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Original Research Article

Clinical outcome of colposcopy guided biopsy in women with abnormal Pap smear results

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ABSTRACT

Background: Cervical cancer is the fourth most common cancer among women globally and remains a significant public health challenge despite being largely preventable. Persistent infection with high-risk human papillomavirus (HPV), particularly HPV-16 and HPV-18, is the primary cause. Early detection through effective screening methods, such as Pap smear and colposcopy, plays a critical role in reducing cervical cancer incidence. This study evaluates the clinical outcomes of colposcopy-guided biopsy in women with abnormal Pap smear results, highlighting the importance of integrated screening approaches.

Methods: This prospective observational study was conducted in the department of obstetrics and gynaecology, GS medical college and hospital, Hapur, over 15-18 months (November 2022-February 2024). A total of 150 women aged 25-65 years with abnormal Pap smear results and cervical symptoms (e.g., leukorrhea, postcoital bleeding, intermenstrual bleeding) were included. Colposcopy-guided biopsies were performed on these patients. Data were analysed using IBM SPSS version 27, applying statistical tests like the T-test and chi-square test, with $p < 0.05$ considered significant. Descriptive statistics summarized the data, presented in charts and tables.

Results: Among the 150 participants, 10.6% had abnormal Pap smear findings, and 17.3% had abnormal colposcopy findings. Squamous metaplasia (46.15%) and high-grade lesions (34.61%) were the most frequently observed abnormalities during colposcopy, while Pap smears predominantly revealed ASC-US (56.25%) and HSIL (31.25%). Postcoital and postmenopausal bleeding had the highest rates of abnormal findings. Colposcopy demonstrated greater sensitivity compared to Pap smear in detecting cervical lesions, emphasizing its importance in early diagnosis.

Conclusions: Colposcopy is more sensitive than Pap smear in detecting cervical abnormalities, particularly high-grade lesions. Combining these methods enhances the accuracy and reliability of cervical cancer detection. Integrating molecular tests and visual inspection techniques into existing screening protocols could further improve outcomes. Raising public awareness about regular screening, HPV vaccination, and early detection is essential to reducing cervical cancer burden globally.

Keywords: Cervical cancer, Pap smear, Colposcopy, Cervical intraepithelial neoplasia, Early detection, Cervical lesions

INTRODUCTION

Cervical cancer is the fourth most common cancer among women worldwide, with a significant global burden.^{1,2} It develops through a continuous process, starting from normal cervical epithelium after HPV infection,

progressing to cervical intraepithelial neoplasia (CIN), and finally developing into invasive squamous carcinoma.³ The primary cause of cervical cancer is persistent infection with high-risk HPV types, particularly HPV-16 and HPV-18.^{1,4} While HPV infection is the primary cause, public awareness of this link is surprisingly low.⁵ This lack of

awareness extends to medical students in some regions, with a study in Saudi Arabia revealing limited knowledge about early warning signs, symptoms, and risk factors among future health professionals.⁶ In conclusion, cervical cancer is a multifactorial disease influenced by various risk factors, including sexually transmitted infections, reproductive factors, hormonal influences, and genetics.² However, it is also one of the most preventable cancers. Comprehensive prevention strategies, including HPV vaccination, regular screening, and public education about risk factors and early detection, are crucial in reducing the global burden of cervical cancer.^{2,7}

