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A COMPARATIVE ANALYSIS OF PAP SMEAR AND COLPOSCOPIC FINDINGS IN INDIVIDUALS PRESENTING WITH VAGINAL DISCHARGE AT A TERTIARY CARE OUTPATIENT DEPARTMENT: A CROSS-SECTIONAL STUDY.

Punita Kumari[1], Rajeev Kumar Khetan*[2], Pratima[3]
[1]Senior Resident, Department of Obs and Gynae, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India.
[2]Assistant Professor, Department of Medicine, Radha Devi Jageshwari Memorial Medical College and Hospital, Turki, Muzaffarpur, Bihar, India.
[3]Associate Professor, HOD Department of Obs and Gynae, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India.

Abstract

Background

Cervical cancer is a predominant cause of cancer-related mortality in women globally. Screening techniques, such as Pap smear and colposcopy, are essential for detecting precancerous lesions, facilitating prompt intervention, and alleviating the disease burden.

Methods

This cross-sectional study was conducted in the Obstetrics and Gynaecology Department, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, over one year. A total of 250 women aged 35–55 years underwent Pap smear, colposcopy, and biopsy for cervical lesion assessment.

Results

Among the participants, 34.0% had high-grade squamous intraepithelial lesions (HSIL), 22.4% had low-grade squamous intraepithelial lesions (LSIL), and 21.2% showed inflammatory changes on Pap smear. Colposcopy revealed CIN I in 48.0% of cases, CIN II–III in 36.4%, and CIN III in 15.6%. Histopathological confirmation showed 83.2% had precancerous lesions, with 7.2% diagnosed with squamous cell carcinoma and 1.2% with adenocarcinoma. Among the total study population (n = 250), 83.2% (208 patients) had abnormal findings suggestive of precancerous or cancerous cervical lesions, while 16.8% (42 patients) showed normal or non-precancerous findings. This corresponds to a prevalence of abnormal cervical pathology of 83.2% in the present study cohort. The study demonstrated that combining Pap smear screening with colposcopic evaluation and targeted biopsy significantly improved early detection of precancerous cervical lesions. This integrated diagnostic approach enabled timely intervention, reducing the risk of progression to invasive cancer.

Conclusion

The study highlights the high prevalence of precancerous cervical lesions, emphasizing the necessity of early screening. Colposcopy demonstrated higher diagnostic accuracy than Pap smear, reinforcing its role in early cervical cancer detection.

Keywords: *Cervical cancer screening, Pap smear, colposcopy, precancerous lesions, cervical intraepithelial neoplasia.*
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Corresponding Author: *Rajeev Kumar Khetan*
Email: *rajeevkhetandh2@gmail.com*
Assistant Professor, Department of Medicine, Radha Devi Jageshwari Memorial Medical College and Hospital, Turki, Muzaffarpur, Bihar, India.

Introduction

The cervix is the lower, constricted portion of the uterus that links it to the vagina. It comprises two orifices: the exterior os and the interior os. The squamocolumnar junction (SCJ) delineates the boundary between squamous and glandular epithelium, with its position fluctuating according to age and hormonal factors. In younger individuals, columnar epithelium approaches the external os more closely. Post-puberty, metaplastic alterations result in the conversion of columnar epithelium to squamous epithelium, causing the squamocolumnar junction to migrate inward. The transition zone, situated between the original and newly established squamocolumnar junction, is a pivotal region for cervical pathology [1].

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Common cervical diseases encompass cervical erosion, characterized by the replacement of ectocervical squamous epithelium with glandular epithelium; cervicitis, denoting inflammation of the cervix; and cervical tuberculosis, frequently arising from an ascending infection. Cervical Intraepithelial Neoplasia (CIN) denotes a continuum of precancerous cellular alterations, varying from mild to severe atypia. Cervical cancer is one of the most common cancers in women, surpassed only by breast cancer. The disease imposes a considerable worldwide burden, with an estimated annual incidence of 90,000 cases in developed countries and 340,000 cases in underdeveloped nations. Cervical cancer is regarded as a significant public health issue due to its elevated fatality rate. The World Health Organisation (WHO) categorizes cervical cancer as a preventable disease, as it can be detected in its premalignant phases by early screening and intervention [1].

