Original Research Paper

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Pathology

EVALUATION OF EPITHELIAL CELL ABNORMALITIES IN CERVICAL SMEARS AT A TERTIARY CARE CENTRE: A RETROSPECTIVE CYTOLOGICAL STUDY

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ABSTRACT **Background:** Cervical cancer is one of the leading causes of cancer-related morbidity and mortality among women, particularly in developing countries. **Aim:** To evaluate the spectrum and frequency of epithelial cell abnormalities in cervical smears received at a tertiary care centre. **Materials and Methods**: A retrospective descriptive study including 150 cervical smear cases was conducted in the Department of Pathology, Atal Bihari Vajpayee Government Medical College, Vidisha. Smears were stained by the conventional Papanicolaou technique and interpreted according to the Bethesda System (2014). **Results:** The majority of women belonged to the 31–40-year age group (34.7%). White discharge per vagina was the commonest presenting complaint (64%). Among adequate smears, NILM constituted 89% of cases. Epithelial abnormalities included ASC-US (4.2%), LSIL (4.2%), HSIL (1.7%), AGUS (0.8%), and SCC (0.8%). **Conclusion:** Conventional Pap smear is an effective and economical screening tool for early detection of cervical epithelial abnormalities.

KEYWORDS : Cervical cytology; Pap smear; Bethesda system; Epithelial cell abnormalities; Cervical cancer screening.

INTRODUCTION

Cervical cancer remains one of the leading causes of cancer-related morbidity and mortality among women globally. According to GLOBOCAN 2022 estimates, cervical cancer is the fourth most common cancer among women worldwide, accounting for more than 660,000 new cases and approximately 350,000 deaths annually. More than 85% of these deaths occur in developing countries where organized screening programmes are either inadequate or inaccessible.[1]

India contributes significantly to the global burden of cervical cancer, accounting for nearly one-fifth of all cases and deaths worldwide. It is estimated that approximately 123,000 women are diagnosed with cervical cancer annually in India, and nearly 77,000 women succumb to the disease every year.[2] Cervical carcinoma is the second most common malignancy among Indian women after breast carcinoma and remains an important public health concern.[3]

Persistent infection with high-risk Human Papillomavirus (HPV), particularly HPV types 16 and 18, is recognized as the principal etiological factor in cervical carcinogenesis.[4] However, several co-factors including early age at first intercourse, multiple sexual partners, multiparity, smoking, prolonged oral contraceptive use, poor genital hygiene, immunosuppression, and low socioeconomic status contribute significantly to disease progression.[5]

Unlike many other malignancies, cervical cancer is characterized by a prolonged premalignant phase, often extending over several years. During this period, precursor lesions can be identified and treated effectively, thereby preventing progression to invasive disease.[6] This long latent period makes cervical cancer one of the most preventable forms of cancer if appropriate screening strategies are implemented.

The Papanicolaou (Pap) smear introduced by George Papanicolaou revolutionized cervical cancer screening and remains one of the most successful cancer screening methods in medical history.[7] The implementation of organized cytology-based screening programmes in developed countries has resulted in a remarkable reduction in both incidence and mortality from cervical carcinoma, with reductions approaching 70–80%.[8]

The Bethesda System for Reporting Cervical Cytology provides a standardized nomenclature for reporting cervical smears and categorizes epithelial abnormalities into atypical squamous cells, low-grade squamous intraepithelial lesions, high-grade squamous intraepithelial lesions, and invasive malignancies.[9] This system facilitates uniform communication between cytopathologists and clinicians and guides appropriate patient management.

Conventional Pap smear is simple, inexpensive, minimally invasive, and can be performed in peripheral healthcare settings with limited resources.[10] It not only aids in the identification of premalignant and malignant lesions but also provides valuable information regarding inflammatory and infectious conditions affecting the cervix.