Colposcopy and Pap smear are two important screening methods for cervical cancer detection, each with its own strengths and limitations. Colposcopy has shown higher sensitivity compared to Pap smear in detecting high-grade cervical lesions. In a study of immunodeficient patients, colposcopy demonstrated 66.7% sensitivity and 98.94% specificity, while Pap smear had 18.2% sensitivity and 98.5% specificity in detecting CIN \geq 2.⁸ Interestingly, the combination of Pap smear with other screening methods can significantly improve detection rates. Co-testing with visual inspection with acetic acid (VIA) or visual inspection with iodine solution (VILI) increased the sensitivity of Pap smear from 71.6% to 87.1% and 95% respectively, albeit with higher rates of unnecessary colposcopies. Additionally, the use of molecular tests as an adjunct to Pap smear appears to be a promising option for improving detection of high-grade lesions in population-based screening programs.⁹ In conclusion, while Pap smear remains a widely used screening tool, colposcopy shows higher sensitivity in detecting cervical lesions. However, the integration of multiple screening methods, including molecular tests and visual inspection techniques, may provide the most comprehensive approach to cervical cancer screening. The choice of screening method should consider factors such as resource availability, patient population, and the specific strengths of each technique.^{8,9}

Cervical cancer remains a major global health concern, despite being largely preventable through early detection and HPV vaccination. Current screening methods, such as Pap smear and colposcopy, have their strengths and limitations, with colposcopy showing higher sensitivity for detecting high-grade lesions. However, combining Pap smear with other methods like visual inspection techniques and molecular tests has shown promising results in improving detection rates. The rationale for this study is to evaluate and compare the effectiveness of integrating multiple screening approaches to enhance the accuracy of cervical cancer detection, ultimately contributing to more comprehensive and accessible screening strategies, particularly in areas with limited resources/low awareness.

Objectives

Objectives were to evaluate the clinical outcome of colposcopy guided biopsy in women with abnormal Pap smear results.

METHODS

This prospective observational study, approved by the ethical committee, was conducted at the department of obstetrics and gynaecology, GS medical college and hospital, Hapur, over a period of 15-18 months (November 2022-February 2024). The study aimed to evaluate cervical abnormalities in women aged 25-65 years, with a sample size of 150 patients determined based on a prevalence rate of 11% for cervical cancer, a 5% margin of error, and a 95% confidence interval. Patients were recruited from the OPD/IPD of the department of obstetrics and gynaecology, particularly those presenting with unhealthy cervixes, including symptoms such as leukorrhea, postcoital bleeding, intermenstrual bleeding, and postmenopausal bleeding. Inclusion criteria included abnormal cytology results in women aged 25-65 with symptoms or signs of cervical abnormalities. Exclusion criteria involved pregnant women, those under 25 years, post-radiation patients, and those with invasive cervical cancer. Data collected was analysed using IBM SPSS version 27 software, with statistical tests (T-test and Chi-square test) applied to assess significance, with $p < 0.05$ considered statistically significant. Descriptive statistics, including mean, standard deviation, and percentages, were used for data summarization, and results were presented with relevant diagrams, figures, and tables.

RESULTS

The study included a total of 150 participants, categorized into various age groups and education levels. In terms of age distribution, the majority of participants (48.0%) were aged 36-45 years, followed by 24.0% in the 46-55 age group, 23.3% in the 25-35 age group, and the smallest proportion (4.7%) aged 56-65 years. Regarding education levels, 40.0% of participants were illiterate, while 50.7% had completed education up to the 12th standard, and 9.3% were graduates or had higher qualifications. This demographic breakdown highlights a relatively balanced representation across age groups, with a predominant portion of participants having up to secondary education.

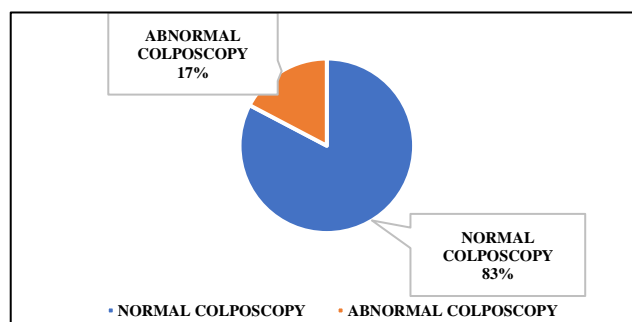


Figure 1: Distribution of study participants based on colposcopy findings.

