

## CYTOLOGICAL SPECTRUM OF CERVICAL PAP SMEARS IN A TERTIARY CARE CENTRE: A RETROSPECTIVE CROSS-SECTIONAL STUDY

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### ABSTRACT

**Background:** Cervical cancer remains one of the leading causes of cancer-related morbidity and mortality among women, particularly in low- and middle-income countries. The Papanicolaou (Pap) smear is a simple, cost-effective, and widely accepted screening tool for the early detection of premalignant and malignant cervical lesions. **Objective:** To evaluate the cytological spectrum of cervical lesions detected on Pap smears in a tertiary care centre. **Materials and Methods:** This retrospective cross-sectional study was conducted in the Department of Pathology of a tertiary care teaching hospital in Jharkhand. A total of 200 cervical Pap smear cases received during the study period were included after applying inclusion and exclusion criteria. Relevant demographic and cytological data were retrieved from departmental records. Smears were stained using the Papanicolaou technique and classified according to The Bethesda System for Reporting Cervical Cytology (2014). Data were analyzed using descriptive statistics and expressed as frequencies and percentages. **Results:** Out of 200 Pap smears evaluated, 160 cases (80%) were reported as negative for intraepithelial lesion or malignancy (NILM). Epithelial cell abnormalities were observed in 40 cases (20%). Among the abnormal smears, ASC-US was the most common finding in 15 cases (7.5%), followed by ASC-H in 10 cases (5%), LSIL in 8 cases (4%), HSIL in 6 cases (3%), and squamous cell carcinoma (SCC) in 1 case (0.5%). The highest frequency of positive lesions was noted in the 30–55 years age group. **Conclusion:** Cervical Pap smear cytology remains an effective screening modality for early detection of cervical epithelial abnormalities. Strengthening regular screening and awareness programs is essential, particularly in resource-limited settings such as Jharkhand.

## INTRODUCTION

Cervical cancer remains one of the most common malignancies affecting women worldwide and continues to be a major cause of cancer-related morbidity and mortality, particularly in low- and middle-income countries. According to the World Health Organization, it is one of the leading cancers among women, with a disproportionately high burden in developing countries where screening coverage is still inadequate.<sup>[1]</sup>

The Papanicolaou (Pap) smear is a simple, cost-effective, and widely accepted screening tool for the detection of cervical epithelial abnormalities. It plays a crucial role in identifying inflammatory, premalignant, and malignant lesions at an early stage, thereby facilitating timely intervention. The Bethesda System for Reporting Cervical Cytology provides a standardized framework for categorizing

abnormalities such as atypical squamous cells of undetermined significance, low-grade squamous intraepithelial lesions (LSIL), high-grade squamous intraepithelial lesions (HSIL), and invasive carcinoma.<sup>[2-4]</sup>

Persistent infection with high-risk human papillomavirus (HPV), particularly types 16 and 18, is recognized as the most important etiological factor in the development of cervical cancer. However, the progression from HPV infection to invasive carcinoma is usually slow, often spanning several years, which provides an important opportunity for early detection through routine cytological screening.<sup>[1,4]</sup>

In India, cervical cancer continues to pose a substantial public health challenge. Despite national screening initiatives, participation remains inadequate in many states, particularly in eastern and tribal regions. Institution-based studies are

therefore important to guide local screening strategies and early detection programs.<sup>[2,3]</sup>

From the Jharkhand perspective, the burden is particularly relevant because of limited awareness, poor access to organized screening programs, and a significant rural and tribal population. A cross-sectional study from a tertiary care hospital in Jharkhand demonstrated a significant association between established risk factors and abnormal Pap smear findings, underscoring the importance of routine cervical cytology screening in this population.<sup>[5]</sup>

Recent prospective and retrospective observational studies from Indian tertiary care centres between 2021 and 2026 have shown that the majority of Pap smears are reported as negative for intraepithelial lesion or malignancy (NILM), while a smaller but clinically significant proportion reveals epithelial abnormalities ranging from ASC-US to invasive carcinoma.<sup>[3,6,7]</sup>

In this context, the present retrospective cross-sectional study was undertaken to evaluate the cytological spectrum of cervical Pap smears in a tertiary care centre and to assess the distribution of cervical epithelial abnormalities, with special relevance to the regional population of Jharkhand.

The objective of this study: The primary aim is to evaluate the cytological spectrum of cervical lesions identified from Papanicolaou (Pap) smears conducted among women at a tertiary care center.

The secondary objectives include determining the frequency of different types of cervical cytological lesions—namely inflammatory, benign, premalignant, and malignant lesions. Additionally, the study seeks to categorize the findings of Pap smears following the Bethesda System for Reporting Cervical Cytology and to analyze the age-wise distribution of the various identified cervical cytological abnormalities.

