



“COMPARATIVE DIAGNOSTIC ACCURACY OF PAP SMEAR AND COLPOSCOPY IN UNHEALTHY CERVIX: INSIGHTS FROM NORTHEAST INDIA”.

¹*Dr. Pijush Das, ²Dr. Jaharlal Baidya, ³Dr. Sayantan Choudhury, ⁴Dr. Kula Shekhar Bhattacharjee, ⁵Dr. Gopa Paul, ⁶Dr. Nishtha Das,

¹*MS, Medical Officer, Tripura Sundari Sub Divisional Hospital, Udaipur (Tripura), 799120, India, Email: pijush124@gmail.com

²MD, Professor, Department of Obstetrics and Gynaecology, Agartala Government Medical College & Govind Ballabh Pant Hospital, Agartala (Tripura), 799006, India, Email: iamjlbaidya@hotmail.com

³Senior Resident, Department of Obstetrics and Gynaecology, Agartala Government Medical College & Govind Ballabh Pant Hospital, Agartala (Tripura), 799006, India, Email: drsayantanchoudhury@gmail.com

⁴Associate Professor, Department of Pathology, Agartala Government Medical College & Govind Ballabh Pant Hospital, Agartala (Tripura), 799006, India, Email: doctorksb65@gmail.com

⁵Senior Resident, Department of Obstetrics and Gynaecology, Agartala Government Medical College & Govind Ballabh Pant Hospital, Agartala (Tripura), 799006, India, Email: gopapaulagmc@gmail.com

⁶MD Pathology, Medical Officer, Tripura Sundari Sub Divisional Hospital, Udaipur (Tripura), 799120, India, Email: nishthadas94@gmail.com

***Corresponding Author:** Dr. Pijush Das

*MS, Medical Officer, Tripura Sundari Sub Divisional Hospital, Udaipur (Tripura), 799120, India, Mobile Number: +91- 9774539748, Email: pijush124@gmail.com

ABSTRACT

Background: Cervical cancer continues to be a leading contributor to cancer-related morbidity and mortality among women worldwide. Recent epidemiological trends indicate a marked increase in the prevalence of cervical premalignant lesions. Early detection and clinical management of these abnormalities are essential for preventing malignant transformation and facilitating timely therapeutic intervention. **Aim:** The study sought to evaluate the diagnostic accuracy of Pap smear cytology and colposcopy in comparison to histopathological examination of cervical biopsy specimens for the diagnosis of cervical lesions. **Methodology:** This prospective observational study involved 180 women between the ages of 21 and 65 presenting with a clinically unhealthy cervix. Each participant underwent screening through Pap smear, colposcopy, and colposcopically guided biopsy. The findings from these diagnostic methods were systematically compared and analyzed. Final diagnostic correlations for both Pap smear and colposcopy were established using histopathological examination as the gold standard. **Results:** The sensitivity, specificity, Positive Predictive Value (PPV), and Negative Predictive Value (NPV) were assessed and compared between two diagnostic modalities. A total of 180 patients were included in the study, with a mean age of 33.26 ± 7.29 years. The Pap smear demonstrated a sensitivity of 78.1% and a specificity of 91.2%. Its PPV and NPV were calculated as 65.8% and 95.1%, respectively. In comparison, colposcopy yielded a sensitivity of 90.6%, specificity of 94.6%, PPV of 78.4%, and NPV of 97.9%. The overall diagnostic accuracy was

reported to be 88.9% for Pap smear and 93.9% for colposcopy. **Conclusion:** The study indicates that colposcopy exhibits superior diagnostic accuracy compared to Pap smears in identifying cervical premalignant and malignant lesions. Colposcopy and colposcopically guided biopsy should be integrated with Pap smear in cervical cancer screening, given that their combined application yields higher accuracy in identifying cervical abnormalities.

Keywords: Cervical Cancer, Pap smear, Colposcopy, Diagnostic Accuracy, Comparative Study

INTRODUCTION

Cervical cancer remains a devastating disease that affects women globally. Premalignant cells on the cervix are identified based on their structure, particularly in the "transformation zone" where cell types transition.¹ Cervical cancer is the second most common cancer among Indian women between 15 and 44 years old, comprising about 14% of all female cancer cases. The disease poses a significant public health challenge in India, which accounts for 18% of the global burden of invasive cervical cancer. Furthermore, an alarming 80–85% of cases in India are not detected until the advanced stages (III or IV).² The prolonged pre-invasive phase of cervical cancer makes it a preventable disease, provided that comprehensive screening programs are implemented for early detection and appropriate treatment.³ Although human papillomavirus (HPV) DNA testing is the gold standard for screening due to its reproducibility, its expense and reliance on specialized lab facilities pose significant challenges to widespread implementation. This underscores the importance of adopting other ideal preventive measures.⁴