Figure 1 illustrates the distribution of study participants based on colposcopy findings in which 83% were normal and 17% were found with abnormal findings.

Figure 2 illustrates the distribution of colposcopic findings among patients with abnormal results, categorized into squamous metaplasia, low-grade lesions, and high-grade lesions. The largest proportion of cases (46.15%) showed squamous metaplasia, a benign condition reflecting normal cellular changes often associated with the transformation zone of the cervix. High-grade lesions were identified in 34.61% of cases, indicating significant abnormalities with a higher risk of progression to cervical cancer, warranting closer clinical attention. Low-grade lesions accounted for 19.23% of findings, representing mild abnormalities typically associated with transient HPV infections and often resolving spontaneously. This distribution underscores the importance of colposcopic evaluation in detecting and stratifying cervical abnormalities for appropriate management.

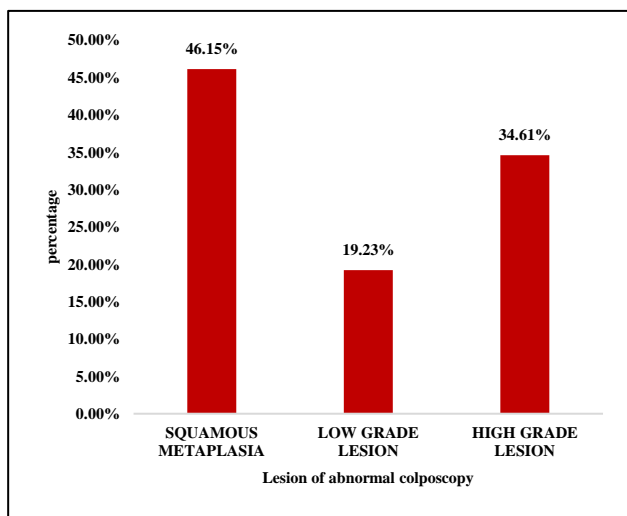


Figure 2: Distribution of lesion among abnormal colposcopy, (n=26).

Figure 3 depicts the distribution of study participants among Pap smear findings in which 89% were found normal and 11% were found abnormal findings.

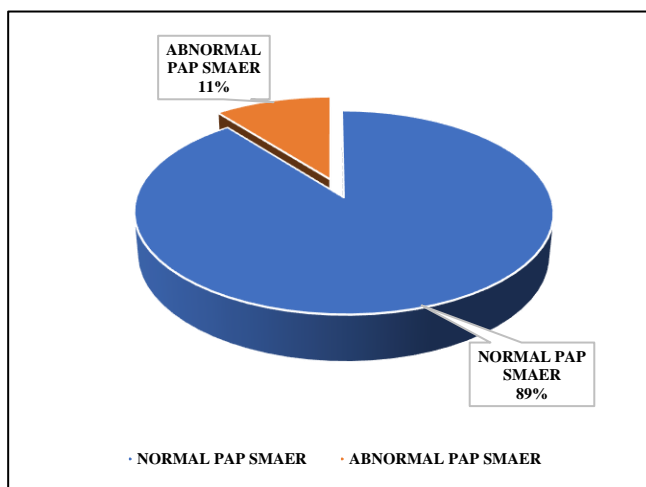


Figure 3: Distribution of study participants among Pap smear findings.

Figure 4 presents the distribution of abnormal PAP smear findings among patients, categorized into three diagnostic groups. The majority of cases, 56.25%, were identified as ASC-US (Atypical Squamous Cells of Undetermined Significance), indicating a significant proportion of mild, unclear cellular abnormalities requiring follow-up. HSIL (High-grade squamous intraepithelial lesion) accounted for 31.25% of cases, reflecting a substantial number of higher-risk abnormalities that may necessitate further investigation and intervention. The least frequent finding was LSIL (Low-Grade Squamous Intraepithelial Lesion), comprising 12.50% of cases, typically indicative of mild abnormalities often associated with transient HPV infections. This distribution highlights the predominance of ASC-US in abnormal PAP smear results, emphasizing the need for careful monitoring and stratified management strategies.

