the diagnosis. Colposcopically guided biopsy of suspicious areas provides the final diagnosis, serving as the gold standard for detecting intraepithelial lesions.[2,3,9,10]

Histopathological confirmation is the final gold standard in diagnosis. However, in developing countries like India, implementing cytology-based screening programs is challenging due to limitations such as a lack of trained personnel, infrastructure, and resources, as well as high costs. Furthermore, these programs have limitations, including low sensitivity and high false-negative rates.[2,3,11-13] Despite these challenges, screening efforts have significantly reduced cervical cancer rates globally, although the developing world still accounts for 90% of cervical cancer-related deaths.[14,15]

In developing countries, the incidence and prevalence of cervical cancer remain high due to the absence of widespread screening programs. Colposcopy, a diagnostic procedure that allows magnified examination of cervix and vulvar tissue, is particularly effective in identifying premalignant and malignant lesions due to their distinct visual characteristics. The colposcope aids in differentiating between normal and abnormal areas of the cervix and facilitates direct biopsy or surgery for pathological analysis. The primary aim of colposcopy is to detect and treat precancerous lesions at an early stage, thereby preventing the development of cervical cancer.[14,15] As cervical cancer has a lengthy pre-invasive phase, early detection through screening can significantly reduce its incidence.[14,16] This study is to assess the correlation between pap smear results, colposcopy findings, and histopathological outcomes in women with abnormal cervices.

Materials and methods

This comparative cross-sectional study was conducted in the Department of Obstetrics and Gynecology, KPJ Specialized Hospital, Dhaka, Bangladesh., from November 2023 to October 2024. Participants were selected based on specific criteria: having an unhealthy cervix on pelvic examination, recurrent vaginitis, postcoital bleeding or both. Patients who had previously been diagnosed with cervical malignancy or received treatment were excluded from the study. The sample size of 56 participants was included. Data were collected by documenting the results of colposcopy and histology reports. Any abnormal features observed during colposcopy—such as acetowhite areas or atypical vascular patterns—were classified as abnormal findings, irrespective of their degree of severity. All participants then underwent biopsy for histopathological examination. Histological changes were classified as normal and CIN or invasive carcinoma. Patients with human papillomavirus (HPV)-related changes or other borderline conditions were not included in the study. The data collected were analyzed using SPSS for windows 25.

Result:

The study included 56 subjects, with a mean age of 36.21 ± 7.30 years (Table 1). The most common diagnosis among the participants was vaginal discharge, affecting 53.6% of the subjects. Other diagnoses included vaginal discharge (7.1%), polymenorrhagia (3.6%), unhealthy conditions (21.4%), metrorrhagia (10.7%), and postmenopausal bleeding (3.6%) (Table 2). Human papillomavirus (HPV) status was positive in 28.6% of the participants and negative in 71.4%. This indicates that the majority of the women in the study did not have an HPV infection (Table 3). For PAP smear results, the majority of the participants (57.1%) had a negative result, followed by 35.7% with ASCUS and small proportions with normal (3.6%) or HSIL results (3.6%). In colposcopic findings, 53.6% of the women had cervical intraepithelial neoplasia (CIN), while 28.6% showed squamous metaplasia, and 17.9% had normal results. Histopathology revealed cervicitis in 75% of the participants, while 25% had CIN (Table 4).

Correlation between PAP smear and colposcopic findings showed that among women with ASCUS result, 46.7% had normal colposcopy findings, while 20% had CIN, and 25% had squamous metaplasia. There was a significant portion of women with negative PAP smears (46.7%) who had CIN (80%) and squamous metaplasia (62.5%) (Table 5). The correlation between PAP smear results and histopathological findings revealed notable discrepancies. Among women with negative PAP smears, 57.1% were diagnosed with cervicitis, while an equal proportion, 57.1%, were found to have cervical intraepithelial neoplasia (CIN) upon histopathological examination. This highlights that a negative PAP smear does not always rule out underlying cervical pathology, emphasizing the importance of histopathological confirmation for accurate diagnosis (Table 6). Correlation of colposcopy and

histopathological examination. All women with CIN on colposcopy (100%) had CIN on histopathology, while 38.1% with CIN on colposcopy had cervicitis on histopathology (Table 7).

