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Original Research Article

STUDY OF CERVICAL CANCER SCREENING BY PAP SMEAR AND ITS CLINICAL CORRELATION AT A TERTIARY CARE HOSPITAL: A RETROSPECTIVE ANALYSIS OF 500 CASES IN NASHIK

Vidya Aher-Kale[1], Purva More[2], Bharati Deore[3], Pooja Ippar[4], Anagha Mogal[5]

[1]Assistant Professor, Department of Pathology, Dr. Vasantrao Pawar Medical College Hospital and Research Centre, Nashik, Maharashtra, India.
[2]Assistant Professor, Department of Pathology, Dr. Vasantrao Pawar Medical College Hospital and Research Centre, Nashik, Maharashtra, India.
[3]Associate Professor, Department of Pathology, Dr. Vasantrao Pawar Medical College Hospital and Research Centre, Nashik, Maharashtra, India.
[4]Junior Resident, Department of Pathology, Dr. Vasantrao Pawar Medical College Hospital and Research Centre, Nashik, Maharashtra, India.
[5]Junior Resident, Department of Pathology, Dr. Vasantrao Pawar Medical College Hospital and Research Centre, Nashik, Maharashtra, India.

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Corresponding Author:
Dr. Vidya Aher-Kale,
Assistant Professor, Department of Pathology, Dr. Vasantrao Pawar Medical College Hospital and Research Centre, Nashik, Maharashtra, India.
Email: drvidya89@gmail.com

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ABSTRACT

Background: Cervical cancer remains a significant public health challenge in India, accounting for a substantial portion of global mortality. The Papanicolaou (Pap) smear is the standard screening tool for detecting precancerous lesions. However, in resource-limited settings, correlating clinical signs and symptoms with cytological findings is crucial to stratify high-risk patients and improve diagnostic accuracy.

Materials and Methods: This retrospective observational study was conducted at a Tertiary Care Centre in Nashik, Maharashtra, from June 2025 to November 2025. A total of 500 women, aged 21–75 years, were enrolled. Participants underwent a detailed clinical history taking and per-speculum examination followed by a conventional Pap smear. Smears were stained and reported by pathologists. Statistical analysis was performed using the Chi-square test to assess clinical-cytological correlations.

Results: The mean age of participants was 39.5 ± 10.4 years. The most common presenting symptom was vaginal discharge (54.2%), while the most common per-speculum finding was cervical erosion (32.6%). Cytological evaluation revealed that 472 (94.4%) smears were Negative for Intraepithelial Lesion or Malignancy (NILM), of which 68.4% showed inflammatory changes. Epithelial Cell Abnormalities (ECA) were detected in 28 cases (5.6%), comprising ASC-US (2.0%), LSIL (2.2%), HSIL (1.0%), and ASC-H (0.4%). A statistically significant correlation was found between the symptom of post-coital bleeding and the presence of dysplasia ($p < 0.001$). Furthermore, per-speculum findings of cervical erosion with bleeding on touch were significantly associated with HSIL and malignancy ($p < 0.01$).

Conclusion: While inflammatory smears represent the majority of findings in the Nashik region, the presence of post-coital bleeding and specific cervical signs like erosion significantly increases the probability of harbouring premalignant lesions. Clinical correlation combined with Pap screening is essential for effective triage and early management of cervical cancer.

Keywords: Cervical Cancer, Pap Smear, Clinical Correlation, Bethesda System, Dysplasia.

INTRODUCTION

Cervical cancer is the fourth most common cancer among women globally, but in India, it ranks as the second most frequent malignancy in women of reproductive age.[1] Despite being a largely preventable disease due to its long latent phase and well-defined etiology—persistent High-Risk Human Papillomavirus (HR-HPV) infection—morbidity and mortality rates remain unacceptably high in developing nations.[2] The disparity in survival rates between developed and developing countries is largely attributed to the lack of organized, population-based screening programs.

The Papanicolaou (Pap) smear test, introduced over 80 years ago, remains the cornerstone of cervical cancer screening. Its implementation in developed countries has reduced cervical cancer incidence by up to 80%.[3] The reporting of Pap smears has been standardized globally by The Bethesda System (TBS), with the 2019 update providing the most current terminology for effective communication between clinicians and pathologists.[4] TBS classifies findings into Negative for Intraepithelial Lesion or Malignancy (NILM) and Epithelial Cell Abnormalities (ECA), allowing for risk stratification and standardized management algorithms.

However, in many Indian settings, Pap smear screening is opportunistic rather than systematic. Women often present to tertiary care centres only when symptomatic—complaining of leukorrhea (vaginal discharge), pelvic pain, or irregular bleeding.[5] Consequently, the "clinical correlation"—the relationship between what the clinician sees (gross appearance of the cervix) and what the pathologist sees (cytology)—becomes a vital diagnostic metric. While several studies describe cytological patterns, there is a need for more granular data correlating specific clinical signs, such as "cervical erosion" or "hypertrophy," with cytological outcomes in specific demographics.[6]

Nashik, a rapidly urbanizing district in Maharashtra, serves a diverse population comprising both urban dwellers and rural referrals. Recent data on the specific cytological profile and its clinical correlates in this region post-2024 are sparse. Understanding which clinical signs are most predictive of dysplasia can help clinicians in low-resource settings prioritize referrals when cytology results are delayed or equivocal.[7]

The aim of this study is to evaluate the cervical cytopathology spectrum in 500 women at a tertiary care hospital in Nashik and to determine the statistical association between clinical presentation (symptoms and signs) and cytological abnormalities.