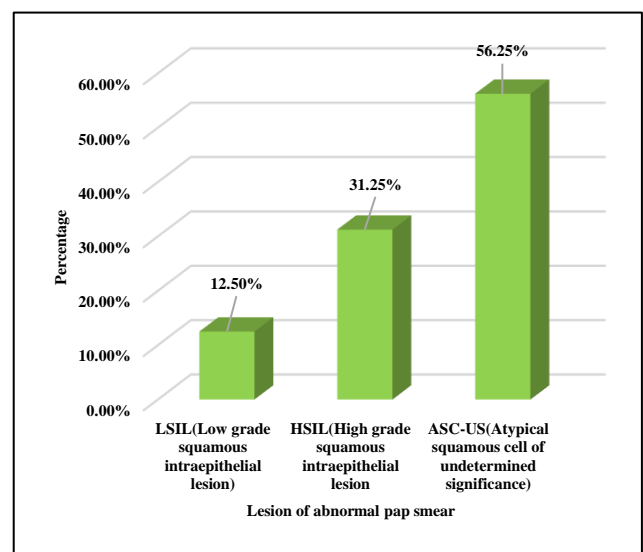


Figure 4: Distribution of lesion finding among abnormal pap smear, (n=16).

Table 1 summarizes the distribution of complaints among 150 patients, alongside the percentage of cases with abnormal PAP smear and abnormal colposcopy findings for each complaint. The most common complaint was whitish discharge per vaginum (PV), reported by 60 patients (40%), of which 8.33% had abnormal PAP smears and 26.66% had abnormal colposcopy findings. Intermenstrual bleeding was noted in 32 patients (21.3%), with abnormal PAP smears and colposcopy findings in 9.3% of cases each. Menorrhagia affected 28 patients (18.7%), with 3.5% showing abnormalities in both PAP smear and colposcopy.

Post-coital bleeding, although less frequent (4 patients, 2.6%), showed a high percentage of abnormalities, with 75% showing abnormal PAP smears and 50% with abnormal colposcopy. Similarly, post-menopausal bleeding, reported by 3 patients (2%), had high abnormality rates, with 66.6% in both PAP smear and colposcopy. Burning micturition (8 patients, 5.3%) and

lower abdominal pain (15 patients, 10%) showed no abnormalities in PAP smear for the former and a 13.3% abnormal rate for the latter in both PAP smear and colposcopy.

Overall, 10.6% of the total patients had abnormal PAP smear findings, and 17.3% had abnormal colposcopy results. This data underscores the importance of these diagnostic methods in evaluating gynaecological complaints.

Table 1: Distribution of study participants based on the basis of presenting complaint.

Complaint	N	Abnormal PAP smear, N (%)	Abnormal colposcopy, N (%)
Whitish discharge PV	60	5 (8.33)	16 (26.66)
Menorrhagia	28	1 (3.5)	1 (3.5)
Intermenstrual bleeding	32	3 (9.3)	3 (9.3)
Post coital bleeding	4	3 (75)	2 (50)
Post menopausal bleeding	3	2 (66.6)	2 (66.6)
Burning micturition	8	0 (0)	0 (0)
Lower abdominal pain	15	2 (13.3)	2 (13.3)
Total	150	16 (10.6)	26 (17.3)

DISCUSSION

Cervical screening plays a critical role in the early detection of abnormal cervical conditions, including precancerous lesions and invasive cervical cancer. The intersection of Pap smears and colposcopy is central to understanding the diagnostic landscape of cervical abnormalities. In this discussion, we delve into the nuances of colposcopy and Pap smear outcomes across various gynaecological presentations, offering insights into their accuracy, sensitivity, and limitations. Drawing comparisons with existing literature, we explore how these diagnostic tools perform in different clinical settings and populations, providing a deeper understanding of their role in cervical cancer prevention.

