The Correlation Between Abnormal Cervical Cytology, Colposcopy, and Histology in the Diagnosis of Cervical Cancer Precursor Lesions

Ondele Nyandana *, Mziwohlanga Mdondolo , Charles Bitamazine Businge

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Article

The Correlation Between Abnormal Cervical Cytology, Colposcopy, and Histology in the Diagnosis of Cervical Cancer Precursor Lesions

Ondele Nyandana *, Mziwohlanga Mdondolo and Charles Bitamazine Businge

Department of Obstetrics and Gynecology, Walter Sisulu University
* Correspondence: onyandana@gmail.com; Tel: (+27 63 704 8295)

Abstract

Background: Cervical cancer is the fourth most common cancer among women globally, with the highest burden in low- and middle-income countries. Limited access to screening and treatment contributes to high mortality, despite effective screening methods like HPV testing and cervical cytology**. Objectives**: To establish the degree of correlation between cervical cytology, colposcopy, and histological features among patients with abnormal cytological smears seen at Nelson Mandela Academic Hospital and Mthatha Regional Hospital. **Methods**: This was an analytical cross-sectional study conducted from June 1, 2024, to June 30, 2025. Two hundred twenty-five participants were enrolled through a convenience sampling method. Demographic and clinical data were collected using a structured questionnaire. Categorical data were expressed as frequencies and proportions, and continuous data were summarized into means ± SD or medians (IQR). X^2 was used to determine the correlation, and a p-value of <0.05 was significant. **Results**: The mean age was of the participants was 45.5 years, with 72% being HIV positive. Most cytology results showed high-grade squamous intraepithelial lesions (HSIL). Colposcopy classified 77% of participants as CIN II or III. Both cytology and colposcopy correlated positively with histology p< 0.05. Cytology showed 92% sensitivity and 33% specificity for detecting CIN 2+ lesions, while colposcopy had 87.4% sensitivity and 49% specificity. Micro-invasive cervical cancer was prevalent in 4% of the participants and was associated with age ≥ 50 years and treatment delay of > 4 months. **Conclusion**: Both colposcopy and cytology demonstrated good sensitivity but poor specificity for the diagnosis of CIN 2 or higher dysplastic lesions of the cervix. Early colposcopic evaluation and treatment of women with HSIL can help prevent incident cervical cancer.

Keywords: HSIL**;** cytology; colposcopy; histology; cervical cancer; correlation

1. Introduction

Cervical cancer is a global health problem, which affects more people from low- and middle-income countries (LMICs). The disease is preventable through proven effective intervention measures such as primary prevention which include vaccination against low and high-risk HPV subtypes and secondary prevention through screening with cervical cytology and HPV DNA methods in resource available settings [3].

Cervical cancer is the 4th most prevalent cancer in women after breast, colorectal and lung cancers. It is the leading gynecological cancer in LMICs. which records about 604 127 new cases annually and causes death in over 341 831 females in 2020 [27]. It is of concern because there are about 85% of new cases and 90% of deaths from cervical cancer occur in low-resource settings. A little more than 50% of patients with cervical cancer die of the disease [29]. Human papilloma virus (HPV) is necessary but not a sufficient cause of cervical cancer [33]. Other co-factors include high parity, lifestyle factors like smoking, multiple sexual partners, long term use of oral contraceptive and most

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importantly sexual transmitted infections like Human Immunodeficiency Virus (HIV) and Chlamydia trachomatis [24].

Population-based cytological screening played a major role in reducing the prevalence of cervical cancer and its morbidity and mortality in high-income countries since its introduction in the 1940s. The introduction and uptake of HPV vaccination will undoubtedly lead to even further reductions in the prevalence and mortality in these countries. Unfortunately, population-based cytological screening never took off in low-middle income countries (LMICs), which accounts for the high prevalence and mortality rates of cervical cancer in these countries [3,35,37].

All women are at risk of cervical cancer and peak age is 51 years and increased incidence with increase in age [9]. Chronic HPV infection with high-risk strains has been proven to be the etiology of cancer of the cervix [34]. There has been a noted increase in HPV infection globally the global pooled prevalence was 31% for any HPV and 21% for high-risk HPV. HPV 16 was the most prevalent (5%) followed by HPV 6 (4%) [27]. As many as 93% of cervical cancers could be prevented by screening and early detection of premalignant lesions, by conventional cervical smear (Pap smear) and newer liquid-based cytology (LBC), both of which are cost-effective [22].