MATERIALS AND METHODS

Study Design and Setting: This is retrospective, hospital-based observational study was conducted in the Department of Pathology at a Tertiary Care Centre in Nashik.

Sample Size

A sample size of 500 women ($N = 500$) was determined based on the average outpatient volume and the prevalence of abnormal Pap smears in similar Indian tertiary settings (approx. 5-7%), ensuring adequate power to detect statistical significance in clinical correlations.

Inclusion and Exclusion Criteria

Inclusion Criteria

1. Women aged 21 to 75 years.
2. Women presenting with gynecological symptoms (discharge, bleeding, pain).
3. Asymptomatic women requesting screening.
4. Women willing to give written informed consent.

Exclusion Criteria

1. Pregnant women.
2. Women menstruating at the time of examination.
3. Women with a history of total hysterectomy or known cervical malignancy.
4. Women who had used vaginal medications or douches within 48 hours prior to the test.

Data Collection and Procedure

A structured proforma was used to collect demographic data (age, parity, socioeconomic status) and clinical history (menstrual history, duration of symptoms, contraception use).

Clinical Examination

All patients underwent a thorough general and systemic examination. A per-speculum examination was performed in the lithotomy position under good illumination to visualize the cervix. Clinical findings such as the presence of discharge, hypertrophy, erosion, polyps, or suspicious growths.

Pap Smear Technique

A conventional Pap smear was performed using an Ayre's wooden spatula to scrape the ectocervix (rotating 360 degrees) and a cytobrush for the endocervix. The material was immediately smeared onto clean glass slides and fixed in 95% ethyl alcohol for at least 20 minutes.

Cytological Evaluation

Slides were stained using the rapid Papanicolaou staining method. They were examined by pathologist according to **The Bethesda System (TBS) 2019**. Findings were categorized as:

- **NILM:** Normal, Atrophy, Inflammatory (including specific infections like Candida, Trichomonas, BV).
- **ECA:** Atypical Squamous Cells of Undetermined Significance (ASC-US), Low-grade Squamous Intraepithelial Lesion (LSIL), High-grade Squamous Intraepithelial Lesion (HSIL), Atypical Squamous Cell cannot exclude HSIL (ASC-H) and Squamous Cell Carcinoma (SCC).

Statistical Analysis: Data were entered into MS Excel and analyzed using IBM SPSS Statistics version 27.0. Continuous variables were presented as

mean ± standard deviation (SD). Categorical variables were presented as frequencies and percentages. The **Chi-square test (X^2)** was utilized to determine the statistical significance of the association between clinical findings and cytological abnormalities. A p-value of <0.05 was considered statistically significant.

RESULTS

Demographic Profile: The study comprised 500 women. The age range was 21 to 75 years, with a mean age of 39.5 ± 10.4 years. The majority of women (42%) belonged to the 31–40 years age group. Parity analysis showed that 85% of women were multiparous (Parity ≥ 2).

Clinical Presentation: Table 1 summarizes the clinical profile. The most common presenting symptom was white vaginal discharge (Leukorrhea), seen in 54.2% of patients. On per-speculum examination, 41.4% of cervices appeared healthy, while cervical erosion was the most common abnormality (32.6%).

Table 1: Distribution of Clinical Symptoms and Per-Speculum Findings (N=500)

Clinical Variable	Category	Frequency (n)	Percentage (%)
Symptoms	White Discharge	271	54.2%
	Lower Abdominal Pain	115	23.0%
	Irregular/Intermenstrual Bleeding	45	9.0%
	Post-coital Bleeding	24	4.8%
	Asymptomatic (Routine Screening)	45	9.0%
Per-Speculum Findings	Healthy Looking Cervix	207	41.4%
	Cervical Erosion (Ectopy)	163	32.6%
	Hypertrophied Cervix	88	17.6%
	Polyp / Growth	12	2.4%
	Vaginitis / Cervicitis appearance	30	6.0%

Cytological Findings

Out of 500 smears, 472 (94.4%) were negative for malignancy (NILM), while 28 (5.6%) showed epithelial cell abnormalities. Among the NILM group, inflammatory changes were highly prevalent.

