PREVALENCE AND PATTERN OF EPITHELIAL ABNORMALITIES IN CERVICAL PAP SMEAR SCREENING AT A TERTIARY CARE HOSPITAL IN NORTH INDIA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Cervical cancer remains a significant public health problem, particularly in developing countries like India, where screening coverage is limited. The Papanicolaou (Pap) smear is an effective and economical tool for early detection of epithelial abnormalities, thereby reducing disease burden through timely intervention.

Objectives: To determine the prevalence and pattern of epithelial abnormalities in cervical Pap smear samples among women attending a tertiary care hospital in North India, and to assess their distribution across age groups and clinical presentations.

Methods: A hospital-based cross-sectional observational study was conducted from March 2021 to July 2021 among 56 women attending the gynecology outpatient department. Cervical smears were collected using standard techniques and reported according to the Bethesda System (2014). Data regarding demographic and clinical variables were recorded. Statistical analysis was performed using SPSS version 22.0, with $p<0.05$ considered statistically significant.

Results: The majority of participants were in the 31–40 years age group (32.1%). Vaginal discharge was the most common presenting complaint (42.9%). Cytological examination revealed that 82.1% of smears were negative for intraepithelial lesion or malignancy, while epithelial abnormalities were detected in 17.9% of cases. LSIL was the most common abnormality (7.1%), followed by ASC-US (5.4%), HSIL (3.6%), and one case of squamous cell carcinoma (1.8%). The prevalence of abnormalities increased with age, with the highest proportion observed in women above 60 years. A

higher frequency of abnormalities was noted among women with abnormal uterine bleeding and postcoital bleeding, though the association was not statistically significant.

Conclusion: The study demonstrates a notable burden of epithelial abnormalities in a tertiary care setting, underscoring the importance of routine Pap smear screening. Strengthening screening programs and increasing awareness are essential to facilitate early detection and reduce cervical cancer-related morbidity and mortality.

Keywords: Cervical cancer; Pap smear; Epithelial abnormalities; LSIL; Screening; Bethesda system

INTRODUCTION

Cervical cancer remains a major global public health concern, ranking as the fourth most common cancer among women worldwide. Despite being largely preventable through effective screening and early treatment of precancerous lesions, it continues to contribute significantly to morbidity and mortality, particularly in low- and middle-income countries [1]. According to the World Health Organization, nearly 90% of cervical cancer deaths occur in resource-limited settings, reflecting disparities in access to screening and preventive healthcare services [2]. Persistent infection with high-risk human papillomavirus (HPV) types is well established as the primary etiological factor in the development of cervical intraepithelial neoplasia (CIN) and invasive carcinoma [3].

The Papanicolaou (Pap) smear remains one of the most widely used and cost-effective screening tools for the early detection of epithelial abnormalities of the cervix. It enables identification of premalignant changes, thereby allowing timely intervention and significantly reducing the incidence and mortality associated with cervical cancer [4]. Organized screening programs in developed countries have demonstrated a substantial decline in cervical cancer rates over the past few decades, underscoring the effectiveness of cytological screening [5]. However, in many developing regions, including India, opportunistic rather than organized screening predominates, leading to suboptimal coverage and delayed diagnosis [6].

In India, cervical cancer is the second most common cancer among women, with a considerable proportion of cases diagnosed at advanced stages [7]. The burden is further compounded by socio-cultural barriers, lack of awareness, limited healthcare infrastructure, and inadequate screening uptake [8]. Regional variations exist in the prevalence of epithelial abnormalities detected through Pap smear screening, influenced by factors such as age, parity, socioeconomic status, and sexual behavior [9]. Studies conducted in different parts of India have reported varying prevalence rates of epithelial abnormalities, typically ranging from 1% to 8%, highlighting the need for region-specific data to guide public health interventions [10].