An Iranian descriptive analytical study published in 2013 found the conventional Pap smear to have a sensitivity and specificity 51% and 66.6% respectively, whereas that of liquid-based cytology was 55.3% and 77.7% respectively. Relationship between Pap smear and colposcopy and LBC and colposcopy was significant with $p<0.001$ [12]. Vidyadhar and colleagues in 2017 in their study found that sensitivity and specificity of PAP smear was 29.7% and 94.4%. Sensitivity and specificity of colposcopy was 85.9% and 74.3%respectively.

Positive correlation was observed between colposcopy and histology and sensitivity and specificity of 90% and 98.7 respectively, while cervical cytology and colposcopy had a poor specificity of 58% and cytology and histology were 62% with concordance of 35% between cytology and histology [23]. In a study comparing the accuracy of cytology, colposcopy and histology if diagnosing premalignant lesions, colposcopic examination showed good accuracy for detecting cervical lesions, especially for low-grade lesions. For low-grade lesions, the accuracy was 80.48% for evaluator 1 and 82.92% for evaluator 2. Both evaluators had similar accuracy for high-grade lesions. Overall, colposcopy was more accurate than cytology [20]. A study in India also compared these modalities and found the accuracy of cytology when compared to colposcopy was 81.82% and colposcopy and histology was 83.6% with a combined accuracy of 76.36% [10].

A Welsh study found that 87% of cases identified as High-grade intraepithelial lesion (HSIL) by colposcopy were confirmed through cervical biopsy and histology. However, 13% turned out to be Low-grade intraepithelial lesions (LSIL). Through colposcopy, 69% of the LSIL were correctly identified; while 25% of those labeled as LSIL were HSIL on biopsy [6]. A comparative study in India demonstrates that colposcopy has higher sensitivity than Pap smear (95% vs 44%) while Pap smear has greater specificity compared to colposcopy (93% vs 84.62%) making histological diagnosis necessary for confirmation. The combined approach improved screening accuracy to 87%. This vastly great difference between cervical cytology and histopathology can either lead to missed high grade lesions or overtreatment of low-grade lesion and the is a need to correlate the cytology, colposcopy and histology. This study was conducted to address the paucity of corresponding data in our setting.

2. Materials and Methods

Study Design

This was a cross-sectional analytical study, to evaluate the correlation between cytological screening, colposcopy and histology in patients referred or scheduled for colposcopy.

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Study Setting

The study took place at Mthatha Regional Hospital (MRH) and Nelson Mandela Academic Hospital (NMAH) which are rural level 2/3 tertiary referral hospitals in the north-east of the Eastern Cape Province. Approximately 800 patients are seen in the GOPD in both hospitals per month.

Study Population

Target population was all patients with abnormal cytological screening reports who are referred or scheduled for colposcopy and treatment at MRH and NMAH.

Ethical Considerations

Ethics approval was obtained from the Faculty of Health Sciences Research Ethics Committee, Walter Sisulu University (Ethics clearance certificate 161/2024). Permission was sought from the MRH and NMAH administration and Eastern Cape Department of health. The research was carried out according to the Declaration of Helsinki and principles of the Belmont report.

Sample Size Calculation

Omoyeni et al (2022) reported the rate of invasive SCC among women with CIN2+ who received care at a tertiary hospital in Kwa-Zulu-Natal, South Africa as 10.5%. Assuming a similar rate among the study population at Nelson Mandela Academic Hospital and Mthatha Regional Hospital, the sample size was calculated using the Cochran's formula, as follows:

$N=(Z_\alpha)^2 \times P(100-P)/e^2$, where N is the sample size, $Z_\alpha = 1.96$, the z-score at a confidence interval of 95%, P=expected proportion (10.5%). e=maximum error (4%), a=0.05.

$N= (1.96)2 \times 10.5(100-10.5)/4^2=225$

Sampling Method

All consecutive patients who gave informed consent to participate in the study were included.

Inclusion criteria:

All patients with abnormal cytological screening reports referred or scheduled for colposcopy and treatment at MRH and NMAH who gave informed consent were eligible to participate in the study.