Several studies from India and other developing countries have reported varying frequencies of epithelial cell abnormalities on cervical cytology, ranging from 1.5% to 8%, depending upon demographic characteristics and screening practices.[11–13] Evaluation of the spectrum of cervical lesions in different populations is therefore important for understanding local disease patterns and for planning effective screening strategies.

The present study was undertaken to evaluate the frequency and spectrum of epithelial cell abnormalities in cervical smears received at a tertiary care centre in central India and to assess the role of conventional Pap smear in the early detection of premalignant and malignant cervical lesions.

MATERIALS AND METHODS

Study Design

The present study was a retrospective descriptive study conducted in the Department of Pathology, Atal Bihari Vajpayee Government Medical College, Vidisha, Madhya Pradesh, India.

Study Duration: The study was carried out over a period of one year.

Study Population:

The study included women attending the Gynecology Outpatient Department (OPD) and Inpatient Department (IPD) who underwent cervical cytological examination during the study period.

Sample Size: A total of 150 cervical smear cases received in the Department of Pathology were included in the study.

Inclusion Criteria

- Women presenting to the Gynecology OPD/IPD, with or without symptoms.
- Women undergoing routine cervical screening.
- Women who provided consent for cytological examination.

Exclusion Criteria

- Women previously treated for cervical intraepithelial lesions.
- Women currently receiving treatment for cervical neoplasia.
- Pregnant women.
- Women with a history of previous cervical surgery.

Sample Collection

Cervical smears were obtained during gynecological examination using Ayre's spatula. Smears were immediately fixed in 95% ethyl alcohol and subsequently stained using the conventional Papanicolaou staining technique.

Cytological Examination
All stained smears were examined microscopically by experienced pathologists. The cytological interpretation was carried out according to the Bethesda System for Reporting Cervical Cytology (2014).

The smears were categorized as:
- Negative for Intraepithelial Lesion or Malignancy (NILM)
- Atypical Squamous Cells of Undetermined Significance (ASC-US)
- Atypical Glandular Cells of Undetermined Significance (AGUS)
- Low-Grade Squamous Intraepithelial Lesion (LSIL)
- High-Grade Squamous Intraepithelial Lesion (HSIL)
- Squamous Cell Carcinoma (SCC)

Statistical Analysis
Data were entered into Microsoft Excel and analyzed using descriptive statistics. Continuous variables were expressed as mean and standard deviation where appropriate. Categorical variables were represented as frequencies and percentages.

RESULTS
- A total of 150 cervical smears were analyzed during the study period.
- The age of the participants ranged from <30 years to >70 years.
- The majority of women belonged to the 31–40 years age group (34.7%), followed by the 41–50 years age group (28%).
- White discharge per vagina was the most common presenting complaint, observed in 64% of women.
- Most cervical smears were adequate for evaluation and were categorized according to the Bethesda System.
- Negative for Intraepithelial Lesion or Malignancy (NILM) was the predominant cytological finding, accounting for 89% of cases.
- Epithelial cell abnormalities were identified in 11% of cases.
- Among NILM cases, non-specific inflammatory pathology was the most common finding (64.4%), followed by bacterial vaginosis (12.7%) and candidiasis (9.3%).
- Among epithelial cell abnormalities, ASC-US and LSIL were the most frequent lesions, each constituting 4.2% of cases.
- HSIL (1.7%), AGUS (0.8%), and squamous cell carcinoma (0.8%) were less frequently encountered.

The frequency of epithelial cell abnormalities observed in the present study is summarized below:
- ASC-US: 4.2%
- AGUS: 0.8%
- LSIL: 4.2%
- HSIL: 1.7%
- SCC: 0.8%
- Overall epithelial abnormalities: 11%.