The data provided shows a significant difference in colposcopy outcomes, with 82.70% of cases resulting in normal colposcopy findings and 17.30% showing abnormal results. This distribution aligns with findings from several studies, though with some variations. For instance, Cristoforoni et al reported that computer-aided colposcopy had a 74.1% accuracy in diagnosing normal histology, which is lower than the 82.70% normal rate given.¹⁰ However, Ghosh et al found that colposcopy

overestimated disease severity in 68.8% of women with normal histology, suggesting a higher false positive rate for abnormal findings than the 17.30% provided.¹¹ In conclusion, while the given percentages fall within a plausible range based on existing literature, they may not fully capture the complexity and variability of colposcopy outcomes across different populations and methodologies. Factors such as the use of computer-aided systems, HPV status, and the experience of the colposcopist can significantly influence the accuracy of colposcopic impressions.

The provided data suggests a distribution of cervical lesions, with 46.15% showing squamous metaplasia, 19.23% low-grade lesions, and 34.61% high-grade lesions. This distribution aligns with the general understanding of cervical cytology and histology findings in abnormal Pap smears. Interestingly, this distribution differs from some of the findings reported in the provided papers. For instance, Owens et al reported that 40% of LSIL-H (Low-grade squamous intraepithelial lesion, cannot exclude high-grade) cases were associated with CIN 2+ (CIN 2 or worse), which is closer to the high-grade lesion percentage in the given data.¹⁰ However, Shidham et al found a lower percentage (33%) of high-grade lesions in LSIL-H cases. In conclusion, the distribution provided (46.15% squamous metaplasia, 19.23% low-grade lesions, and 34.61% high-grade lesions) represents a spectrum of cervical abnormalities.¹² While it doesn't perfectly match any single study's findings, it falls within the range of outcomes reported in various studies. The relatively high percentage of high-grade lesions (34.61%) underscores the importance of careful evaluation and follow-up of abnormal cervical cytology findings.

The provided data suggests a distribution of cervical cytology results, with ASC-US being the most common (56.25%), followed by HSIL (31.25%), and LSIL (12.50%). However, this distribution doesn't align perfectly with the findings from the provided research papers. According to Shidham et al out of 77,979 cases, 1,970 were interpreted as LSIL (1,523), LSIL-H (146), ASC-H (109), and HSIL (192).¹² This shows a higher prevalence of LSIL compared to HSIL, which contradicts the given percentages. Similarly, Owens et al identified 426 LSIL, 86 ASC-H, 81 LSIL-H, and 110 HSIL cytologic interpretations during a 1-year period, again showing a higher prevalence of LSIL.¹⁰ Interestingly, Morency et al reported a different distribution in their study of 1417 Papanicolaou tests: 19.5% LSIL, 3.6% ASC-H, and 7.5% HSIL.¹³ This shows a higher prevalence of LSIL compared to HSIL, which is more consistent with other studies but still differs from the given percentages. In conclusion, while the provided percentages show ASC-US as the most common result, followed by HSIL and then LSIL, this distribution is not consistently supported by the research papers provided. Most studies show a higher prevalence of LSIL compared to HSIL. The high percentage of ASC-US in the given data could be reflective of specific population

characteristics or screening practices, but more context would be needed to fully interpret these results.