The concept of pre-invasive cervical disease was first introduced in 1947. It can be detected clinically or through simple, cost-effective, and non-invasive screening methods such as the Papanicolaou (Pap) smear. If abnormalities are found, further evaluation using colposcopy and cervical biopsy can confirm the diagnosis. Early detection and timely intervention play a crucial role in reducing both morbidity and mortality associated with cervical cancer.

Colposcopy is a non-invasive optical technique used to examine the lower genital tract under magnification and bright illumination. It is a routine outpatient procedure and is commonly performed for screening, diagnosis, and follow-up of cervical abnormalities. In cases of suspicious cytological findings, colposcopy-directed biopsy provides definitive confirmation of precancerous or malignant changes. Colposcopy is indicated in various clinical scenarios, including abnormal cervical cytology, high-grade abnormalities, suspicious cervical lesions, persistent low-grade squamous intraepithelial lesions (LSIL) for more than 18 months, and positive visual inspection tests (VIA, VILI) or human papillomavirus (HPV) tests [2,3,4].

Aim of the Study

This study is to evaluate patients exhibiting abnormal vaginal discharge by Pap smear and colposcopy to detect cervical abnormalities. The objective is to ascertain the prevalence of precancerous cervical lesions in the study population and to assess the sensitivity and accuracy of cytology and colposcopy in identifying these lesions. This study evaluates diagnostic strategies to enhance early identification and prompt intervention, thereby decreasing the morbidity and death related to cervical cancer.

Methods

Study Design

This study was designed as a cross-sectional study to assess the prevalence of precancerous cervical lesions and evaluate the effectiveness of Pap smear and colposcopy in detecting these abnormalities among women attending the gynecology outpatient department.

Study Setting and Duration

The study was conducted in the Department of Obstetrics and Gynaecology at Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, over one year, from 1 January 2024 to 1 January 2025.

Study Population

A total of 250 women attending the gynecology outpatient department during the study period were included based on predefined inclusion and exclusion criteria.

Sample Size and Sampling Method

The sample size of 250 participants was determined based on an anticipated prevalence of precancerous cervical lesions of approximately 20%, with a 95% confidence level and a 5% margin of error. To ensure sufficient power and account for potential dropouts or unusable samples, an additional 10% was added to the estimated sample size. A systematic random sampling method was used to select eligible women attending the gynecology outpatient department during the study period.

Inclusion Criteria

Women aged 35–55 years were included if they presented with any of the following conditions:

- Persistent abnormal vaginal discharge,
- Post-coital bleeding,
- Abnormal uterine bleeding,
- Postmenopausal bleeding.

Exclusion Criteria

The study excluded:

- Pregnant women,
- Unmarried women,
- Patients with a known history of cervical carcinoma,
- Post-hysterectomy patients,
- Individuals with other abnormal findings were detected on speculum examination.

Procedure

A detailed medical history was recorded for each participant, focusing on age, parity, menstrual history (including intermenstrual and excessive bleeding), marital and sexual history (including post-coital bleeding and dyspareunia), contraceptive use, and symptoms such as foul-smelling vaginal discharge, itching, or burning micturition.

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A thorough clinical examination was conducted, starting with a systemic assessment, followed by a local examination. The patient was placed in the dorsal lithotomy position, and Cusco's speculum was used to visualize the cervix under proper illumination. Any visible lesions or abnormal discharge were noted.

A Pap smear was collected from the squamocolumnar junction using Ayer's spatula. The smear was spread onto a clean glass slide, fixed with 95% ethanol, air-dried, and stained using the Papanicolaou method. The staining process involved hydration, hematoxylin staining (1–2 minutes), rinsing in tap water, and final staining with Papanicolaou stain.

Findings from the Pap smear were categorized as normal cytology, inflammatory changes, atypical squamous cells, or dysplastic changes. A colposcopic examination was conducted to assess cervical abnormalities, with findings classified as normal, inflammatory changes, cervical intraepithelial neoplasia (CIN), or invasive carcinoma. In cases where abnormalities were detected, a colposcopy-directed punch biopsy was performed, and the tissue sample was sent for histopathological examination.

Statistical Analysis

All collected data were entered into Microsoft Excel and analyzed using SPSS software (version 20). Results were presented as percentages, and a p-value of <0.05 was considered statistically significant.