Tertiary care hospitals serve as important centers for opportunistic screening, particularly in populations that may otherwise have limited access to preventive services. Evaluating the prevalence of epithelial abnormalities in such settings provides valuable insights into the burden of premalignant lesions and helps identify high-risk groups. Furthermore, local data are essential for strengthening screening strategies and optimizing resource allocation in healthcare systems.
Despite the recognized importance of Pap smear screening, there remains a paucity of data from certain regions of North India, especially from smaller cohorts in tertiary care settings. Many existing studies focus on larger populations or specific subgroups, potentially overlooking subtle epidemiological patterns in routine clinical practice. Therefore, there is a need to generate context-

specific evidence regarding the prevalence of epithelial abnormalities detected through cervical cytology in this region.

In this context, the present study aims to determine the prevalence of epithelial abnormalities in cervical Pap smear samples among women attending a tertiary care hospital in North India. Additionally, the study seeks to analyze the distribution of these abnormalities across different age groups and clinical presentations, thereby contributing to the existing body of knowledge and aiding in the formulation of targeted screening strategies.

METHODOLOGY

Study Design: This was a hospital-based cross-sectional observational study conducted to determine the prevalence of epithelial abnormalities in cervical Pap smear samples.

Study Setting: The study was carried out in the Department of Pathology in collaboration with the Department of Obstetrics and Gynecology at a tertiary care hospital in North India, catering to both urban and rural populations.

Study Duration: The study was conducted over a period of five months, from March 2021 to July 2021.

Study Population: The study population comprised women attending the gynecology outpatient department (OPD) who underwent cervical cancer screening via Pap smear during the study period.

Inclusion Criteria

Women aged 21–65 years
Sexually active women attending gynecology OPD
Women who consented to participate in the study

Exclusion Criteria

Pregnant women
Women with active vaginal bleeding at the time of examination
Women with a prior history of cervical malignancy
Women who had undergone hysterectomy

Sample Size: The sample size was calculated using the formula for prevalence studies:
$n = Z^2 \times p \times q / d^2$
Where:

n = required sample size
Z = standard normal deviate at 95% confidence level (1.96)
p = expected prevalence of epithelial abnormalities (assumed 5% based on previous Indian studies)
q = 1 − p
d = absolute precision (5%)

Substituting the values:
$n = (1.96)^2 \times 0.05 \times 0.95 / (0.05)^2$
$n \approx 73$

Due to time constraints and limited eligible participants during the study period, a total of 56 subjects were included, and all eligible participants were enrolled consecutively.

Sampling Technique: A consecutive sampling technique was employed, wherein all eligible women presenting during the study period and meeting the inclusion criteria were included until the sample size of 56 was achieved.

Data Collection Tools & Procedure: Data were collected using a predesigned and pretested structured proforma that included demographic details, clinical history, and relevant risk factors. After obtaining informed consent, a detailed gynecological examination was performed. Cervical samples were collected using an Ayre's spatula and endocervical brush under aseptic conditions. The collected material was immediately smeared onto clean glass slides, fixed with 95% ethanol, and stained using the Papanicolaou staining technique. The smears were examined by experienced cytopathologists and reported according to the Bethesda System for Reporting Cervical Cytology (2014). Inadequate smears were excluded from analysis.

Study Variables: Independent variables included age, parity, socioeconomic status, presenting complaints (such as vaginal discharge, bleeding per vaginum), and other clinical parameters. The dependent variable was the cytological outcome of the Pap smear, categorized as negative for intraepithelial lesion or malignancy (NILM), inflammatory changes, and epithelial abnormalities including atypical squamous cells (ASC-US/ASC-H), low-grade squamous intraepithelial lesion (LSIL), high-grade squamous intraepithelial lesion (HSIL), and malignancy.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 22.0. Descriptive statistics such as frequencies and percentages were used to summarize categorical variables. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test as appropriate. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants prior to enrollment. Confidentiality of patient information was strictly maintained. The study adhered to the ethical principles outlined in the Declaration of Helsinki.