The provided data shows the prevalence of abnormal Pap smears and abnormal colposcopy findings for different gynaecological complaints. Whitish discharge per vaginum had the highest percentage of abnormal colposcopy findings at 26.66%, while only 8.33% had abnormal Pap smears. This discrepancy highlights the potential limitations of Pap smears in detecting cervical abnormalities. Interestingly, the data reveals some contradictions with findings from other studies. While the table shows relatively low percentages of abnormal Pap smears, Sherwani et al reported that cytological abnormalities were found in 26.2% of cases using the Pap spin method.¹⁴ Additionally, Najib et al found that colposcopy had higher diagnostic accuracy (96.3%) compared to Pap smears (82.2%) in detecting cervical lesions, which aligns with the higher percentages of abnormal colposcopy findings in the provided data.¹⁵ In conclusion, the data suggests that colposcopy may be more sensitive in detecting cervical abnormalities compared to Pap smears, particularly for patients presenting with whitish discharge. This is supported by findings from multiple studies Karimi-Zarchi et al, Najib et al, Sherwani et al.^{8,14,15} which demonstrated higher sensitivity and accuracy of colposcopy compared to Pap smears. However, it's important to note that a combination of screening methods may provide the most comprehensive approach to cervical cancer detection

Abnormal Pap smears are a common presentation of cervical abnormalities, including invasive cervical cancer. According to Pretorius et al 28% of patients with invasive cervical cancer presented with abnormal Pap smears. These patients had a significantly better disease-free survival (96%) compared to those presenting with other symptoms (Pretorius et al).¹⁶ However, it's important to note that Pap smears may not always accurately predict histologic diagnosis, as demonstrated in Massad et al where exact correspondence between cytology and biopsy was found in only 35% of cases.¹⁷ Interestingly, Priore et al found that in HIV-positive women, Pap smears missed 43% of biopsy-proven intraepithelial lesions.¹⁸ However, when abnormal, the Pap smear had a high positive predictive value (96%) in HIV-positive women. This suggests that while Pap smears may not be highly sensitive, they can be quite specific in certain populations.

Abnormal Pap smears are a common presentation of cervical abnormalities, including invasive cervical cancer. In Pretorius et al 28% of patients with cervical cancer presented with abnormal Pap smears.¹⁶ The study also found that patients presenting with abnormal Pap smears had a disease-free survival rate of 96%, significantly higher than those presenting with other symptoms. Interestingly, Priore et al reported that Pap smears missed 43% of biopsy-proven intraepithelial lesions in HIV-positive women.¹⁸ However, when abnormal, the Pap smear had a high positive predictive value of 96% in HIV-

positive women compared to 78% in non-infected patients. While the provided data mentions lower abdominal pain as a symptom, Pretorius et al reported that only 9% of cervical cancer patients presented with pain.¹⁶ This suggests that pain, including lower abdominal pain, may not be a common presenting symptom for cervical abnormalities detectable by Pap smears or colposcopy.

In conclusion, while the data presented here offers a valuable snapshot of cervical screening outcomes, it also highlights the complexity and variability inherent in diagnostic practices. The interplay between Pap smears, colposcopy, and histological findings is influenced by factors such as population characteristics, screening techniques, and the experience of the clinician. By integrating these diagnostic methods and considering their individual strengths and limitations, healthcare providers can better navigate the path towards effective cervical cancer detection and prevention. As research continues to evolve, a more nuanced approach will emerge, ultimately enhancing the accuracy and effectiveness of cervical cancer screening protocols worldwide.

CONCLUSION

This study highlights the significance of combining Pap smear and colposcopy for the effective detection of cervical cancer. The findings demonstrated that 10.6% of patients had abnormal Pap smear results, while 17.3% had abnormal colposcopy findings. Squamous metaplasia and high-grade lesions were the most commonly observed abnormalities. Colposcopy proved to be more sensitive in detecting cervical lesions, suggesting that integrating multiple screening methods may offer a more comprehensive and reliable approach for early cervical cancer detection. The results emphasize the importance of regular screening, particularly in high-risk populations, to ensure timely diagnosis and intervention.

Based on the findings of this study, it is recommended that Pap smear and colposcopy be used together to enhance the accuracy of cervical cancer detection. Additionally, raising awareness about the importance of regular screening, HPV vaccination, and early detection is crucial to reducing the global burden of cervical cancer. Further research into the role of molecular tests as adjuncts to traditional screening methods may provide even more precise and reliable outcomes in the future.

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