## MATERIALS AND METHODS

This study was designed as a retrospective cross-sectional analysis conducted in the Department of Pathology, in MGM Medical College and Hospital in Jamshedpur, Jharkhand. It evaluated cervical Pap smear records collected from July 2025 to March 2026. The study population comprised all women who underwent cervical cytological examinations via Pap smears during this period, with a final sample size of 200 cases meeting the inclusion criteria for analysis.

**Inclusion Criteria:** Inclusion criteria for the study consist of cervical Pap smears received during the study period, involving women aged 21 years and above who underwent cervical screening. Only smears with adequate cellularity according to the Bethesda system for reporting cervical cytology (10) are accepted, specifically the first available smear from the patient during the study period.

**Exclusion Criteria:** Exclusion criteria include unsatisfactory or inadequate smears, repeat smears from the same patient during the study period, and smears with incomplete demographic or cytological records.

**Data Collection:** Relevant data were collected retrospectively from cytopathology laboratory registers and departmental record files, focusing on clinical presentation or indication for Pap smear, cytological diagnosis, adequacy of smear, and Bethesda category.

### Cytological Examination

Cervical smears were collected using Ayre's spatula and/or endocervical brush during gynecological examination. The smears were immediately fixed in 95% ethanol and stained using the Papanicolaou staining technique.

All smears were reviewed and classified according to The Bethesda System for Reporting Cervical Cytology (2014) into the following categories:

- Negative for intraepithelial lesion or malignancy (NILM)
- Atypical squamous cells of undetermined significance (ASC-US)
- Atypical squamous cells—cannot exclude HSIL (ASC-H)
- Low-grade squamous intraepithelial lesion (LSIL)
- High-grade squamous intraepithelial lesion (HSIL)
- Squamous cell carcinoma (SCC)

### Outcome Measures

The study's primary outcome focused on the cytological spectrum distribution of cervical lesions detected via Pap smear. Secondary outcomes examined the frequency of epithelial cell abnormalities, age-wise distribution of lesions, and the proportion of premalignant and malignant lesions.

**Statistical Analysis:** The data were entered into Microsoft Excel and analyzed using Epi-info. Descriptive statistics included frequencies, percentages, and mean  $\pm$  standard deviation for age, with categorical variables expressed as proportions and presented in tables and figures.

## RESULTS

A total of 200 cervical Pap smear samples were included in the study after applying the inclusion and exclusion criteria.

Among the smears evaluated, 160 cases (80%) were reported as negative for intraepithelial lesion or malignancy (NILM), constituting the majority of cases.

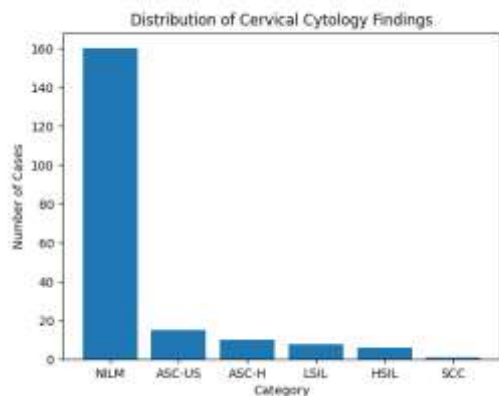
Epithelial cell abnormalities were identified in 40 cases (20%). Among these abnormalities, ASC-US was the most common cytological abnormality, observed in 15 cases (7.5%), followed by ASC-H in 10 cases (5%).

Low-grade squamous intraepithelial lesion (LSIL) was reported in 8 cases (4%), while high-grade squamous intraepithelial lesion (HSIL) was seen in

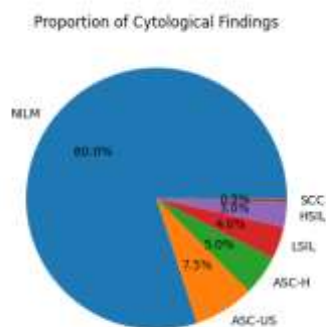
6 cases (3%). Squamous cell carcinoma (SCC) was detected in 1 case (0.5%).

**Table 1: Distribution of Cytological Findings in Cervical Pap Smears (n = 200)**

Category	Number of Cases	Percentage
NILM	160	80%
ASC-US	15	7.5%
ASC-H	10	5%
LSIL	8	4%
HSIL	6	3%
SCC	1	0.5%



**Figure 1: Bar chart showing the distribution of various cervical cytological findings among the study participants**



**Figure 2: Pie chart depicting the proportional distribution of normal and abnormal cervical cytological lesions**

## DISCUSSION

The present retrospective cross-sectional study evaluated the cytological spectrum of cervical Pap smears in a tertiary care centre and demonstrated that the majority of smears were reported as negative for intraepithelial lesion or malignancy (NILM) (80%), while 20% showed epithelial cell abnormalities. These findings reaffirm the continuing value of Pap smear screening as an effective and economical method for the early detection of premalignant and malignant cervical lesions.