RESULTS

A total of 56 women were included in the study. The majority of participants belonged to the 31–40 years age group (32.1%), followed by 41–50 years (28.6%) (Table 1)

Table 1: Age-wise distribution of study participants (n = 56)

Age Group (years)	Number of Participants (n)	Percentage (%)
21–30	12	21.4
31–40	18	32.1
41–50	16	28.6

51–60	7	12.5
>60	3	5.4
Total	**56**	**100**

Vaginal discharge was the most common presenting complaint, reported by 42.9% of participants, while 10.7% were asymptomatic and underwent routine screening (Table 2)

Table 2: Distribution of participants according to presenting complaints

Presenting Complaint	Number (n)	Percentage (%)
Vaginal discharge	24	42.9
Lower abdominal pain	10	17.9
Abnormal uterine bleeding	12	21.4
Postcoital bleeding	4	7.1
Asymptomatic (screening)	6	10.7
Total	**56**	**100**

Cytological evaluation revealed that the majority of smears were negative for intraepithelial lesion or malignancy (NILM), accounting for 82.1% of cases. Epithelial abnormalities were identified in 17.9% of cases, with low-grade squamous intraepithelial lesion (LSIL) being the most frequent abnormality (7.1%), followed by ASC-US (5.4%), HSIL (3.6%), and one case (1.8%) of squamous cell carcinoma (Table 3)

Table 3: Cytological findings on Pap smear (Bethesda classification)

Cytological Diagnosis	Number (n)	Percentage (%)
NILM (including inflammatory smears)	46	82.1
Atypical squamous cells of undetermined significance (ASC-US)	3	5.4
Low-grade squamous intraepithelial lesion (LSIL)	4	7.1
High-grade squamous intraepithelial lesion (HSIL)	2	3.6
Squamous cell carcinoma	1	1.8
Total	**56**	**100**

The prevalence of epithelial abnormalities showed an increasing trend with age, being highest in women aged above 60 years (33.3%) and lowest in the 21–30 years age group (8.3%) (Table 4)

Table 4: Prevalence of epithelial abnormalities in relation to age group

Age Group (years)	Total Cases (n)	Epithelial Abnormalities (n)	Percentage (%)
21–30	12	1	8.3
31–40	18	2	11.1
41–50	16	4	25.0
51–60	7	2	28.6
>60	3	1	33.3
Total	**56**	**10**	**17.9**

A higher proportion of epithelial abnormalities was observed among women presenting with abnormal uterine bleeding and postcoital bleeding compared to other complaints. However, this association was not statistically significant ($p > 0.05$) (Table 5)

Table 5: Association between presenting complaints and epithelial abnormalities

Presenting Complaint	Total (n)	Abnormal Cases (n)	Percentage (%)
Vaginal discharge	24	3	12.5
Lower abdominal pain	10	1	10.0
Abnormal uterine bleeding	12	4	33.3
Postcoital bleeding	4	2	50.0
Asymptomatic	6	0	0
Total	**56**	**10**	**17.9**

DISCUSSION

The present study evaluated the prevalence of epithelial abnormalities in cervical Pap smear samples among women attending a tertiary care hospital in North India. The overall prevalence of epithelial abnormalities was found to be 17.9%, with low-grade squamous intraepithelial lesion (LSIL) being the most common abnormality, followed by atypical squamous cells of undetermined significance (ASC-US), high-grade squamous intraepithelial lesion (HSIL), and a small proportion of invasive carcinoma. An increasing trend in the prevalence of abnormalities with advancing age was also observed, along with a higher proportion of abnormalities among women presenting with abnormal uterine bleeding and postcoital bleeding.