An unhealthy cervix, characterized by the presence of any abnormal growth, ulcer, or vasculature, is a clinically detectable early stage in the life history of cervical cancer. Papanicolaou (Pap) smear cytology continues to be a cornerstone of cervical cancer screening, and a colposcopic evaluation is the recommended follow-up for all patients with abnormal findings. The Pap smear has well-documented limitations, specifically its inconsistent sensitivity (30–87%) and high false-negative rates (15–50%). The integration of alternative diagnostic techniques was prompted by these challenges, with colposcopy serving as a valuable additional tool. Colposcopy allows for magnified viewing (7.5–15×) of the cervix, vagina, and vulva, which improves the detection of precancerous lesions.⁵ Current evidence favors reflex HPV testing for triaging women with atypical squamous cells of undetermined significance (ASCUS). A colposcopic examination is recommended for all women who have either HPV-positive ASCUS (from reflex testing or co-testing) or a low-grade squamous intraepithelial lesion (LSIL) result. While excision and ablation are acceptable treatments for women with a histological diagnosis of CIN 2, CIN 3, or CIN 2/3, this approach excludes pregnant and young women. This is only true if the initial colposcopic examination was adequate.⁶ While other diagnostic methods for cervical pathology are effective, they can produce inaccurate results (false positives or false negatives), making histopathological examination (HPE) of biopsy specimens the gold standard for confirming a diagnosis.⁷

The invasive nature of cervical biopsy, and its associated risks of pain, bleeding, and fibrosis, highlights the urgent need for highly accurate, non-invasive screening tools. This need is further underscored by the fact that the accuracy of Pap smears and colposcopy can vary depending on the skill of the clinician and the quality of the procedure.⁸ The diagnostic accuracy of these tests has been compared in several studies to identify the optimal screening strategy for these patient groups.^{9,10,11,12} While studies exist in India, there is a notable research gap in the Northeast concerning the comparative diagnostic accuracy of Pap smears and colposcopy when correlated with histopathology for cervical precancerous lesions. Therefore, the present study sought to evaluate the diagnostic accuracy of Pap smear cytology and colposcopy in comparison to histopathological examination of cervical biopsy specimens for the diagnosis of cervical lesions in a cohort of women in Northeast India.

METHODOLOGY

Setting

A prospective observational study was conducted for 18 months at the Department of Obstetrics and Gynecology and the Department of Pathology at AGMC & GBP Hospital in Tripura, India. The study included women who were diagnosed with an unhealthy cervix.

Sample size

The study utilized consecutive sampling, a non-probability technique, to enroll 180 patients who met the eligibility criteria. The participants were recruited from an outpatient clinic based on the presenting complaints of profuse white vaginal discharge, post-coital bleeding, menopausal bleeding, or inter-menstrual bleeding. Informed consent was obtained from all subjects before participation. Figure 1 presents the flow diagram of the study.

Inclusion criteria

1. Patients between 21 and 65 years old.
2. Participants who presented with abnormal symptoms such as profuse white vaginal discharge, post-coital bleeding, inter-menstrual bleeding, or post-menopausal bleeding.
3. Patients who had a clinically unhealthy cervix as diagnosed by speculum examination. This included conditions like cervical erosion, cervico-vaginitis, cervical polyps, and condylomata.

Exclusion criteria

1. Patients with bleeding at the time of the examination.
2. Women with a history of a total hysterectomy or a diagnosis of frank invasive cancer.
3. Pregnant women.

Sample Collection Procedures

Following a detailed explanation of the study's protocol, each participant provided informed consent. Subsequently, a clinician proceeded with the collection of the required samples.

Pap smear

All 180 study participants underwent a Pap smear as the initial screening step. The procedure involved positioning the patient in the dorsal lithotomy position, cleaning the vulva, and using a self-retaining Cusco's speculum to collect samples from both the ectocervix and endocervix. Following collection, the sample was smeared onto a glass slide and promptly fixed. The Pap smear was subsequently submitted for cytological examination and assessed according to the Bethesda system guidelines.¹³

Colposcopy

To ensure consistency, one colposcopist was responsible for categorizing all colposcopic findings based on the Swede score.¹⁴ The Swede colposcopic scoring system utilizes five variables: acetowhiteness, margins plus surface, vessel patterns, lesion size, and iodine staining. Each variable is graded from 0 to 2 points, depending on the severity of the observed findings.

Histopathology

A colposcopy-guided biopsy was performed on all patients to obtain tissue for histopathological diagnosis, which was considered the gold standard. A positive histopathological diagnosis was defined as the presence of dysplasia (mild, moderate, or severe), carcinoma in situ (CIS), or squamous cell carcinoma.