Cytomorphological Findings
- ASC-US smears showed mild nuclear enlargement, nuclear membrane irregularity, and minimal hyperchromasia.
- LSIL smears demonstrated koilocytic atypia, nuclear enlargement, and mild dysplastic changes.
- HSIL smears revealed high nuclear-cytoplasmic ratios, coarse chromatin, irregular nuclear contours, and marked hyperchromasia.
- Squamous cell carcinoma smears exhibited pleomorphic malignant squamous cells with dense cytoplasm, irregular hyperchromatic nuclei, and tumor diathesis.

Infectious Lesions
- Bacterial vaginosis was characterized by clue cells.
- Candida infection demonstrated pseudohyphae and budding yeast forms.
- Trichomonas vaginalis appeared as pear-shaped organisms with eccentric nuclei.

Herpes simplex virus infection showed the classical three M's:
- Multinucleation
- Nuclear molding
- Chromatin margination.

DISCUSSION
Cervical cancer remains one of the most common malignancies affecting women worldwide and continues to be a significant public health challenge, particularly in developing countries. Despite the availability of effective screening methods and preventive measures, the disease continues to account for substantial morbidity and mortality because of inadequate screening coverage, lack of awareness, and poor accessibility to healthcare facilities.

The present study was undertaken to evaluate the spectrum and frequency of epithelial cell abnormalities in cervical smears received in a tertiary care centre and to assess the utility of conventional Pap smear as a screening modality for early detection of premalignant and malignant cervical lesions.

Age Distribution
In the present study, the majority of women belonged to the age group of 31–40 years (34.7%), followed by the age group of 41–50 years (28%). Similar findings have been reported by Bamanikar et al., Patel et al., and Sachan et al., who also observed that most women undergoing cervical screening belonged to the reproductive and perimenopausal age groups.

The increased prevalence of cervical abnormalities in this age group may be attributed to prolonged exposure to risk factors such as persistent Human Papillomavirus (HPV) infection, multiparity, early age at marriage, and increased sexual activity.

The findings of the present study are in accordance with the natural history of cervical neoplasia, where precursor lesions usually develop during the third and fourth decades of life and invasive carcinoma occurs approximately one to two decades later.

Clinical Presentation
White discharge per vagina was the commonest presenting complaint and was observed in 64% of study participants. Similar observations have been reported by Tailor et al., Shaki et al., and Ranabhat et al.

White discharge is one of the most frequent gynecological complaints encountered in outpatient practice and is usually associated with chronic cervicitis, bacterial vaginosis, candidiasis, and other inflammatory conditions of the cervix.

Pain abdomen and bleeding per vagina constituted 14% and 11.3% of cases, respectively. A small proportion of women were asymptomatic, emphasizing the importance of routine cervical screening even in apparently healthy women.

Cytological Findings
In the present study, Negative for Intraepithelial Lesion or Malignancy (NILM) constituted the majority of cases (89%). Similar findings have been documented by Patel et al., Bamanikar et al., and Sankaranara yanan et al., where inflammatory and benign lesions represented the predominant category of cervical smears.

The high prevalence of NILM cases indicates that most women attending gynecology clinics suffer from non-neoplastic inflammatory conditions rather than epithelial neoplasia.

Among NILM cases, non-specific inflammatory pathology was the most common finding, accounting for 64.4% of cases. This finding is comparable to studies conducted in different parts of India and reflects the high burden of genital tract infections and poor reproductive hygiene practices in developing countries.

Bacterial vaginosis and candidiasis constituted 12.7% and 9.3% of cases, respectively. Similar frequencies have been reported by several Indian studies. Identification of these infectious conditions is important because chronic inflammation has been implicated in cervical carcinogenesis and may contribute to persistence of HPV infection.

Frequency of Epithelial Cell Abnormalities
The overall frequency of epithelial cell abnormalities in the present study was 11%.

ASC-US and LSIL each accounted for 4.2% of cases and constituted the most common epithelial abnormalities observed.

HSIL was identified in 1.7% of cases, while squamous cell carcinoma and AGUS each accounted for 0.8%.

These findings are comparable to those reported by Nayar and Wilbur, Ranabhat et al., and Sachan et al., who documented low frequencies of epithelial abnormalities in routine cervical screening programs.

