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Comparative Study of Cervical Cancer Screening by Pap Smear and Liquid-Based Cytology and Its Clinical Correlation, of patients attending in tertiary care hospital at NMCH, Patna

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ABSTRACT

Background: Cervical cancer remains a leading cause of morbidity and mortality among women, particularly in developing countries. Early detection through effective screening is crucial. Aims and Objectives: To compare the diagnostic efficacy of conventional Pap smear and Liquid Based Cytology (LBC) and to correlate findings with histopathological examination (HPE). **Materials and Methods**: This prospective study was conducted on 100 high-risk women aged 21-65 years attending the gynecology outpatient department of Nalanda Medical College and Hospital. Paired samples for Pap smear and LBC were collected from each participant. Colposcopy-guided biopsy was performed, and histopathology was considered the gold standard. **Results**: LBC-detected 27% abnormal cases compared to 17% by Pap smear. Sensitivity of LBC was significantly higher 93.10%) than Pap smear (58.62%), while Specificity was 100% for both methods. Diagnostic accuracy was 98% for LBC and 88% for Pap smear. LBC also showed improved detection of LSIL and HSIL lesions and fewer unsatisfactory samples. **Conclusion**: LBC is superior to conventional Pap smear in detecting cervical epithelial abnormalities and can be considered a more reliable screening modality.

Key Words: *Cervical cancer, Pap smear, Liquid-based cytology, Screening, Histopathology, CIN.*

INTRODUCTION

Cervical cancer is one of the most common malignancies affecting women worldwide and remains a major public health problem in India. Despite being preventable, a large proportion of cases are diagnosed at advanced stages due to inadequate screening programs.

The Papanicolaou (Pap) smear has long been the cornerstone of cervical cancer screening and has significantly reduced incidence and mortality in developed nations. However, it is associated with limitations such as false-negative results, poor sample quality, and obscuring factors.

Liquid-Based Cytology (LBC) has been introduced as an improved alternative, offering better preservation of cellular material, reduced background artifacts, and enhanced detection rates of epithelial abnormalities.

This study aims to compare Pap smear and LBC in terms of diagnostic performance and correlate their findings with histopathology.

MATERIALS AND METHODS

Study Design and Setting

Present study was a prospective observational study conducted in the Department of Obstetrics and Gynecology OPD at Nalanda Medical College and Hospital, Patna during September 2024 to August 2025. A total of 100 patients included in study, after detailed clinical history and examination. Informed consent were taken from every participant.

Study Population

A total of 100 women aged 21-65 years with high-risk factors for cervical cancer were included.

Inclusion Criteria

- Postcoital bleeding
- Vaginal discharge
- Early sexual activity (<18 years)
- Multiparity
- Multiple sexual partners
- Post menopausal bleeding

Exclusion Criteria

- Known cervical malignancy
- Bleeding due to non-cervical causes

Procedure

After taking informed consent, detailed history, chief complain, sample was taken for

- Pap smear sample collected using Ayer's spatula
- LBC sample collected using cyto-brush
- Colposcopy performed in all cases
- Biopsy taken from suspicious areas

Statistical Analysis

Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy were calculated using histopathology as the reference standard.

RESULTS

Majority of patients were in 31-40 years age group (44%)
multiparous women have higher prevalence of abnormal findings.
Early age at first coitus showed significant association with abnormal findings ($p<0.018$)

Table 1: Cytological Detection Comparison

Cytological Method	Normal Cases	Abnormal Cases
LBC	73	27
Pap smear	83	17

LBC: 27% abnormal cases
Pap smear: 17% abnormal cases

Table 2: Specimen Adequacy

Method	Satisfactory	Unsatisfactory
LBC	99	1
Pap smear	97	3

LBC: 99% satisfactory
Pap smear: 97% satisfactory

Table 3: Distribution of Lesions (Bethesda System)

Lesion Type	LBC(%)	Pap Smear (%)
Normal	73	83
LSIL	12	7

HSIL	9	1
ASC	2	6
SCC	4	3

Table 4: Histopathological finding (Gold Standard)

Diagnosis	Number of cases	Percentages (%)
Normal	71	71
CIN1	15	15
CIN2	8	8
CIN3	2	2
SCC	4	4

Correlation with Histopathology
Strong correlation observed between cytology and HPE ($p<0.01$)
LBC showed fewer false-negative cases

Table 5 : Diagnostic Performance

Parameter	Pap smear	LBC
Sensitivity	58.62%	93.10%
Specificity	100%	100%
PPV	100%	100%
NPV	85.54%	97.26%
Accuracy	88%	98%

DISCUSSION

The present study demonstrates that LBC is more sensitive than conventional Pap smear in detecting cervical epithelial abnormalities. The higher sensitivity of LBC can be attributed to improved sample collection, reduced obscuring elements, and uniform cell distribution. Pap smear, although widely used, suffers from limitations such as sampling errors and background interference, which contribute to false-negative results.

The findings are consistent with previous studies showing improved detection rates of LSIL and HSIL with LBC. Additionally, LBC reduces the rate of unsatisfactory smears, thereby improving screening efficiency.

Sherwani R.K et al conducted a comparative study between conventional pap smear & LBC revealing that LBC detected cytological abnormalities in 26.2% & 15% with pap smear. Our study corelated this with LBC detecting abnormalities in 27% of cases compared to 17% with pap smear.

A study by Zhu et-al reported to decrease in Atypical Squamous cell (ASC) from 8% with pap smear to 4% with LBC. In our study LBC showed 2% ASC compared to 6% with pap smear.

In our study the sensitivity of LBC was found to be superior to that of conventional pap smear test, consistent with the findings of Sherwani R.K et-al.

CONCLUSION

Liquid-Based Cytology is a superior screening method compared to conventional Pap smear in diagnosing preinvasive cervical lesions. LBS has got Higher sensitivity, Better diagnostic accuracy and reduced false-negative rates as compared to conventional pap smear test. It is recommended that LBC be adopted more widely, especially in high-risk populations to improve early detection and reduce cervical cancer burden. The enhanced accuracy of LBC is attributed to elimination of sampling errors and reduction in false negative results.

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