Bias

To minimize selection bias, a systematic random sampling technique was used. Information bias was reduced through the use of standardized data collection methods and the training of clinical personnel in smear collection and colposcopic examination. All histopathological evaluations were blinded to the Pap smear and colposcopy results to avoid diagnostic bias.

Ethical Approval

The study received ethical clearance from the Institutional Ethics Committee of Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar.

Informed Consent

Written informed consent was obtained from all participants before their inclusion in the study.

Results

A total of 320 women attending the gynecology outpatient department during the study period were initially considered for participation. After applying the inclusion and exclusion criteria, 270 women were deemed eligible. Of these, 250 women consented to participate and were enrolled in the study. All 250 participants completed the clinical evaluation, Pap smear, colposcopic examination, and histopathological biopsy where indicated. There were no dropouts, and all 250 cases were included in the final analysis.

The age distribution of the study participants revealed that the majority of the patients were above 50 years of age, accounting for 74.4% of the total cases, while 25.6% of the patients belonged to the 40–50 years age group. This indicates that older women are more frequently affected by cervical pathologies, highlighting the importance of regular screening in postmenopausal women (Table 1).

Table 1: Age-Wise Distribution of Patients:

Age Group (Years)	Frequency	Percentage (%)
40–50	64	25.6
>50	186	74.4
Total	**250**	**100**

The socioeconomic distribution of the participants showed that the largest proportion of patients belonged to the lower-middle socioeconomic category (53.6%), followed by the upper-middle category (36.8%). A smaller percentage of patients were from the upper-lower (6.8%) and upper (2.8%) socioeconomic groups. These findings suggest that women from lower socioeconomic backgrounds may be more vulnerable to cervical diseases due to limited access to healthcare and screening programs (Table 2).

Table 2: Socioeconomic Status of Patients:

Socioeconomic Category	Frequency	Percentage (%)
Upper	7	2.8
Upper Middle	92	36.8
Lower Middle	134	53.6
Upper Lower	17	6.8
Total	**250**	**100**

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Regarding the characteristics of vaginal discharge among patients, thick and curdy discharge was the most commonly observed type, affecting 52.0% of the patients, followed by thin and watery discharge in 42.4% of cases. Blood-stained discharge was noted in 5.6% of the patients. The predominance of abnormal vaginal discharge underlines its significance as a key symptom necessitating further investigation through cytology and colposcopy for early detection of cervical abnormalities (Table 3).

Table 3: Distribution of Patients Based on Vaginal Discharge Characteristics

Type of Vaginal Discharge	Frequency	Percentage (%)
Thick and curdy	130	52.0
Thin and watery	106	42.4
Blood-stained	14	5.6
Total	**250**	**100**

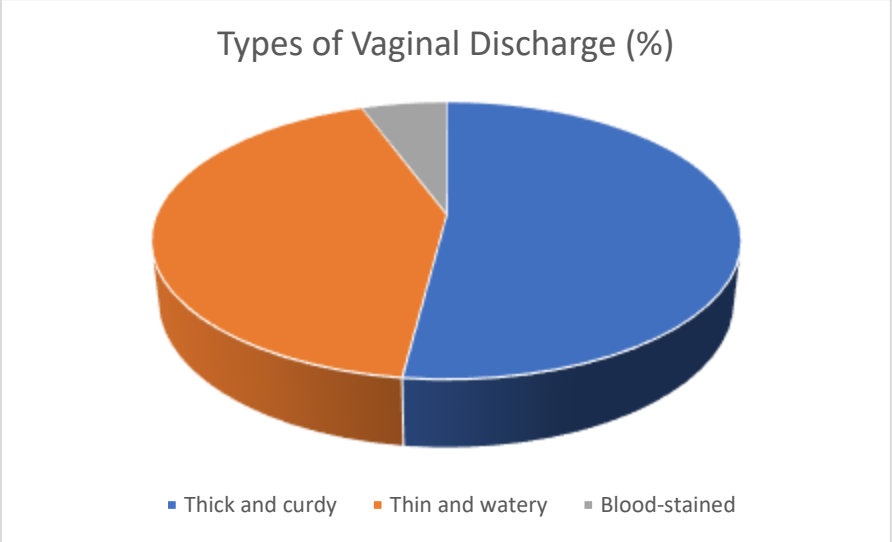

Figure 1: Types of vaginal discharge observed in the patient cohort.