ASC-US was the most common atypical lesion identified. Similar observations have been reported in several studies worldwide and may be attributed to the high prevalence of inflammatory and reactive changes that mimic mild dysplasia.

The frequency of LSIL observed in the present study is comparable with studies conducted by Patel et al. and Bamanikar et al. LSIL represents productive HPV infection and usually affects younger women.

HSIL accounted for a smaller proportion of cases. However, these lesions are clinically significant because they possess a substantial risk of progression to invasive carcinoma if left untreated.

One case of squamous cell carcinoma was identified in the present study, emphasizing the role of Pap smear screening in detecting invasive malignancies at an early stage.

Significance of Pap Smear Screening

Conventional Pap smear remains one of the most successful cancer screening tests in medical history. Organized cervical screening programs have resulted in remarkable reductions in cervical cancer incidence and mortality in developed countries.

The present study further supports the utility of conventional Pap smear as a simple, inexpensive, minimally invasive, and highly effective method for early detection of premalignant and malignant cervical lesions.

In resource-limited settings such as India, conventional cytology remains the most feasible screening modality because of its low cost and easy availability.

Regular cervical screening can identify precursor lesions during the prolonged premalignant phase, allowing timely intervention and thereby preventing progression to invasive carcinoma.

Comparison with Other Studies

The slightly higher frequency of epithelial abnormalities observed in the present study may be attributed to regional differences in demographic characteristics, healthcare access, and screening practices.

Limitations of the Study

- The study was conducted at a single tertiary care centre.
- The sample size was relatively small.
- Histopathological correlation was not available in all cases.
- HPV testing was not performed.
- Long-term follow-up of patients was not undertaken.

Despite these limitations, the study provides valuable information regarding the spectrum of cervical lesions in women attending a tertiary care centre in central India.

CONCLUSION

The present study concludes that:

- Conventional Pap smear is an effective, economical, and minimally invasive screening tool for the early detection of cervical epithelial abnormalities.
- The majority of cervical smears showed benign inflammatory lesions.
- White discharge per vagina was the most common presenting complaint.
- Epithelial cell abnormalities constituted 11% of all adequate cervical smears.
- ASC-US and LSIL were the most common epithelial abnormalities.
- High-grade lesions and invasive carcinoma, though less frequent, were successfully identified by cytological screening.
- Regular cervical cancer screening using Pap smear can significantly reduce the incidence and mortality associated with cervical cancer by facilitating early diagnosis and treatment of precursor lesions.

Conflict Of Interest: Nil.

Source Of Funding: Nil.

Ethical Approval: Obtained from the Institutional Ethics Committee.

Table 1.- Demographic and Clinical Characteristics of Study Participants (n = 150)

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	≤30	32	21.3
	31–40	52	34.7
	41–50	42	28.0
	51–60	13	8.7
	61–70	8	5.3
	>70	3	2.0
Presenting Complaint	White discharge per vagina	96	64.0
	Pain abdomen	21	14.0
	Bleeding per vagina	17	11.3
	Asymptomatic	10	6.7
	Prolapse	6	4.0

Table 2. Cytological Profile of Cervical Smears and Spectrum of NILM Findings (n = 118)

Parameter	**Category**	**Frequency (n)**	**Percentage (%)**
Cytological Diagnosis	NILM	105	89.0
	ASC-US	5	4.2
	AGUS	1	0.8
	LSIL	5	4.2
	HSIL	2	1.7
	SCC	1	0.8
Spectrum of NILM Findings (n = 118)	Non-specific inflammatory pathology	76	64.4
	Bacterial vaginosis	15	12.7
	Candidiasis	11	9.3
	Reactive cellular changes with inflammation	7	5.9
	Atrophic smear	6	5.1
	Trichomonas vaginalis	2	1.7
	Herpes simplex virus	1	0.8