Exclusion Criteria

Patients with cytological abnormalities referred or scheduled for colposcopy and treatment who declined to participate in the study, those whose abnormal cytological screening was older than 6 months without being repeated and patients with symptomatic cervical cancer.

Study procedure

Patients with abnormal cytology were referred for colposcopy and, if needed, treatment. After informed consent and counseling, the cervix was examined using colposcopy following application of acetic acid or Lugol's iodine. If abnormalities were seen, a LLETZ procedure was performed under local anesthesia, and tissue was sent for histology. Patients were monitored, given post-procedure advice, and scheduled for a follow-up visit to review results and plan further care according to guidelines

Data Collection Instrument and Variables

A self-designed data collection sheet (Appendix 1) was used to collect clinical information, and an interviewer-administered questionnaire was used to collect demographic data, clinical history from all the patients in the study. Data variables that were collected included patient's age, race, marital status, occupation, parity, age of sexual debut, history of previous sexually transmitted (STIs), HIV status, and if positive, CD4+ count and viral load, ART regimen and duration, socioeconomic

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status, history of contraceptive use, recreational activities, referral cytology results risk factors, clinical and laboratory findings.

Data Analysis

The data were entered an electronic Microsoft Excel datasheet, double-checked for accuracy and imported to a statistical software package SPSS v28 2021 for analysis. Categorical data were summarised as frequencies and proportions. Continuous data such as age were summarised into means ±SD if normally distributed or median (interquartile range) if not normally distributed. The chi-square test and Fisher's exact tests were used to compare the nominal or categorical variables as appropriate. Pearson's correlation coefficient was used to test for linear relationship between two continuous, normally distributed variables and Spearman's rank correlation was used for variables which were not normally distributed when one or both are ordinal. Statistical significance was set at 5% ($p<0.05$).

3. Results

Proportions of Various Types of Abnormal Cytology Among the Participants

A total of 225 participants with abnormal cervical cytology referred for colposcopy were enrolled. Majority of the participants (77%) had cytology results indicating HSIL, with smaller proportions having ASC-H (8%), persistent LSIL (7.5%), persistent ASC-US (3.1%), AGU-S (1.3%), NILM with HRHPV (0.88%), LSIL-H (0.88%) and atypical cells (0.4%). Colposcopic examination portrayed the lesions as 22.6% CIN I, 26.6% CIN II, and 50.6% as CIN III. Histological diagnosis found 37 (16.4%) of the participants as having no dysplasia, 12 (5.3%) CIN 1, 18 (8.0%) CIN II, 148 (65.8%) CIN III and 9 (4.0%) micro-invasive carcinoma of the cervix.

General Characteristics of the Participants

The age of the participants ages ranged from 22 to 88 years (mean 45.5 ± 12.1 years). The median parity was 3 (range 0–11), and the mean age at sexual debut was 17.4± 2.3 years (range 13–26). Most participants were HIV positive (72%), single or married, not currently using contraception (53%), and did not use alcohol or recreational drugs (70%). There was no significant association between histological lesions and HIV status, marital status, contraceptive use, or use of recreational agent's $p > 0.05$. The lowest mean age was among those with CIN III (44.4 years), and the highest among those with invasive cancer (53 years). There were no significant differences in mean age, median parity, or mean age at sexual debut across the different histological diagnostic categories all $p > 0.05$.

Table 1. Relationship between histology and HIV status, marital status, current use of contraception, and use of recreational substances.

Variable	No dysplasia	CIN I[a]	CIN II[b]	CIN III[c]	Invasive Cancer	P-value[d]
Age [Mean ± sd] (yrs)	45.3 ± 13.3	45. 4 ± 12.9	50.2 ± 12.5	44.4 ± 11.7	53.0 ± 9.3	0.121[#]
Sexual debut [Mean ± sd] (yrs)	17.7 ± 2.1	17.5 ± 1.8	16.9 ± 1.8	17.4 ± 2.4	18.3 ± 3.1	0.549[#]
Parity [Median (p25, p75)]	3 (2, 4)	2 (0, 3)	2 (2, 4)	3 (1, 4)	3 (2, 5)	0.122*
HIV status	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	
Positive	23 (63.9)	9 (81.8)	13 (72.2)	112 (76.7)	5 (55.6)	0.420
Negative	13 (36.1)	2 (18.2)	5 (27.8)	34 (23.3)	4 (44.4)	
Total	36 (100.0)	11 (100.0)	18 (100.0)	146 (100.0)	9 (100.0)	
Marital status	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	
Married	14 (37.8)	6 (50.0)	4 (50.0)	53 (35.8)	6 (66.7)	0.780
Single	21 (56.8)	6 (50.0)	4 (50.0)	90 (60.8)	3 (33.3)	
Divorced	1 (2.7)	0 (0.0)	0 (0.0)	2 (1.4)	0 (0.0)	
Widowed	1 (2.7)	0 (0.0)	0 (0.0)	3 (2.0)	0 (0.0)	