The study employed a multi-tiered diagnostic strategy combining cytological screening, colposcopic evaluation, and histopathological confirmation to enhance early identification and prompt intervention for cervical lesions. Pap smear screening served as the initial step, effectively detecting both low- and high-grade squamous intraepithelial lesions and atypical cellular changes. Colposcopy, performed on all participants, enabled real-time visualization of cervical abnormalities using acetic acid and Lugol's iodine, aiding in the assessment of lesion severity through the Modified Reid Colposcopic Index. Directed biopsies were then taken from suspicious areas to ensure histopathological accuracy. This integrated approach ensured a high detection rate of precancerous lesions (83.2%) and facilitated timely clinical decision-making, highlighting its effectiveness in cervical cancer prevention strategies.

Among the study group, a significant majority of patients, approximately 87.2% (218/250), showed no notable abnormalities on per-abdominal examination. However, 11.2% (28/250) of patients presented with a palpable abdominal mass, while 1.6% (4/250) exhibited tenderness upon examination. Upon visualization of the cervix using a speculum and during Pap smear collection, it was observed that 50.8% (127/250) of patients had mucopurulent discharge. Additionally, 32.4% (81/250) presented with thick curdy white discharge, 8.4% (21/250) had greenish discharge, and 8.4% (21/250) exhibited blood-stained discharge.

Microscopic examination of wet smears revealed that 4.4% (11/250) of the patients tested positive for Candida hyphae, whereas the remaining 95.6% (239/250) showed no identifiable organisms. Pap smear analysis was conducted for all study participants, with results indicating that 34.0% (85/250) of smears showed high-grade squamous intraepithelial lesions (HSIL), 22.4% (56/250) displayed low-grade squamous intraepithelial lesions (LSIL), and 21.2% (53/250) had inflammatory changes. Additionally, 12.8% (32/250) of smears indicated atypical squamous cells of undetermined significance (ASCUS), while 8.4% (21/250) exhibited normal cytology. Notably, 1.2% (3/250) of patients were diagnosed with adenocarcinoma based on cytological findings.

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All patients underwent colposcopic evaluation, during which a 3% acetic acid solution was applied to assess aceto-white areas, followed by Lugol's iodine staining to note further changes. The findings were scored according to the Modified Reid Index. Colposcopy results showed that 48.0% (120/250) of patients had cervical intraepithelial neoplasia grade I (CIN I), 15.6% (39/250) had CIN III, and 36.4% (91/250) exhibited CIN II–CIN III changes. Cervical biopsies were performed on all patients to confirm histopathological findings, revealing that 15.6% (39/250) had no malignant features. Among the remaining patients, 31.2% (78/250) were diagnosed with CIN I, 17.2% (43/250) with CIN II, and 20.0% (50/250) with CIN III. Additionally, carcinoma in situ (CIS) was identified in 8.4% (21/250) of patients, while 7.2% (18/250) were diagnosed with squamous cell carcinoma and 1.2% (3/250) with adenocarcinoma.

Overall, the study revealed that the majority of patients, 83.2% (208/250), exhibited precancerous cervical lesions, whereas 16.8% (42/250) had no evidence of precancerous changes. These findings underscore the importance of early screening and intervention for cervical abnormalities to prevent progression to invasive carcinoma.

Discussion

This study involved 250 women presenting to the outpatient department with complaints of vaginal discharge. Each participant underwent a Pap smear, colposcopy, and biopsy to evaluate the effectiveness and accuracy of these diagnostic tools in detecting precancerous cervical lesions. Kalliala et al. [8] reported that the prevalence of cervical intraepithelial neoplasia (CIN) is higher in women above 30 years of age. In our study, a majority of patients with precancerous lesions belonged to the lower socioeconomic group (53.6%, 134/250). Similarly, Vaidya et al. [9] found that 80% of CIN I and 50% of CIN II cases occurred in individuals from lower socioeconomic backgrounds, where poor hygiene increases the risk of cervical cancer.