Table 3. Comparison of Clinical Presentation and Frequency of Epithelial Cell Abnormalities with Other Studies

Study	**Commonest Symptom**	**Frequency of Epithelial Cell Abnormalities (%)**
Tailor et al.	White discharge per vagina	–
Shaki et al.	White discharge per vagina	–
Patel et al.	–	6.8
Sachan et al.	–	7.9
Ranabhat et al.	–	5.0
Present study	**White discharge per vagina**	**11.0**

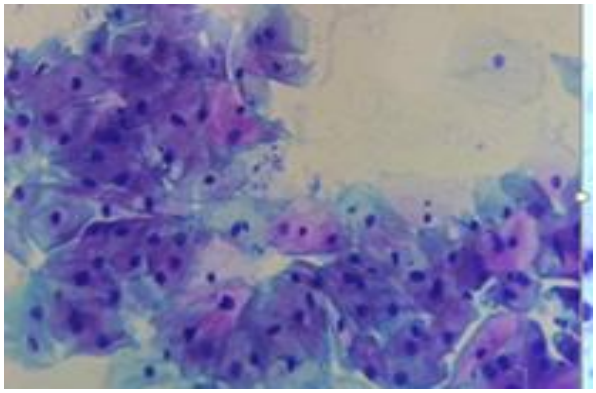
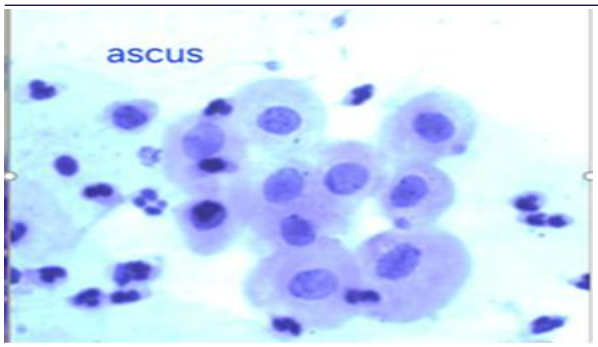


Fig 1. (a)NILM (Negative for Intraepithelial Lesion orMalignancy) Pap smear showing **mature squamous epithelial cells with small, uniform nuclei and abundant cytoplasm**, with **no evidence of dysplasia or malignancy**.



(b)ASC-US – Squamous cells showing mild nuclear enlargement and atypia on Pap smear.

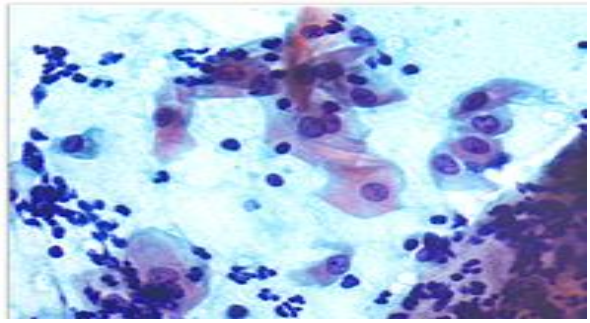
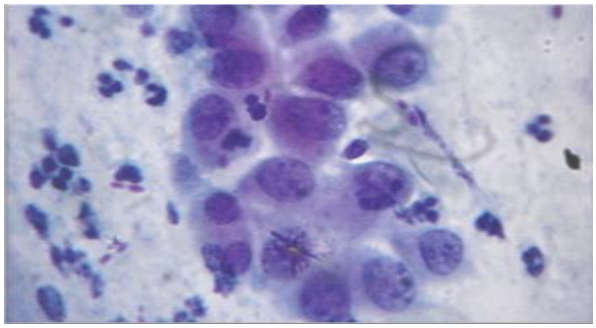
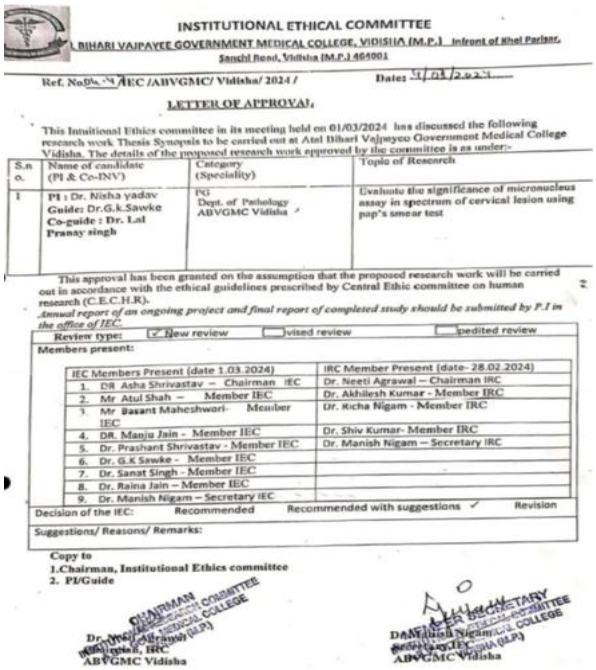