Ethical consideration

The Institutional Ethical Committee of AGMC granted ethical approval for this study before its initiation (Ref. No. F.4(6-13)/AGMC/Medical Education/IEC Approval/2022/23118).

Statistical Analysis

All collected data were initially entered into Microsoft Excel 2007, then transferred to SPSS (version 21) for analysis. Qualitative data were summarized using frequencies and percentages, while quantitative data were presented as mean $\pm$ standard deviation (SD). The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for each screening test were calculated using standard formulas. A p-value of less than 0.05 was considered statistically significant.

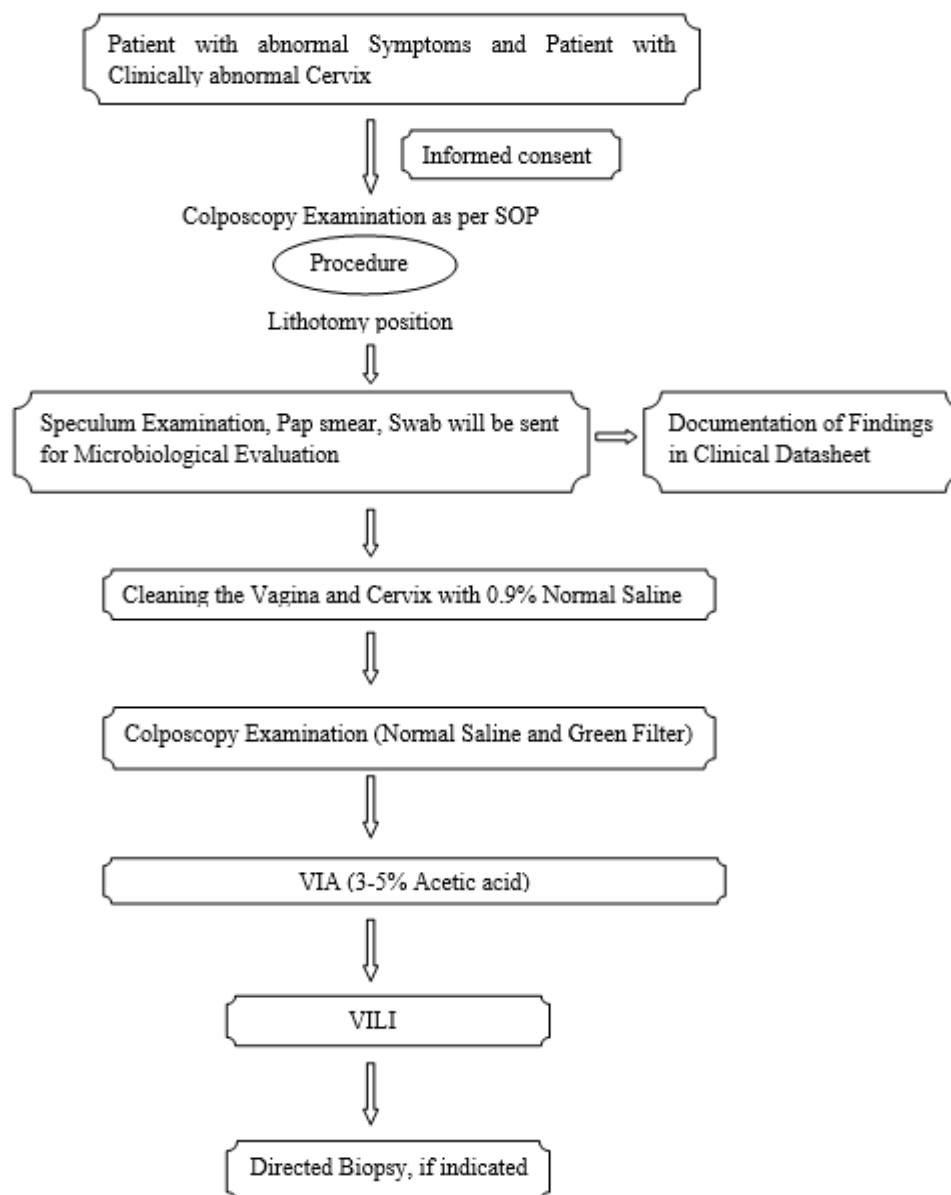


Figure 1: Flow diagram of the study.

