

Research Article

Cytological Distribution of Pap Smear Findings in Cervical Screening in a tertiary care Hospital of North East India*Aziz N¹, Talukdar PM^{2*}, Ahmed W¹, Sonowal B,¹*¹Department of Pathology, Gauhati Medical College and Hospital, Assam, India.²Multidisciplinary Research Unit, Gauhati Medical College and Hospital, Assam, India.**(Received: 17-02-2026****Revised: 03-06-2026****Accepted: 07-06-2026)**Corresponding Author: **Pinku Mani Talukdar** Email: pnk.guwahati@gmail.com**ABSTRACT**

Background: Pap smear screening plays a pivotal role in early detection of cervical epithelial abnormalities and associated infections. This study evaluates the cytological patterns and prevalence of various cervical lesions in women undergoing routine Pap smear screening.

Methods: All woman attending Outpatient Department of Obstetrics and Gynaecology at Gauhati Medical College and Hospital, Guwahati were screened over a period of 1 year. A retrospective analysis of Pap smear reports was conducted, categorizing findings based on the Bethesda System. A total of 1,835 samples were examined for inflammatory, infectious, premalignant, malignant, and unsatisfactory smears. Ayre spatula was used to collect the smear sample and placed on a glass slide fixed promptly in 95% ethyl alcohol, and transported to the Department of Pathology for cytological assessment.

Results: Out of 1,835 smears, 1,619 (88.25%) were Negative for Intraepithelial Lesion or Malignancy (NILM). Inflammatory smears accounted for 10 (0.54%), and 178 (9.7%) samples were unsatisfactory. Premalignant lesions included HSIL in 8 cases, ASC-H in 4 cases, and ASCUS in 4 cases (including 1 with inflammation). Atypical glandular and endocervical cells were noted in 6 cases. One case of squamous cell carcinoma and one case of ASC-H with carcinoma were identified.

Conclusion: The predominance of NILM results highlights the effectiveness of Pap smear screening in ruling out malignancy. However, the presence of high-grade lesions and one invasive carcinoma underscores the need for vigilant cytological evaluation and appropriate follow-up.

Keywords: Pap smear, cervical cytology, HSIL, ASCUS, ASC-H

1. INTRODUCTION

Cervical cancer remains a major global health concern, particularly in low- and middle-income countries (LMICs), where it disproportionately affects women of reproductive and middle age. According to the World Health Organization (WHO), cervical cancer is the fourth most common cancer in women worldwide, with an estimated 604,000 new cases and 342,000 deaths in 2020, and approximately 90% of these deaths occur in LMICs [1] WHO, 2023. The high incidence and mortality rates in these settings highlight significant inequities in access to human papillomavirus (HPV) vaccination, organized screening programs, diagnostic infrastructure, and timely treatment. Persistent

infection with oncogenic HPV types, particularly HPV-16 and HPV-18 remains the primary etiological factor, accounting for nearly 70% of all cervical cancer cases globally [2]. In countries such as India, cervical cancer continues to be a leading cause of cancer-related mortality among women, contributing to roughly 21% of the global cervical cancer burden [3]. More than 80% of cervical cancer cases occur in developing and resource-limited nations, where limited public awareness, socio-cultural barriers, inadequate health infrastructure, and challenges in implementing large-scale cytology-based screening programs contribute to delayed diagnosis and poor outcomes [4, 5]. Cytology-based screening using the Papanicolaou (Pap)

smear remains one of the most cost-effective and widely adopted methods for the early detection of cervical epithelial abnormalities in resource-constrained environments [6]. When combined with adequate follow-up, Pap smear programs have been shown to reduce cervical cancer incidence by up to 80% in populations with high coverage and quality assurance [7]. This method allows for the detection of a spectrum of cellular changes ranging from inflammatory and reactive lesions to atypical squamous cells, premalignant intraepithelial lesions (low-grade and high-grade squamous intraepithelial lesions), and invasive carcinoma. Accurate cytological diagnosis enables timely intervention, interrupting the progression from persistent HPV infection to high-grade lesions and invasive cancer. Against this background, the present study seeks to analyze the distribution of cytological findings in a cohort of women screened via Pap smear, focusing on the relative proportions of inflammatory, atypical, premalignant, and malignant lesions. Understanding the prevalence of each category can guide targeted prevention strategies, strengthen screening program design, and ultimately contribute to reducing the morbidity and mortality associated with cervical cancer in high-burden settings.

2. MATERIALS AND METHODS

Study design: The current study is a Retrospective review of consecutive Pap smears over a period of one year from 2024 January to 2025 January, at Gauhati Medical College & Hospital, Guwahati.

Study subjects: Women presenting with various Gynaecological complaints, such as vaginal discharge (including blood-stained or foul-smelling), postcoital bleeding, intermenstrual bleeding, postmenopausal bleeding, lower abdominal pain, infertility, and secondary amenorrhea, were enrolled in the study. Cervical samples were obtained from the ectocervix using a wooden Ayre's spatula, which was rotated 360° to ensure adequate cell collection. The material was immediately spread onto pre-labelled glass slides, fixed promptly in 95% ethyl alcohol, and transported to the Department of Pathology for cytological assessment. Smears were evaluated

and reported in accordance with the 2014 revision of the Bethesda System for Reporting Cervical Cytology, which categorizes findings as either negative for intraepithelial lesion/malignancy (NILM) or epithelial cell abnormalities (ECA), encompassing both squamous and glandular cell changes. Unsatisfactory smears excluded from lesion evaluation but included in sample adequacy analysis.

Sample Size

A total of 1,835 Pap smear reports were included in the current study.