Fig 2.- (a)Low- grade squamous intraepithelial lesion (LSIL)



(b)High-Grade squamous intraepithelial lesion (HSIL)



INSTITUTIONAL ETHICAL COMMITTEE

L BIHARI VAJPAYEE GOVERNMENT MEDICAL COLLEGE, VIDISHA (M.P.) Infront of Khel Parisar, Sanchi Road, Vidisha (M.P.) 464001

Ref. No.: /IEC /ABVGMC/ Vidisha/ 2024 / Date: 01/03/2024

LETTER OF APPROVAL

This Institional Ethics committee in its meeting held on 01/03/2024 has discussed the following research work Thesis Synopsis to be carried out at Atal Bihari Vajpayee Government Medical College Vidisha. The details of the proposed research work approved by the committee is as under:-

S.no.	Name of candidate (PI & Co-INV)	Category (Speciality)	Topic of Research
1	PI : Dr. Nisha yadav Guide: Dr.G.k.Sawke Co-guide : Dr. Lal Pranay singh	PG Dept. of Pathology ABVGMC Vidisha	Evaluate the significance of micronucleus assay in spectrum of cervical lesion using pap's smear test

This approval has been granted on the assumption that the proposed research work will be carried out in accordance with the ethical guidelines prescribed by Central Ethic committee on human research (C.E.C.H.R).

Annual report of an ongoing project and final report of completed study should be submitted by P.I in the office of IEC.

Review type: ☑ New review ☐ vised review ☐ pedited review

Members present:

IEC Members Present (date 1.03.2024)	IRC Member Present (date- 28.02.2024)
1. DR Asha Shrivastav – Chairman IEC	Dr. Neeti Agrawal – Chairman IRC
2. Mr Atul Shah – Member IEC	Dr. Akhilesh Kumar - Member IRC
3. Mr Basant Maheshwari - Member IEC	Dr. Richa Nigam - Member IRC
4. DR. Manju Jain - Member IEC	Dr. Shiv Kumar- Member IRC
5. Dr. Prashant Shrivastav - Member IEC	Dr. Manish Nigam – Secretary IRC
6. Dr. G.K Sawke - Member IEC	
7. Dr. Sanat Singh - Member IEC	
8. Dr. Raina Jain – Member IEC	
9. Dr. Manish Nigam – Secretary IEC	

Decision of the IEC: Recommended Recommended with suggestions ✓ Revision

Suggestions/ Reasons/ Remarks:

Copy to
1.Chairman, Institutional Ethics committee
2. PI/Guide

CHAIRMAN INSTITUTIONAL ETHICAL COMMITTEE ABVGMC Vidisha

MEDICAL SECRETARY INSTITUTIONAL ETHICAL COMMITTEE ABVGMC Vidisha

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