Table 1: Age distribution of the study subject (n=56)

Age in years	Frequency	Percentage (%)	Mean ± SD
22-30	14	25.0	36.21±7.30
31-40	28	50.0	
41-50	12	21.4	
51-60	2	3.6	

Table 2: Diagnosis of the study subject (n=56)

Diagnosis	Frequency	Percentage (%)
Vaginal discharge	4	7.1
Vaginal discharge	30	53.6
Polymenorrhagia	2	3.6
Unhealthy	12	21.4
Metrorrhagia	6	10.7
Post menopausal bleeding	2	3.6

Table 3: HPV of the study subject (n=56)

HPV	Frequency	Percentage (%)
Positive	16	28.6
Negative	40	71.4

Table 4: Distribution of women according to PAP smear, colposcopic and histopathological findings (n=56)

PAPS	Frequency	Percentage (%)
Normal	2	3.6
Ascus	20	35.7
HSIL	2	3.6
Negative	32	57.1
Colposcopy		
Normal	10	17.9
CIN	30	53.6
Squamous metaplasia	16	28.6
Histopathology		
Cervicitis	42	75.0
CIN	14	25.0

Table 5: Correlation of PAP Smear and colposcopic finding

PAPS	Colposcopic findings			P value
	Normal (n=30)	CIN (n=10)	Squamous metaplasia (n=16)	
	No.(%)	No.(%)	No.(%)	
Normal	0(0)	0(00)	2(12.5%)	0.104
Ascus	14(46.7%)	2(20%)	4(25%)	
HSIL	2(6.7%)	0(00)	0(00)	
Negative	14(46.7%)	8(80%)	10(62.5%)	

Data were analyzed using chi-square test

Table 6: Correlation of PAP smear and histopathological examination (n=56)

PAPS	Histopathological examination		P value
	Cervicitis (n=42)	CIN (n=14)	
	No.(%)	No.(%)	
Normal	2(4.8%)	0(00)	0.659
Ascus	14(33.3%)	6(42.9%)	
HSIL	2(4.8%)	0(00)	
Negative	24(57.1%)	8(57.1%)	

Data were analyzed using fisher exact test

Table 7: Correlation of colposcopy and histopathological examination (n=56)

Colposcopy	Histopathological examination		P value
	Cervicitis (n=42)	CIN (n=14)	
	No.(%)	No.(%)	
Normal	10(23.8%)	0(00)	0.001
CIN	16(38.1%)	14(100%)	
Squamous metaplasia	16(38.1%)	0(00)	

Discussion

Abnormal cervix conditions include chronic cervicitis (such as endocervicitis), cervical erosions, lacerations, and leukoplakia. Even if the Pap smear is negative, these lesions can be precancerous. Most early-stage cervical cancers are asymptomatic. Therefore, a diagnosis is typically made after histological analysis of biopsies obtained during colposcopy or from visibly abnormal cervical tissue.

Cervical invasive cancer is considered preventable due to its prolonged pre-invasive stage, which allows for effective screening and treatment. Routine screening and HPV vaccination are recommended to reduce future cervical cancer prevalence. However, in developing countries like India, cytology-based screening programs have faced limited success due to a lack of trained personnel, inadequate laboratory facilities, high costs, and insufficient follow-up care.[14]

The mean age of the patient in the current study was 36.21 ±7.18 years which was consistent with previous study.[14] In a study on the evaluation of an unhealthy cervix, Gohil et al. observed that most patients (53.33%) were over 40 years.[17] Comparable findings were reported in studies by Upadhyay et al.[18] and Joshi et al.[11], where the mean ages of the patients were 36.4 and 32.2 years, respectively. Other studies by Pimple et al.[19] and Boicea et al.[20] have reported similar patient distributions.

The findings of this study highlight the prevalence of various gynecological conditions among the 56 study subjects, with vaginal discharge being the most frequently diagnosed, affecting more than half of the participants. The second most prevalent diagnosis was unhealthy (21.4%). Metrorrhagia (10.7%), or abnormal bleeding between periods, was also relatively common. The diagnosis of vaginal discharge (7.1%) was less common but could be linked to specific infections or structural abnormalities that require targeted treatment. Polymenorrhagia (3.6%) and post-menopausal bleeding (3.6%) were observed in a smaller proportion of subjects. Similar study Kohale et al.[14] reported white discharge was the most common (73%) symptom, followed by irregular periods of blood loss (11%), post-coital hemorrhage (9%), and postmenopausal bleeding (7%). Savitha et al. also observed that white discharge per vagina was the most common symptom (86%) among cases.[7] Similar findings were reported by Upadhyay et al.[18], Chaudhary et al.[2], and Bhalerao et al.[1]