Regarding clinical symptoms, the majority of women in this study experienced vaginal discharge, with 52.0% (130/250) reporting thick curdy discharge and 42.4% (106/250) experiencing thin watery discharge for more than six months. Chronic excessive vaginal discharge is a well-recognized risk factor for cervical cancer. Additionally, 14.0% (35/250) of participants reported post-coital bleeding, among whom 60% (21/35) were diagnosed with CIN, indicating a strong correlation between post-coital bleeding and precancerous cervical lesions. Shalini et al. [10] observed that among women experiencing post-coital bleeding, 5.6% had CIN I, 3.6% had CIN II/III, and 55% had invasive cancer. Similarly, 22.4% (56/250) of participants in this study reported postmenopausal bleeding, and 56.2% (32/56) of these cases were associated with CIN. Furthermore, 15.6% (39/250) of participants experienced irregular menstruation, including intermenstrual bleeding, and 23.0% (9/39) of them were diagnosed with CIN.

Mayavati et al. [11] demonstrated a link between early marriage and cervical cancer. Consistent with this, our study found that most women diagnosed with CIN were married before the age of 20. Moreover, CIN was more common in multiparous women. Among contraceptive users, CIN was observed in 62.5% (20/32) of women using oral contraceptive pills, 25% (5/20) of intrauterine contraceptive device (IUCD) users, and 39.2% (61/156) of those who had undergone permanent sterilization. Stern et al. [12] suggested that hormonal contraceptive use increases the risk of cervical dysplasia and that HPV-positive women taking oral contraceptives have up to a fourfold increased risk of developing CIN. In this study, 75.6% (189/250) of participants had no family history of cervical cancer.

On clinical examination, cervical erosion was the most frequent finding, present in 76.0% (190/250) of patients, with 74.0% (141/190) of these cases being CIN-positive. A hypertrophic cervix without erosion was noted in 15.2% (38/250) of patients, and 63.0% (24/38) of these cases were linked to CIN. Additionally, an unhealthy hypertrophied cervix was observed in 60.4% (151/250) of participants, with CIN detected in 55.6% (84/151) of them.

All patients underwent Pap smear testing, which indicated that 25.6% (64/250) had low-grade squamous intraepithelial lesions (LSIL), 33.6% (84/250) had high-grade squamous intraepithelial lesions (HSIL), and 12.8% (32/250) displayed atypical squamous cells of unknown significance (ASCUS). The comparison of Pap smear results with histopathological findings from cervical biopsy indicated that the Pap smear exhibited reduced sensitivity in identifying precancerous lesions. Accuracy assessments demonstrated that colposcopy exhibited superior efficacy, with an accuracy rate of 85.9%, in contrast to 46.4% for the Pap smear. Massad et al. [13] previously showed that colposcopic accuracy in detecting CIN is roughly 80%, although Olanian et al. [14] observed that this accuracy can reach up to 89%. These findings underscore the essential function of colposcopy in the early identification and management of precancerous cervical lesions.

Conclusion

This study highlights the importance of comprehensive screening methods, including Pap smear, colposcopy, and biopsy, in detecting precancerous cervical lesions. The findings indicate that women from lower socioeconomic backgrounds, those with poor hygiene, and those with risk factors such as early marriage, multiparity, and long-term contraceptive use are more susceptible to cervical intraepithelial neoplasia (CIN). While Pap smear remains a useful screening tool, its lower sensitivity underscores the need for colposcopy, which demonstrated a higher accuracy (85.9%) in detecting precancerous lesions. The

study reinforces the significance of early detection through regular cervical screening programs to prevent the progression of CIN to invasive cervical cancer, emphasizing the need for awareness and accessibility of these screening modalities, particularly in high-risk populations.

List of Abbreviations

HSIL – High-Grade Squamous Intraepithelial Lesion
LSIL – Low-Grade Squamous Intraepithelial Lesion
ASCUS – Atypical Squamous Cells of Undetermined Significance
CIN – Cervical Intraepithelial Neoplasia
CIS – Carcinoma in Situ

Source of Funding

This study received no external funding and was conducted using departmental resources.

Conflict of Interest

The authors declare no conflict of interest.

Generalizability

The findings are generalizable to women aged 35–55 years attending gynecology outpatient departments in similar tertiary care settings.

Author Contributions

All authors contributed to the study design, data collection, analysis, manuscript preparation, and final approval of the version to be published.

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