RESULTS

The study involved 180 cases of an unhealthy cervix, with an average age of 33.26 years. Nearly half of the participants (46.7%) were under 30, while the remaining cases were evenly split among the 31-

40, 41-50, and 51-60 age groups (17.8% each). In terms of socio-economic status, 57.8% of the cases were from the lower or upper-lower class, 41.6% were from the middle class, and 0.6% were from the upper class. Regarding educational qualifications, 15.6% of the study groups were illiterate. A majority of participants had completed primary (38.9%) or secondary (35.0%) education, while only 10.6% had attained a degree at the graduate level or higher. The most common complaint was profuse white vaginal discharge (63.3%). Less frequent complaints included lower abdominal pain (14.4%), vaginal bleeding (9.4%), post-menopausal bleeding (8.9%), and post-coital bleeding (7.2%).

Normal Pap smear findings were observed in 59.4% of cases. Abnormalities were reported in the remaining patients, with atypical squamous cells of undetermined significance (ASCUS) in 12.2%, low-grade squamous intraepithelial lesions (LSIL) in 7.2%, high-grade squamous intraepithelial lesions (HSIL) in 17.2%, and squamous cell carcinoma in 3.9% (Figure 2). Colposcopy revealed normal findings in 47.2% of cases. Grade 1 changes, suggesting benign or low-grade lesions, were observed in 20.6% of patients. Grade 2 changes, indicative of high-grade lesions, were present in 12.2% of cases. Finally, 8.3% of cases were suspicious for malignancy (Figure 3). Histopathology revealed benign conditions in 82.2% of cases and malignancy in 17.8% of cases (Figure 4).