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Total	37 (100.0)	12 (100.0)	8 (100.0)	148 (100.0)	9 (100.0)	
Contraception	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	
None	19 (51.4)	6 (50.0)	8 (44.4)	74 (50.0)	7 (77.8)	0.841
LARC[h]	10 (27.0)	2 (16.7)	6 (33.3)	38 (25.7)	1 (11.1)	
Barrier	6 (16.2)	3 (25.0)	3 (16.7)	24 (16.2)	0 (0.0)	
Sterilized	2 (5.4)	1 (5.6)	1 (5.6)	5 (3.4)	1 (11.1)	
COCs[i]	0 (0.0)	0 (0.0)	0 (0.0)	7 (4.7)	0 (0.0)	
Total	37 (100.0)	12 (100.0)	18 (100.0)	148 (4.7)	9 (100.0)	
Recreation drugs	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	
User	13 (35.1)	5 (41.7)	3 (16.7)	46 (31.1)	0 (0.0)	0.152
Non-user	24 (64.9)	7 (58.3)	15 (83.3)	102 (68.9)	9 (100.0)	
Total	37 (100.0)	12 (100.0)	18 (100.0)	148 (100.0)	9 (100.0)	

CIN I = Cervical Intraepithelial Neoplasia 1; CIN II = Cervical Intraepithelial Neoplasia 2; CIN III = Cervical Intraepithelial Neoplasia; 3; P-value = probability value; SD = standard deviation; p25 = 25th percentile; p75 = 75th percentile; LARC = Long-acting Reversible Contraception; COCs = Combined Oral Contraceptives.

Correlation Between Histology, Cytology, and Colposcopy

Both cytology and colposcopy were positively correlated with histology (the gold standard), with Spearman's correlation coefficients of 0.283 and 0.324, respectively (p <0.001, Table 2).

Table 2. Correlation between Histology, cytology, and colposcopy features.

	Spearman's statistic	**Cytology**	**Colposcopy**
Histology	Correlation coefficient	0.283	0.324
	P value	<0.001	<0.001
Cytology	Correlation coefficient		0.162
	P value		0.015

P-value = probability value.

There was also a significant concordance of both colposcopic and cytological diagnosis with histological diagnosis of the cervical lesions (respective Chi-squares 43.936, p < 0.001, and 80.906, p <0.001) (Tables 3 and 4).

Table 3. Concordance between histological and colposcopic diagnoses.

Histology	**Colposcopy**			**Chi-square**	**P value**
	CIN 1	**CIN II**	**CIN III**		
CIN I	7	3	2	43.936	<0.001
CIN II	4	6	8		
CIN III	16	39	93		
Invasive cancer	2	0	7		
No dysplasia	17	12	8		
Total	46	60	118		

P-value = probability value; CIN I = Cervical Intraepithelial Neoplasia 1; CIN II = Cervical Intraepithelial Neoplasia 2; CIN III = Cervical Intraepithelial Neoplasia 3.

Table 4. Concordance between histological and cytological diagnoses.