Cytological Classification

Smears were interpreted and reported using the Bethesda System, and findings were grouped into the following categories:

- Negative for Intraepithelial Lesion or Malignancy (NILM)
- Inflammatory smears
- Unsatisfactory smears
- Atypical squamous/glandular cells
- Squamous intraepithelial lesions (low-grade and high-grade)
- Carcinoma

Statistical analysis: Frequencies and percentages were calculated using MS excel.

3. RESULTS

Out of 1,835 smears, 1,619 (88.25%) were Negative for Intraepithelial Lesion or Malignancy (NILM). Inflammatory smears accounted for 10 (0.54%), and 178 (9.7%) samples were unsatisfactory. Premalignant lesions included HSIL in 8 cases, ASC-H in 4 cases, and ASCUS in 4 cases (including 1 with inflammation). Atypical glandular and endocervical cells were noted in 6 cases. One case of squamous cell carcinoma and one case of ASC-H with carcinoma were identified. The result of the comparative analysis of Pap smears are shown in Table 1.

4. DISCUSSION

The present study demonstrated that the majority of cervical smears were reported as NILM (88.25%), indicating the absence of significant epithelial abnormalities in most screened women. This finding is comparable to reports

from other cervical cytology-based screening studies, where NILM constitutes the predominant diagnostic category [8].

Table1: Table showing proportion of various inflammatory smears

Cytological Category	Frequency (n)	Percentage (%)
Negative for Intraepithelial Lesion or Malignancy (NILM)	1619	88.25%
Unsatisfactory sample	178	9.7%
Inflammatory	10	0.54%
ASC-H (Atypical Squamous Cells – Cannot Exclude HSIL)	4	0.22%
ASC-H with carcinoma	1	0.05%
ASCUS (Atypical Squamous Cells of Undetermined Significance)	3	0.16%
ASCUS with inflammation	1	0.05%
Atypical endocervical cells, NOS	4	0.22%
Atypical glandular cells, NOS	2	0.11%
Bacterial vaginosis	2	0.11%
High-grade squamous intraepithelial lesion (HSIL)	8	0.44%
High-grade SIL with carcinoma suspicion	2	0.11%
Squamous cell carcinoma	1	0.05%

The high proportion of NILM smears reflects the overall low prevalence of cytologically detectable premalignant and malignant lesions in the screened population and underscores the utility of routine cervical screening in identifying women at low immediate risk for cervical neoplasia. Epithelial cell abnormalities were identified in a small proportion of cases; however, their detection remains clinically relevant because these lesions represent different stages in the spectrum of cervical carcinogenesis. HSIL accounted for 0.44% of cases, while ASC-H was observed in 0.22% of smears. Although infrequent, these categories warrant particular attention owing to their strong association with underlying high-grade cervical intraepithelial neoplasia (CIN2/CIN3). Early identification of such lesions enables timely colposcopic evaluation and therapeutic intervention, thereby reducing the likelihood of progression to invasive cervical carcinoma. The detection of these abnormalities highlights the effectiveness of cytological screening in identifying women requiring further diagnostic workup. ASCUS constituted 0.21% of the study population. Although ASCUS represents an equivocal

cytological diagnosis, its recognition is important because a subset of affected women may harbour persistent high-risk human papillomavirus infection or underlying cervical intraepithelial lesions. Similarly, atypical glandular and endocervical cell abnormalities were observed in 0.33% of cases. Despite their low frequency, glandular abnormalities are clinically significant because they may be associated with premalignant or malignant lesions of the endocervix and, less commonly, the endometrium. These findings emphasize the importance of appropriate follow-up strategies, including repeat cytology, HPV testing, and colposcopic assessment, as recommended by contemporary management guidelines. The identification of a single case of squamous cell carcinoma further demonstrates the role of cervical cytology in detecting invasive disease. Although the prevalence of invasive carcinoma was low, its detection within a screening setting highlights the continued burden of cervical cancer and supports the need for sustained screening efforts. Early diagnosis through cytological examination facilitates prompt clinical management and may contribute to improved patient outcomes. An important observation in the present study was the relatively high proportion of unsatisfactory smears (9.7%). Unsatisfactory specimens compromise diagnostic accuracy and may necessitate repeat testing, resulting in increased healthcare costs and the potential for delayed diagnosis. Several factors, including inadequate sampling of the transformation zone, obscuring inflammation or blood, poor cellularity, and technical issues related to slide preparation and fixation, may contribute to unsatisfactory results. Therefore, periodic training of sample collectors, adherence to standardized collection protocols, and continuous quality assurance measures are essential to improve specimen adequacy and enhance the overall effectiveness of cervical cancer screening programs. Overall, the findings of the present study support the continued use of Pap smear cytology as an effective screening tool for the detection of cervical epithelial abnormalities. The identification of atypical, premalignant, and malignant lesions emphasizes

the importance of vigilant cytological evaluation and appropriate follow-up, which remain fundamental to cervical cancer prevention and control.

5. CONCLUSION

Routine Pap smear screening remains a vital tool for early detection of cervical epithelial abnormalities. Although most samples were NILM, the presence of high-grade lesions and carcinoma cases necessitates continued awareness, timely diagnosis, and appropriate follow-up. Improved sample adequacy and HPV co-testing could further enhance diagnostic accuracy.

ABBREVIATIONS

ASC-H: Atypical Squamous Cells – Cannot Exclude HSIL; ASCUS: Atypical Squamous Cells of Undetermined Significance; HSIL: High-grade Squamous Intraepithelial Lesion; NILM: Negative for Intraepithelial Lesion or Malignancy.

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CONFLICT OF INTERESTS

The authors declare no competing interests exist.

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