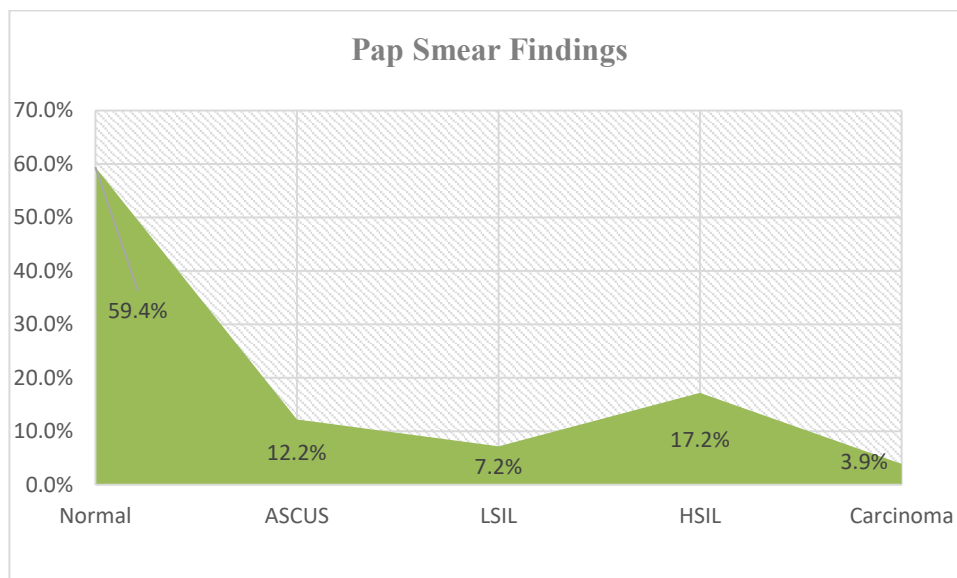


Figure 2: Distribution of PAP smear findings

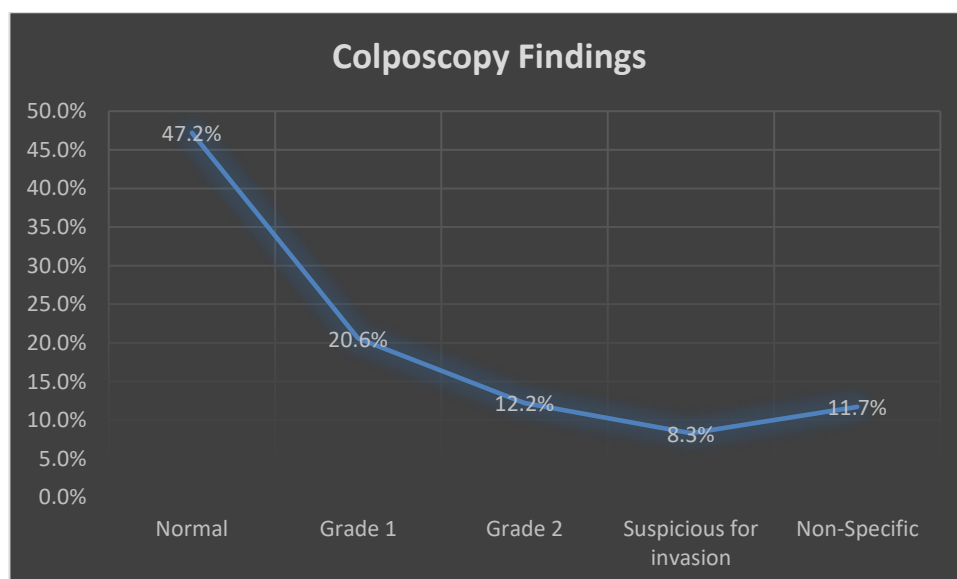


Figure 3: Distribution of Colposcopy findings

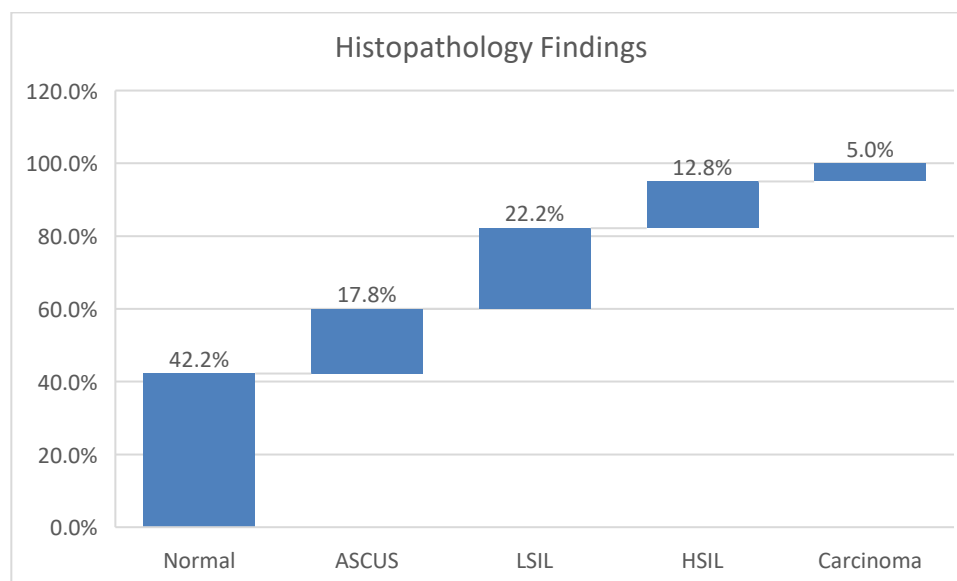


Figure 4: Distribution of Histopathology findings

Table 1 presents the frequency and percentage distribution of participants using different methods. The Pap smear demonstrated a sensitivity of 78.1% and a specificity of 91.2% for differentiating between benign and malignant lesions. The test's positive predictive value (PPV) and negative predictive value (NPV) were 65.8% and 95.1%, respectively, resulting in an overall accuracy of 88.9% (Table 2).

Table 3 indicates that most cancer patients were between 51 and 60 years old (40.0%), with smaller percentages found in the 20-30 (26.7%), 31-40 (20.0%), and 41-50 (13.3%) age groups. Colposcopy demonstrated a high level of accuracy (93.9%) in differentiating between benign and malignant lesions. Its sensitivity was 90.6%, its specificity was 94.6%, and it had a PPV of 78.4% and an NPV of 97.9% (Table 4). Figure 5 illustrates a comparison of diagnostic accuracy between Pap smear and colposcopy.

Table 1: Frequency and percentage distribution of the participants using different methods (n=180)

	Pap Smear		Histopathology		Colposcopy		
	N	%	N	%		N	%
Normal	107	59.4%	76	42.2%	Normal	85	47.2%
ASCUS	22	12.2%	32	17.8%	Grade 1*	37	20.6%
LSIL	13	7.2%	40	22.2%	Grade 2	22	12.2%
HSIL	31	17.2%	23	12.8%	Suspicious for invasion	15	8.3%
Carcinoma	7	3.9%	9	5.0%	Non-Specific	21	11.7%
Total	180	100.0%	180	100.0%	Total	180	100.0%

*As per SWEDE Score

Table 2. Diagnostic accuracy of Pap smear using histopathological examination as the gold standard

Pap Smear	Histopathology		Total	Parameters	%
	Benign	Malignant		Sensitivity	78.1%
Benign	135	7	142	Specificity	91.2%
Malignant	13	25	38	PPV	65.8%
Total	148	32	180	NPV	95.1%
				Efficacy	88.9%

Table 3: Age-specific distribution of cancer

Age group (in years)	No. of malignancy	
	Frequency	Percentage
20-30	04	26.7
31-40	03	20.0
41-50	02	13.3
51-60	06	40.0
Total	15	100

Table 4. Diagnostic accuracy of colposcopy using histopathological examination as the gold standard