The distribution of women based on PAP smear, colposcopic, and histopathological findings reveals a wide range of results across these diagnostic tests. In the PAP smear analysis, the majority of women (57.1%) had a negative result, while a significant proportion (35.7%) showed ASCUS (Atypical Squamous Cells of Undetermined Significance). A smaller percentage of women had normal (3.6%) or high-grade squamous intraepithelial lesions (HSIL) (3.6%). Colposcopic examination revealed that most women (53.6%) had cervical intraepithelial neoplasia (CIN), while 28.6% exhibited squamous metaplasia, and 17.9% had normal colposcopic results. Histopathological findings indicated cervicitis in 75% of the women, with 25% diagnosed with CIN. These findings highlight the significant presence of cervical abnormalities in this population, with a high prevalence of cervicitis and CIN, both of which are crucial indicators for cervical health and potential cancer risk. These results align with those from other studies.[4–10] A similar study by Maheshwari et al.[3] found that in a group of 80 women, 40% had ASCUS, 37.5% had LSIL, 15% had HSIL, and 7.5% had ASC-H. All women underwent colposcopy, revealing that 37.5% were normal, 26.3% had CIN I, 21.3% had CIN II, and 15% had CIN III. Histopathological examination showed non-specific cervicitis/inflammation in 35%, CIN 1 in 23.8%, CIN 2 in 22.5%, CIN 3 in 15%, and 3.8% had squamous cell carcinoma.

The correlation between PAP smear and colposcopic findings showed varying associations between the two diagnostic methods. Among women with a normal PAP smear, 12.5% exhibited squamous metaplasia on colposcopy, with no cases of CIN or normal findings. For those with ASCUS on PAP smear, 46.7% had normal colposcopic results, 20% showed CIN, and 25% had squamous metaplasia. No colposcopic findings of CIN or squamous metaplasia were noted in women with HSIL. In women with negative PAP smears, 46.7% had normal colposcopic findings, while 80% had CIN and 62.5% showed squamous metaplasia. The higher prevalence of CIN and squamous metaplasia in women with negative PAP smears underscores the complexity of interpreting PAP smear results and highlights the importance of colposcopy for further evaluation. These findings align with results from other studies.[7–11] A similar study by Maheshwari et al.[3] reported that 40% of ASCUS cases had normal colposcopic findings (21.3%), 16.3% had CIN I, and 2.5% had CIN II. Among LSIL cases (37.5%), 16.3% were normal, 8.8% had CIN I, and 12.5% had CIN II. In ASC-H cases (7.5%), 1.3% had CIN I, 3.8% had CIN II, and 2.5% had CIN III. In HSIL cases (15%), 2.5% had CIN II, and 12.5% had CIN III.

The correlation between PAP smear results and histopathological examination showed varying associations between the two diagnostic methods. Among women with a normal PAP smear, 4.8% were diagnosed with cervicitis, with no cases of CIN observed. In women with ASCUS on PAP smear, 33.3% had cervicitis and 42.9% had CIN, indicating that ASCUS may be linked to both inflammatory and neoplastic changes. For women with HSIL, 4.8% had cervicitis, but no CIN cases were found on histopathology. In the group with negative PAP smears, 57.1% had cervicitis and 57.1% had CIN. A similar study by Maheshwari et al.3 reported that among 80 cases of abnormal PAP smears that underwent biopsy, 40% with ASCUS showed 17.5% nonspecific chronic cervicitis, 13.8% CIN I, and 8.8% CIN II. In 37.5% of LSIL cases, 17.5% had nonspecific chronic cervicitis, 7.5% had CIN I, and 12.5% had CIN II. Among 7.5% ASC-H cases, 2.5% had CIN I, 3.8% had CIN III, and 1.3% had squamous cell carcinoma (SCC). In 15% of HSIL cases, 1.3% had CIN II, 11.3% had CIN III, and 2.5% had SCC.

The correlation between colposcopy and histopathological examination showed an association between colposcopic findings and histopathological diagnoses. Among women with normal colposcopic results, 23.8% had cervicitis. In contrast, all women with CIN detected on colposcopy (100%) were confirmed to have CIN on histopathology. Women with squamous metaplasia on colposcopy showed no histopathological evidence of CIN, but 38.1% were diagnosed with cervicitis. A similar study by Maheshwari et al.3 involving 80 cases that underwent histopathological examination, found that 35% were diagnosed with non-specific cervicitis, 23.8% with CIN 1, 22.5% with CIN 2, 15% with CIN 3, and 3.8% with squamous cell carcinoma. A limitation of this study is that the patient sample was drawn from a single hospital, representing only one geographical area.

Conclusion

This study identified vaginal discharge as the most common clinical presentation, followed by unhealthy symptoms and vaginal discharge. HPV positivity was detected in a notable proportion of the subjects. PAP smear results showed a predominance of negative findings, with a significant number of women having ASCUS. Colposcopic examination revealed cervical intraepithelial neoplasia (CIN) in a considerable proportion of cases, along with squamous metaplasia. Histopathological examination indicated cervicitis in most cases, while CIN was observed in a smaller number. Overall, the study emphasizes the importance of combining diagnostic tools such as Pap smear, colposcopy, and histopathology for the accurate assessment and early detection of cervical abnormalities. The strong correlation between colposcopy and histopathology suggests that colposcopy may be a more reliable method for detecting CIN, especially in women with abnormal screening results.

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