The prevalence of epithelial abnormalities observed in this study is relatively higher than that reported in several Indian studies, where rates typically range from 1% to 8% [10]. However, some hospital-based studies have reported higher prevalence rates, especially in symptomatic populations, which may explain the findings in the present study. Opportunistic screening in tertiary care settings often includes women with gynecological complaints, thereby increasing the likelihood of detecting abnormalities compared to community-based screening programs. This highlights the influence of study setting and population characteristics on reported prevalence rates.

LSIL emerged as the most common epithelial abnormality in this study, which is consistent with findings from other studies conducted in similar settings [10]. LSIL represents early HPV-induced changes and often regresses spontaneously, particularly in younger women. The detection of LSIL

underscores the importance of regular screening and follow-up to prevent progression to higher-grade lesions. The relatively lower proportion of HSIL and invasive carcinoma observed in the present study aligns with the expected distribution in screening populations, where premalignant lesions are more frequently detected than advanced disease.

The observed increase in epithelial abnormalities with advancing age is in agreement with the natural history of cervical carcinogenesis, where persistent HPV infection over time may lead to progressive epithelial changes [3]. Similar age-related trends have been reported in other studies, indicating that older women, particularly those above 40 years, constitute a higher-risk group for significant cytological abnormalities. This finding supports the need for targeted screening strategies focusing on women in higher age groups, especially in resource-limited settings.
The association between presenting complaints and epithelial abnormalities revealed that women with abnormal uterine bleeding and postcoital bleeding had a higher proportion of abnormalities compared to those with other symptoms. Although the association was not statistically significant, likely due to the small sample size, the trend is clinically relevant. Symptoms such as postcoital bleeding are well-recognized warning signs of cervical pathology and warrant prompt evaluation. Similar observations have been reported in previous studies, where symptomatic women demonstrated a higher yield of abnormal cytology [8].

From a public health perspective, the findings of this study reinforce the importance of strengthening cervical cancer screening programs in India. Opportunistic screening at tertiary care centers provides an important opportunity for early detection, particularly among women who may not participate in organized screening programs. However, reliance solely on opportunistic screening may not be sufficient to reduce the overall disease burden. Integration of community-based screening initiatives, awareness programs, and HPV vaccination strategies is essential to achieve meaningful reductions in cervical cancer incidence and mortality [2].
The strengths of the present study include the use of standardized cytological reporting based on the Bethesda system and the inclusion of both symptomatic and asymptomatic women, providing a realistic representation of routine clinical practice. Additionally, the study contributes region-specific data from North India, where limited literature is available from smaller tertiary care settings.

However, certain limitations must be acknowledged. The relatively small sample size (n=56) limits the generalizability of the findings and reduces the statistical power to detect significant associations. The study was hospital-based and may be subject to selection bias, as women attending tertiary care centers may not represent the general population. Furthermore, the lack of histopathological correlation and HPV testing restricts the ability to confirm cytological findings and assess the underlying etiology. Future studies with larger sample sizes, longitudinal follow-up, and incorporation of HPV testing are recommended to provide more comprehensive insights.

CONCLUSION

The present study highlights a considerable prevalence (17.9%) of epithelial abnormalities detected through cervical Pap smear screening in a tertiary care setting in North India. Low-grade squamous intraepithelial lesion was the most common abnormality, with a clear trend of increasing prevalence with advancing age. Symptomatic women, particularly those presenting with abnormal uterine bleeding and postcoital bleeding, demonstrated a higher proportion of abnormalities, emphasizing the need for prompt evaluation in such cases.These findings reinforce the importance of routine cervical cytological screening as an effective tool for early detection of premalignant and malignant lesions.

Opportunistic screening in tertiary care hospitals plays a vital role; however, there is a need to strengthen organized screening programs to improve coverage and early diagnosis. Public health strategies should focus on increasing awareness, promoting regular screening, and integrating HPV-based approaches for better outcomes. Further large-scale studies are recommended to validate these findings and guide region-specific screening policies.

DECLARATIONS

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Consent: Written informed consent was obtained from all participants prior to inclusion in the study.
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