Colposcopy	Histopathology		Total	Parameters	%
	Benign	Malignant		Sensitivity	90.6%
Benign	140	3	143	Specificity	94.6%
Malignant	8	29	37	PPV	78.4%
Total	148	32	180	NPV	97.9%
				Efficacy	93.9%

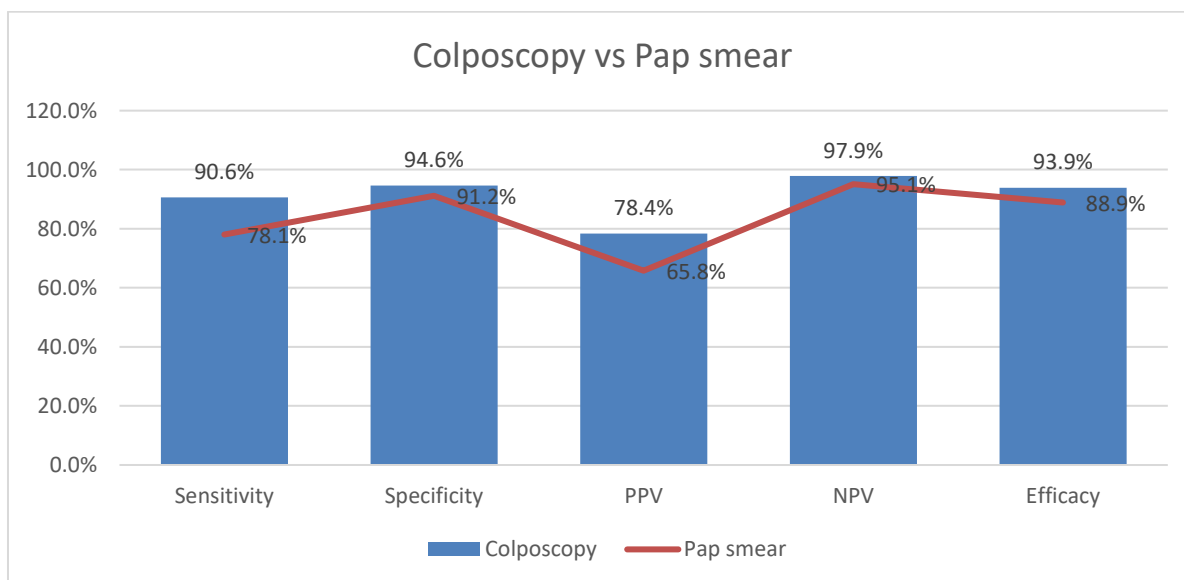


Figure 5: Comparison of diagnostic accuracy between colposcopy and Pap smear

DISCUSSION

Malignant lesions of the cervix represent a prevalent form of genital cancer, particularly among Indian women. While it is well-established that early identification during the preinvasive stage can mitigate both morbidity and mortality, the lack of comprehensive screening programs has resulted in limited public awareness across India.¹⁵ This study aimed to assess the diagnostic accuracy of Pap smear

cytology and colposcopy relative to histopathological evaluation of cervical biopsy specimens in identifying cervical lesions among women in Northeast India.

The accurate detection of cervical premalignant and malignant lesions is essential for effective prevention and timely intervention. In this context, histopathological examination remains the definitive diagnostic standard against which other screening and diagnostic tools—such as the Pap smear and colposcopy—are evaluated. Both Pap smear and colposcopy play pivotal roles in improving patient outcomes.

The Pap smear, introduced as a primary screening tool due to its simplicity and cost-effectiveness, has significantly reduced cervical cancer incidence in many countries. However, its diagnostic accuracy is influenced by factors such as sampling technique, cytological interpretation, and lesion location. Our results showed that the Pap smear achieved a sensitivity of 78.1% and specificity of 91.2%. Colposcopy, on the other hand, provides a magnified visual assessment of the cervix and allows for targeted biopsies of suspicious areas. Our results showed that the colposcopy achieved a sensitivity of 90.6% and specificity of 94.6%,

A comparative study found that colposcopy correlated more closely with histopathological findings than Pap smear, especially in cases of high-grade squamous intraepithelial lesions (HSIL). The authors emphasized that while a Pap smear may yield false negatives due to sampling errors or interpretive limitations, colposcopy allows for direct assessment and guided biopsy, improving diagnostic precision. Despite its high specificity, the relatively lower sensitivity can result in false negatives, particularly in glandular or endocervical lesions.¹⁶

When compared to histopathology, colposcopy demonstrates higher sensitivity, often reported between 65% and 92%. However, the specificity of colposcopy, ranging from 45% to 65%, is relatively lower than that of the Pap smear. This reduced specificity is frequently linked to false-positive results, contributing to excessive biopsy procedures and patient discomfort. In many studies, colposcopy has shown better concordance with histopathological findings than Pap smear, especially in detecting high-grade squamous intraepithelial lesions (HSIL) and carcinoma in situ.¹⁷ In Table 5, the sensitivity and specificity of Pap smear and colposcopy are assessed and contrasted with data from other investigations.