The predominance of NILM cases in the present study is comparable with recent tertiary care studies from India. Agrawal et al. reported that most cervical smears in their study were negative for intraepithelial lesions, while Gujjar et al. similarly observed a predominance of NILM cases in a hospital-based retrospective analysis.<sup>[2,3]</sup> Comparable findings have also been reported in more recent prospective studies.<sup>[6,7]</sup>

Among abnormal cytological findings, ASC-US (7.5%) was the most common lesion in our study, followed by ASC-H (5%), LSIL (4%), and HSIL (3%). This distribution is broadly in agreement with other recent studies, where atypical squamous lesions constituted the majority of abnormal smears.<sup>[3,6]</sup>

The relatively higher proportion of ASC-H and HSIL in the present study may be attributed to the tertiary care setting, where more symptomatic, high-risk, or referred patients are evaluated. Such centres often receive patients with persistent vaginal discharge, postcoital bleeding, or abnormal per speculum findings, thereby increasing the likelihood of detecting significant epithelial abnormalities.

The age group of 30–55 years showed the maximum number of positive lesions in the present study. This observation is consistent with the natural history of cervical carcinogenesis, wherein persistent high-risk HPV infection gradually progresses through precursor lesions over several years before manifesting as high-grade dysplasia or carcinoma.<sup>[1,4]</sup> Similar age distributions have been reported in studies from 2021–2026.<sup>[2,6,7]</sup>

The detection of one case of squamous cell carcinoma (0.5%) in the present study highlights the crucial role of cervical cytology in identifying invasive malignancy at an early and potentially treatable stage. Comparable low frequencies of invasive carcinoma have been reported in recent Indian tertiary care studies, reflecting the relative rarity of frank malignancy compared with precursor lesions in screened populations.<sup>[3,7]</sup>

From the Jharkhand perspective, these findings are particularly significant. Limited awareness, inadequate organized screening, and barriers in healthcare access—especially among rural and tribal populations—continue to contribute to delayed diagnosis. Previous studies from Jharkhand have emphasized the association of established risk

factors with abnormal Pap smear findings, supporting the need for strengthening routine cervical cancer screening in the region.<sup>[5]</sup>

The findings of the present study support the recommendations of the WHO cervical cancer elimination strategy, which emphasizes regular screening for early detection and management of precancerous lesions.<sup>[1]</sup>

A limitation of the present study is its retrospective design, which restricted the availability of detailed clinical and histopathological follow-up data. Future prospective studies with cytohistological correlation and HPV status assessment would provide a more comprehensive understanding of the disease spectrum.<sup>[8,9]</sup>

## CONCLUSION

The retrospective cross-sectional study confirms that cervical Pap smear cytology is an effective screening method for detecting cervical epithelial abnormalities in women at a tertiary care center. Most cases were reported as negative for intraepithelial lesion or malignancy (NILM), but a significant number showed abnormalities, particularly ASC-US, with the highest prevalence in women aged 30–55. The study emphasizes the critical nature of routine Pap smear screenings in identifying premalignant lesions and invasive cancers, particularly in Jharkhand, where awareness and access to screening are limited. It calls for enhanced cervical cancer screening programs, community awareness, and follow-up care to improve prevention and control of cervical cancer.

### Limitations

It is a retrospective design relying on existing records, conducted at a single tertiary care center, which limits generalizability. Clinical data such as socioeconomic status and HPV status were not uniformly available. Moreover, there was no histopathological follow-up for all abnormal cases, impacting the assessment of Pap smear accuracy. Finally, selection bias is present, as the sample consists of women from a tertiary hospital, possibly leading to a higher proportion of abnormal results than in community screenings.

### Recommendations

1. Strengthening routine cervical cancer screening, particularly for women aged 30–55, who exhibited the highest lesion frequency.
2. Implementing community awareness programs in rural Jharkhand to educate about cervical cancer and the importance of screenings.
3. Ensuring prompt follow-up and referral for women with abnormal cytological results to prevent invasive carcinoma.

4. Conducting future multicentric studies with larger sample sizes to assess the epidemiological and cytological landscape of cervical lesions.
5. Considering combined screening with Pap smear and HPV DNA testing to enhance sensitivity in detecting premalignant lesions.

**Conflict of Interest:** None.

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