Histology	**Cytology**	**Chi-square**	**P value**

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	AGU-US	ASC-H	ASC-US	Atypical cells	HSIL	LSIL	LSIL-H	NILM		
CIN I	2	5	1	0	3	1	0	0	80.906	<0.001
CIN II	0	1	1	0	14	2	0	0		
CIN III	1	7	3	1	128	6	2	0		
Invasive cancer	0	0	0	0	9	0	0	0		
No dysplasia	0	5	2	0	20	8	0	2		
Total	3	18	7	1	174	17	2	2		

AGC-US = Atypical Glandular Cells of Undetermined Significance; ASC-H = atypical squamous cells – cannot exclude high-grade squamous intraepithelial lesion; ASC-US = Atypical Squamous Cells of Undetermined Significance; HSIL = High-Grade Squamous Intraepithelial Lesion; LSIL = Low-Grade Squamous Intraepithelial Lesion; LSIL-H = Low-Grade Squamous Intraepithelial Lesion – Cannot Exclude High-Grade Squamous Intraepithelial Lesion; NILM = Negative for Intraepithelial Lesion or Malignancy; CIN I = Cervical Intraepithelial Neoplasia 1; CIN II = Cervical Intraepithelial Neoplasia 2; CIN III = Cervical Intraepithelial Neoplasia 3.

Colposcopic and cytological findings also exhibited significant concordance (Chi=square 471.411, p =0.001, Table 5)

Table 5. Concordance between colposcopic and cytological diagnoses.

Colposcopy Findings	Cytology								Chi-square	P value
	AGU-US	ASC-H	ASC-US	Atypical cells	HSIL	LSIL	LSIL-H	NILM		
CIN I	2	5	1	0	32	5	1	0	471.411	0.001
CIN II	0	7	4	0	42	5	1	1		
CIN III	1	6	2	1	100	7	0	1		
Total	3	18	7	1	174	17	2	2		

AGC-US = Atypical Glandular Cells of Undetermined Significance; ASC-H = atypical squamous cells – cannot exclude high-grade squamous intraepithelial lesion; ASC-US = Atypical Squamous Cells of Undetermined Significance; HSIL = High-Grade Squamous Intraepithelial Lesion; LSIL = Low-Grade Squamous Intraepithelial Lesion; LSIL-H = Low-Grade Squamous Intraepithelial Lesion – Cannot Exclude High-Grade Squamous Intraepithelial Lesion; NILM = Negative for Intraepithelial Lesion or Malignancy; CIN I = Cervical Intraepithelial Neoplasia 1; CIN II = Cervical Intraepithelial Neoplasia 2; CIN III = Cervical Intraepithelial Neoplasia 3.

When histology was taken as the gold standard, cytology had a sensitivity of 92% (161/175) and a specificity of 33% (16/49) for the identification of participants with cervical lesions with histological diagnosis of cervical dysplasia of CIN II or greater (CIN 2+) (Table 6).

Table 6. Sensitivity and specificity of cytology for identification of CIN 2+ lesions.

	Histology		Chi-square	P value
Cytology	**CIN 1**	**CIN2+**		
LSIL	***16 (33%)***	14 (8%)	20.059	<0.001
HSIL	33 (67%)	***161 (92%)***		
Total	49 (100%)	175 (100%)		

HSIL = High-Grade Squamous Intraepithelial Lesion; LSIL = Low-Grade Squamous Intraepithelial Lesion; CIN I = Cervical Intraepithelial Neoplasia 1; CIN II = Cervical Intraepithelial Neoplasia 2 or more.

Kappa= 0.254 (SE = 0.076, 95% confidence interval 0.104 - 0.404)

Sensitivity and specificity of colposcopy for CIN 2+

In the study population colposcopy had sensitivity of 87.4% and specificity of 49%) for identification of patient with CIN 2+ (Table 7)

Table 7. Sensitivity and specificity of colposcopy for identification of CIN 2+ lesions.

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	Histology			
Colposcopy	CIN 1	CIN2+	Chi-square	P value
CIN 1	***24 (49%)***	22 (12.6%)	31.096	<0.001
CIN 2+	25 (51%)	***153 (87.4%)***		
Total	49 (100%)	175 (100%)		

CIN I = Cervical Intraepithelial Neoplasia 1; CIN II = Cervical Intraepithelial Neoplasia 2 or more; Kappa= 0.37 (SE 0.07. 95% confidence interval 0.23 - 0.52) showing a fair to moderate agreement between the two tests.