Table 5: Evaluation of Diagnostic Performance Metrics for Pap Smear and Colposcopy

Sl No	Study	Pap Smear		Colposcopy	
		Sensitivity	Specificity	Sensitivity	Specificity
1	Rokade A et al. ¹⁸	19.5%	83.3%	90.2%	72.8%
2	Ashmita D et al. ¹⁹	57%	76%	92%	67%
3	C. P. Padmini et al. ²⁰	24.3%	98.3%	80.4%	81.1%
4	Gandi SR et al. ²¹	69.25%	83.9%	92.3%	60.9%
5	Prasad D et al. ²²	91.7%	45.45%	83.3%	72.7%
6	Rampuria et al. ²³	50%	86.6%	96.4	39.53
7	Present Study	78.1%	91.2%	90.6%	94.6%

The diagnostic accuracy of Pap smear and colposcopy, particularly in terms of sensitivity and specificity, has been shown to vary across different studies. These variations can be attributed to multiple factors, including differences in study populations, methodologies, sample sizes, and the criteria used for interpreting test results. For instance, some studies may report higher sensitivity for colposcopy due to more experienced clinicians or advanced equipment, while others might find the Pap smear more specific in detecting precancerous lesions. Additionally, regional healthcare practices and the prevalence of cervical abnormalities can influence outcomes. This variability underscores the importance of contextualizing diagnostic performance within the framework of each study and highlights the need for standardized protocols to ensure consistent and reliable screening outcomes.

Limitations

However, both methods have limitations. Pap smear may yield false negatives due to inadequate sampling or interpretive errors, while colposcopy is subject to interobserver variability and may miss endocervical lesions not visible on the ectocervix. Despite its clinical utility, colposcopy is constrained by the requirement for specialized resources and the subjective nature of its interpretation. Continued efforts to standardize assessment criteria and improve practitioner training are vital for enhancing its diagnostic reliability. Therefore, histopathological confirmation through biopsy remains indispensable for definitive diagnosis.

CONCLUSION

In conclusion, while a Pap smear is an effective and accessible screening tool, its diagnostic limitations necessitate the use of colposcopy for further evaluation. Although Pap smear remains indispensable for initial screening, colposcopy serves as a crucial adjunct for confirming and characterizing cervical lesions. Histopathological examination is widely regarded as the gold standard for the definitive diagnosis of cervical lesions, providing clear and accurate confirmation of pathological changes. The integrated use of all three diagnostic modalities—Pap smear for initial screening, colposcopy and biopsy for detailed evaluation, and histopathology for final confirmation—collectively enhances the overall diagnostic accuracy in detecting premalignant and malignant cervical conditions.

Acknowledgement: We gratefully acknowledge the valuable insights and assistance provided by Dr. Sukanta Nath, Research Scientist at Atal Bihari Vajpayee Regional Cancer Centre, Agartala, Tripura, in the preparation of this manuscript.

REFERENCES

1. Kohale MG, Dhobale AV, Hatgoankar K, Bahadure S, Salgar AH, Bandre GR. Comparison of Colposcopy and Histopathology in Abnormal Cervix. *Cureus*. 2024;16(2):e54274.
2. Prasad D, Sinha A, Mishra U, Parween S, Raman RB, Goel N. Colposcopic evaluation of cervix in symptomatic women and its correlation with Pap smear. A prospective study at a tertiary care centre. *J Family Med Prim Care*. 2021;10(8):2923-2927.
3. Sachan PL, Singh M, Patel ML, Sachan R. A Study on Cervical Cancer Screening Using Pap Smear Test and Clinical Correlation. *Asia Pac J Oncol Nurs*. 2018;5(3):337-341.
4. Nayak PK, Mitra S, Agrawal S, Hussain N, Thakur P, Mishra B. Role of various screening techniques in detecting preinvasive lesions of the cervix among symptomatic women and women having unhealthy cervix. *J Cancer Res Ther*. 2021;17(1):180-185.
5. Kori A, Ahirwar M, Meravi J, Sirpurkar M, Kumar A. Colposcopic evaluation of unhealthy cervix in gynecology patients: A prospective observational study. *Bioinformation*. 2025;21(7):2001-2005.
6. Barut MU, Kale A, Kuyumcuoğlu U, Bozkurt M, Ağaayak E, Özekinci S, et al. Analysis of Sensitivity, Specificity, and Positive and Negative Predictive Values of Smear and Colposcopy in Diagnosis of Premalignant and Malignant Cervical Lesions. *Med Sci Monit*. 2015;21:3860-3867.
7. Sabbella AN, Hasamnis VA. Comparative Study and Evaluation of Pap Smear and Colposcopy with Histopathology in Cervical Lesions. *European Journal of Cardiovascular Medicine*. 2025;15(3):32-39.
8. Najib FS, Hashemi M, Shiravani Z, Poordast T, Sharifi S, Askary E. Diagnostic Accuracy of Cervical Pap Smear and Colposcopy in Detecting Premalignant and Malignant Lesions of Cervix. *Indian J Surg Oncol*. 2020;11(3):453-458.
9. Chen C, Yang Z, Li Z, Li L. Accuracy of several cervical screening strategies for early detection of cervical cancer: a meta-analysis. *Int J Gynecol Cancer*. 2012;22(6):908-921.