Table 2: Cytomorphological Distribution based on Bethesda System 2019

Bethesda Category	Finding	Frequency (n)	Percentage (%)
NILM	**Total NILM**	**472**	**94.4%**
	Normal / Atrophy	149	29.8%
	Inflammatory (Non-specific)	265	53.0%
	Specific Infections (Candida/BV/TV)	58	11.6%
ECA	**Total Abnormalities**	**28**	**5.6%**
	ASC-US	10	2.0%
	LSIL	11	2.2%
	HSIL	5	1.0%
	Atypical Squamous Cell cannot exclude HSIL (ASC-H)	2	0.4%
Total		**500**	**100%**

Clinical-Cytological Correlation

Table 3 illustrates the association between the visual appearance of the cervix and the Pap smear results. A significant correlation was observed. While a "Healthy" appearing cervix largely yielded NILM results, cervices with "Erosion" or "Growth" had a significantly higher incidence of dysplasia. Notably, 41.6% (5/12) of patients with a visible growth/polypoid lesion showed epithelial abnormalities.

Table 3: Correlation of Per-Speculum Findings with Cytological Outcome

Per-Speculum Finding	NILM (n)	ECA (ASC-US to SCC) (n)	Total (n)	ECA Rate (%)
Healthy Cervix	205	2	207	0.9%
Cervical Erosion	151	12	163	7.4%
Hypertrophy	84	4	88	4.5%
Polyp / Suspicious Growth	7	5	12	41.6%
Vaginitis	25	5	30	16.6%
Total	**472**	**28**	**500**	**5.6%**

Chi-Square Value (X^2) = 68.42; p-value < 0.001 (Highly Significant)

Additionally, when correlating symptoms, Post-coital bleeding showed the highest predictive value for ECA, with 8 out of 24 patients (33.3%) in this group showing dysplasia ($p < 0.001$), compared to only 3.6% in the "White Discharge" group.

DISCUSSION

This study of 500 women in Nashik highlights the critical role of Pap smear screening in a tertiary care setting and establishes a strong link between clinical signs and cytopathological outcomes.

Prevalence of Abnormalities

The prevalence of Epithelial Cell Abnormalities (ECA) in our study was 5.6%. This finding aligns with other Indian studies, such as those by Bal et al. (5.0%),[8] and Mulay et al. (4.8%),[9] suggesting a consistent burden of pre-neoplastic lesions in the Indian population. The distribution of lesions (LSIL 2.2% > HSIL 1.0%) follows the expected epidemiological pyramid, where low-grade lesions are more common and often regress spontaneously, while high-grade lesions persist.[10]

Inflammatory Burden

A striking finding was the high prevalence of inflammatory smears (64.6% including specific infections) within the NILM category. This is significantly higher than rates reported in Western literature but consistent with reports from developing countries. Verma et al. reported inflammatory smears in 60-70% of their rural Indian cohort.[11] This reflects poor genital hygiene, lack of barrier contraception, and the high prevalence of reproductive tract infections (RTIs) in the Nashik region. Clinically, this emphasizes that while cancer screening is the primary goal, the Pap smear is also a vital tool for diagnosing and treating benign infections that affect women's quality of life.

Clinical Correlation – The Key Finding:

The core objective of this study was clinical-cytological correlation. We found a highly significant association ($p<0.001$) between the gross appearance of the cervix and the Pap result.

Women with a "healthy" looking cervix had a negligible rate of abnormalities (0.9%), whereas those with "cervical erosion" had a 7.4% rate of ECA. This contradicts the traditional view that erosion is merely a physiological ectopy; in symptomatic women, it warrants close cytological scrutiny. This supports the findings of Sherwani et al., who noted that unhealthy cervices are significantly more likely to harbor dysplasia.[12]

Furthermore, "Post-coital bleeding" emerged as the most ominous symptom. With 33.3% of these women showing abnormalities (including both cases of ASC-H), this symptom serves as a critical "red flag." A study by Sachan et al. similarly identified post-coital bleeding as the strongest clinical predictor of cervical malignancy.[13]

Diagnostic Utility

The study revealed that visual inspection alone is insufficient. While "Suspicious Growths" strongly correlated with ECA, 14 cases of ECA (50% of all abnormalities) were found in cervices that merely looked "eroded" or "hypertrophied," and 2 were found in clinically "healthy" cervices. This reinforces that Visual Inspection with Acetic Acid (VIA) or naked-eye inspection cannot entirely replace cytology.[14]

Limitations

The study utilized conventional Pap smears, which can be limited by obscuring blood or inflammation compared to Liquid-Based Cytology (LBC). Additionally, HPV DNA testing was not included due to cost constraints, which would have provided higher sensitivity for risk stratification.[15]

CONCLUSION

The present study conducted in Nashik confirms that the Pap smear remains an indispensable diagnostic tool. We conclude that:

1. There is a high burden of inflammatory cervicovaginal disease in this demographic.
2. The prevalence of premalignant/malignant lesions is 5.6%, warranting continued vigilance.
3. There is a statistically significant correlation between clinical signs (erosion, bleeding on touch) and cytological abnormalities.
4. **Post-coital bleeding** is the most significant symptom predicting malignancy.

Clinicians in tertiary care centres should maintain a high index of suspicion for patients presenting with cervical erosion or post-coital bleeding. However, the detection of abnormalities in non-specific clinical presentations underscores the necessity of routine screening for all sexually active women, regardless of the benign appearance of the cervix.

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