Rate of micro-invasive cancer

Nine patients out of 225 were found to have microinvasive cancer on histology (4%; 95% CI: 1.4–6.6%) (Figure 1). The median (IQR) age of the participants with micro-invasive cervical cancer on histology was 50 (48, 61) years. This is significantly higher than that of other participants which was 43 (36, 52) years (p = 0.022). Participants with invasive carcinoma had a significantly higher treatment delay (median time between cytology and LLETZ: median (IQR) of 4 (3, 6.5) months vs. 3 (2, 4) months than for those without (p = 0.044) . There was no difference in the parity and sexual debut between the two groups (p <0.05, Table 8)

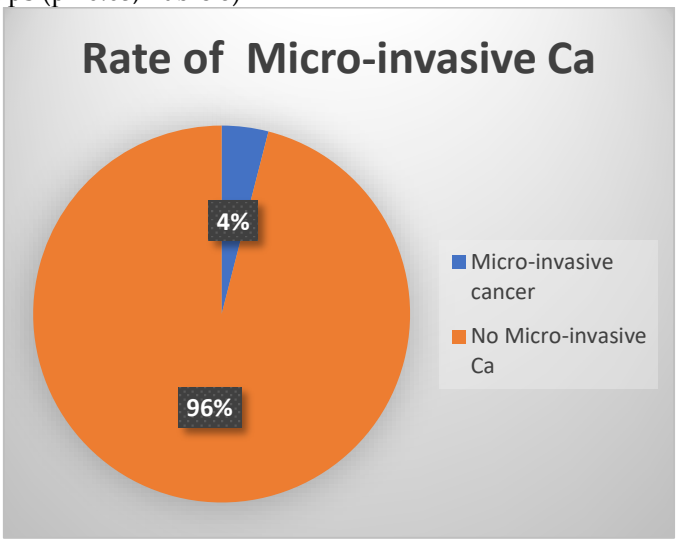

Figure 1. Pie chart to show the rate of micro-invasive cancer.

Table 8. Comparison of Demographic and Reproductive characteristics between women with Non-Invasive and invasive cervical cancer.

Variable	No invasive Ca	Invasive Ca	*Z-statistic	P value
Media Age (IQR) yrs	43 (36, 52)	50 (48, 61)	-2.298	0.022
Treatment delay [Median (IQR)] months	3 (2, 4)	4 (3, 6.5)	-2.014	0.044
Median Parity (IQR)	3 (2, 2)	3 (2, 5)	-0.918	0.359
Sexual debut [Median (IQR)] yrs	18 (15.5, 21)	17 (16, 19)	-1.106	0.269

*Mann-Whitney U Z-statistic.

There was no association between HIV status and invasive cervical cancer among the study participants (Chi-square 1.788, p = 0.411) (Table 9).

Table 9. The relationship between HIV status incident microinvasive cervical cancer among women with abnormal cytology results.

	HIV status		*Chi-square*	*P value*
Histology	*Positive*	*Negative*		
Ca cervix	*5*	*4*	*1.778*	*0.411*

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No Ca cervix	*157*	*54*
Total	*162*	*58*

4. Discussion

This study found that cytological screening and colposcopic assessment of cervical lesions were positively correlated with histopathology diagnosis (correlation coefficients 0.283 and 0.324, respectively; $P < 0.001$). However, the correlations were not strong enough (Pearson correlation coefficient < 0.7) which could be explained by the high sensitivity but low specificity. This can potentially lead to overtreatment of patients and the risk of complications from unwarranted treatment.

The sensitivity of cytology in this study was 92%, with a specificity of 33% for correctly identifying CIN 2+ lesions. This indicates that cytology though a good screening modality, is less effective in correctly determining individuals without pre-malignant cervical lesions. These results show a similar pattern to those reported by Trojnarska et al (2026) who reported a sensitivity of 94.5% and a specificity of 0.0% [30]. A study carried out in Moscow, Russia by Asaturova et al (2022) reported a sensitivity of 87.6% and specificity of 64% for cervical cytology when compared with histopathology [4]. The variations observed in these studies can be partially explained by the different study populations with that of Trojnarska et al (2026) comprising predominantly of participants with HSIL on cytology like in the current study while that of Asaturova et al (2022) comprising a more heterogenous population of women who had undergone opportunistic screening. Furthermore, the sensitivity and specificity of cytology depend on the quality of samples and laboratory processing, and adequacy of the interpretation [16,17].