10. Cobucci R, Maissonette M, Macêdo E, Santos Filho FC, Rodovalho P, Nóbrega MM, et al. Pap test accuracy and severity of squamous intraepithelial lesion. *Indian J Cancer*. 2016;53(1):74-76.
11. Karimi Zarchi M, Binesh F, Kazemi Z, Teimoori S, Soltani HR, Chiti Z. Value of colposcopy in the early diagnosis of cervical cancer in patients with abnormal pap smears at Shahid Sadoughi hospital, Yazd. *Asian Pac J Cancer Prev*. 2011;12(12):3439-3441.
12. Singhal A, Raina RK, Verma S, Verma Ashok. Predictive Accuracy of Cervical Cytology and Colposcopy in Diagnosing Premalignant and Malignant Cervical Lesions: A Hospital-based Study from the Sub-Himalayan Region of Indian Subcontinent. *CHRISMED Journal of Health and Research*. 2019;6(1):39-43.
13. Nayar R, Wilbur DC. The Bethesda System for Reporting Cervical Cytology: A Historical Perspective. *Acta Cytol*. 2017;61(4-5):359-372.
14. Alan M, Gunyeli I, Gultekin M, Sancı M, Yuce K. Correlation of Swede score colposcopy scoring system and histopathological results in patients with high-risk HPV infection other than HPV16 and 18. *Int J Gynecol Cancer*. 2020;30(1):35-40.
15. Yadav J, Agarwal S, Jain A. Comparison of Visual Inspection Methods with Pap Smear as Screening Test for Premalignant Lesions of the Cervix. *J Midlife Health*. 2024;15(1):19-24.
16. Singh S, Tyagi SM. Correlation of Pap smear And Colposcopic Findings In Relation To Histopathology In Detection Of Premalignant Lesions Of Cervix. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*. 2020;19(8):13-18.
17. D JC, Rajkumar, DF DBN, K U. Comparison And Correlation Of Pap Smear, Colposcopy, And Histopathology In The Evaluation Of Cervical Pre-Cancer Among Women: Towards Strengthening Early Detection Strategies. *International Journal of Environmental Sciences*. 2025;11(23):47-51.
18. Rokade A, Kshirsagar N, Laddad M. PAP smear versus colposcopy in symptomatic women and women with suspicious-looking cervix. *J Nat Sc Biol Med*. 2021;12:145-148.
19. Ashmita D, Shakuntala PN, Rao SR, Sharma SK, Geethanjali S. Comparison and correlation of PAP smear, colposcopy and histopathology in symptomatic women and suspicious looking cervix in a tertiary hospital care centre. *Int J Health Sci Res*. 2013;3(5):50-59.
20. CP Padmini, Indira N, Chaitra R, Priyanka Das, Girish BC, Nanda Gopal KM, et al. “Cytological and Colposcopic Evaluation of Unhealthy Cervix”. *Journal of Evidence based Medicine and Healthcare*. 2015;2(40):6783-6790.
21. Gandhi SR, Vishwekar PS. A study on correlation of Pap smear, colposcopy and colposcopic directed biopsy in women with unhealthy cervix. *Journal of Evolution of Medical and Dental Sciences*. 2017;6(7):515-519.
22. Prasad D, Sinha A, Mishra U, Parween S, Raman RB, Goel N. Colposcopic evaluation of cervix in symptomatic women and its correlation with Pap smear. A prospective study at a tertiary care centre. *J Family Med Prim Care*. 2021;10(8):2923-2927.
23. Rampuria S, Chandwaskar N. Comparative study of PAP smear and colposcopy with cervical biopsy. *Int J Reprod Contracept Obstet Gynecol*. 2023;12(7):2113-2118.