In the current study, colposcopy showed a sensitivity of 87.4% and specificity of 49% for identifying patients with CIN 2+. This is concordant with previous studies that reported similar results: Allameh et al (2022) and Ivanova et al reported (2024) a sensitivity of > 96% and a specificity of 41% and 53% respectively, and Kim et al (2020) a sensitivity of 87.8% and a specificityof 59.3% [2,11,13]. The higher sensitivity reported by Allameh et al (2022) and Ivanova et al (2024) compared to the current and that of Kim et al (2020) may have arisen from the subjective nature of colposcopic assessments and varied experience of the various colposcopists as opposed to all procedures carried out by one specialist gynaecological oncologist. Further variation may be attributed to the number of colposcopic directed biopsies, and the proportion of younger participants with type 1 (T1) transformation zone compared to T2 and T3 that is more common among post-menopausal women, with better sensitivity for those classified as T1 compared to T2 or T3 [5,8,28,30]. The current study also reported a much higher sensitivity than a recent meta-analysis by Qin et al (2023) who reported a sensitivity of 68% [23]. Unlike the current study that included only participants diagnosed with HSIL, ASCH, or HR-HPV, the studies included in the meta-analysis by Qin at al. (2023) had some participants with LSIL whose final histological diagnosis was normal, hence reducing the overall prevalence of HSIL. Some authors have opined that apart from affecting the positive and negative predictive values, the prevalence of a disease can also have an influence on the sensitivity and specificity of a diagnostic test [15].

Compared to the relatively high sensitivity for diagnosis of CIN2+ in the current study, specificity of colposcopy in the current study was only 41% which is quite low. This is concordant with previous studies (Allameh & Maryam., 2022; Ivanova et al., 2024; Kim et al., 2020) who also reported specificity ranging between 41% to 59 %. This may be attributable to the inherent diagnostic dependence on acetowhite lesions and vascular patterns of the cervical lesions some of which may be present among patients with other cervical lesions such as cervicitis, warts or granulomatous lesion [21]. However, the result of the current study differs from a systematic review by Qin et al (2023) who reported a specificity of 93%. This is likely due to the high heterogeneity of the studies included in the meta-analysis by Qin at al. (2023) which could arise from the varied quality of the specimens, technical expertise in classification of cytological and colposcopic grades of the original studies [32].

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In the current study, the rate of microinvasive cancer rate was 4%, this is much less than a study conducted over a 6-year period in Brazil found that found the rate of invasive disease in patients with HSIL of 11.7% (Kuperman Nde et al., 2015). This may be attributed to differences in the social demographic factors, post-menopausal status, the different proportions of type 2 and 3 transformation zone, and endocervical glandular involvements which have been previously been proposed as factors associated with micro-invasive cervical cancer in biopsy specimens taken from patients with HSIL [6,36]. In the current study, older age, and delays in seeking treatment after abnormal cytology were associated with incident micro-invasive cervical cancer. Therefore, timely intervention for those above 45 years with colposcopy evaluation and Large Loop Excision or Transformation Zone (LLETZ) can greatly assist in the reduction of incident micro-invasive cervical cancer.

Limitations

The current study was done at one tertiary hospital complex hence limiting the generalization of the findings to other settings. Colposcopy were performed by different healthcare professionals with varied experience hence not absolutely standardized, potentially introducing subjectivity and errors.

Conclusion

There was significant concordance between colposcopic and cytological diagnoses, as well as histological diagnoses. Despite good sensitivity for both colposcopy and cytology, both methods demonstrated low specificity for CIN2+, potentially leading to over-treatment. Age above 50 years and delays beyond 4 months between cytology and treatment were associated with the risk of micro-invasive cervical cancer.

Supplementary Materials: The following supporting information can be downloaded at the website of this paper posted on Preprints.org. Appendix 1: Title: data collection sheet.

Author Contributions: Conceptualization, data collection, analysis, and manuscript preparation: O.N.; Supervision and critical revision: M.M., C.B.B.

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Informed Consent Statement: Informed consent was obtained from all participants involved in the study

Data Availability Statement: Data is available upon request.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

HPV	Human Papilloma virus
MRH	Mthatha Regional Hospital
NMAH	Nelson Mandela Academic Hospital
LBC	Liquid based cytology
LLETZ	Large Loop Excision of Transformation Zone
CIN	Cervical Intraepithelial neoplasia

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