Correlation of Colposcopic Findings with Histologic Diagnosis in Cervical Lesions at Federal Medical Centre, Abuja

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Abstract

Background: Early detection and treatment remain a key strategy for the eradication of cervical-cancer-related morbidities and mortalities. The overtreatment attributed to see and treat using visual inspection with acetic acid (VIA) or lugol's iodine (VILI) and delays in commencement of treatment for premalignant and micro-invasive lesions attributed to histology waiting time, both underscore the need for other reliable diagnostic alternatives. Colposcopy is an invaluable tool for the assessment and management of cervical premalignant, micro-invasive and early malignant lesions. Reid's colposcopic index (RCI) has been reported to accurately predict the histologic grading of cervical lesion, which is the definitive diagnosis.

Aims: This study aimed to evaluate the accuracy of colposcopic findings using Reid's Colposcopic Index (RCI) in predicting the histological diagnosis of cervical lesions at the Federal Medical Centre Abuja.

Materials and Methods: This nine-year retrospective comparative study analyzed colposcopy-directed biopsies and their corresponding histological diagnoses from August 6, 2015, to August 5, 2024, at Federal Medical Centre Abuja. Cases meeting inclusion criteria were identified from colposcopy and histopathology clinic records. The RCI scoring system was compared with histologic diagnoses. Data were analyzed using Epi Info version 7.2.6.0 (2023), employing descriptive statistics and Kappa statistics to assess the level of agreement between colposcopic and histological findings.

Results: Of the 304 colposcopies performed, 145 cases met the study criteria. The median age was 43 years, with most patients being multiparous and having tertiary education. The primary indication for colposcopy was an abnormal Pap smear (51.72%). Colposcopic impressions using RCI showed a high accuracy, with benign conditions correctly identified in 94.03% of cases. The overall sensitivity of colposcopy for CIN I, CIN II, CIN III, and microinvasive carcinoma ranged from 75% to 90%, while specificity ranged from 88.6% to 100%. The Kappa value for agreement between colposcopic impressions and histological diagnoses was 0.76, indicating substantial agreement

Conclusions: The study demonstrated a strong correlation between RCI-based colposcopic impressions and histological diagnoses, affirming itsaccuracy in assessing cervical lesions. These findings support the use of colposcopy with RCI as an effective diagnostic tool, particularly in settings with limited access to histopathological services. This approach may enhance the quality of cervical cancer screening and management in resource-limited environments.

Keywords: Colposcopy, Reid's Colposcopic Index, Cervical Intraepithelial Neoplasia, Histological Diagnosis, Cervical Cancer Screening.

INTRODUCTION

Cervical cancer remains one of the leading causes of cancer-related deaths in women in developing countries. This is so; despite being identified as one of the most successfully treatable forms of cancer once detected early and managed effectively. Therefore, a comprehensive approach to prevent, screen and treat is needed to eliminate the disease.

Colposcopy has emerged as a valuable tool as regards the early detection and prevention of cervical cancer[1]. It involves the use of a colposcope, a specialized instrument that allows real-time visualization and assessment of the uterine cervix, including the transformation zone, vagina, and vulva. This procedure aids in detecting intraepithelial neoplasia, such as cervical (CIN), vaginal (VAIN), vulva (VIN) lesions, and invasive cancer [1]. Additionally, colposcopy serves as a valuable guide for directed biopsies and supports ablation or excision procedures [2].

Cervical cancer is the fourth most common cancer in women and a leading cause of cancer-related deaths worldwide [2-4].

Despite being a preventable and curable disease, its global burden remains high, with an age-standardized incidence rate of 13.3 cases per 100,000 women-years and a mortality rate of 7.2 deaths per 100,000 women-years in 2020 [3]. Approximately 85% of these cases occur in low- and middle-income countries[4]. In Nigeria, the prevalence of cervical cancer is significantly high, accounting for 39.66% of all gynecological cancers at the Federal Medical Centre (FMC) Abuja[5].

Persistent infection with high-risk human papillomavirus (HPV) is the primary cause of cervical cancer [6]. Although most HPV infections are cleared by the immune system, around 5% may progress to a premalignant stage, which, if untreated, can advance to an invasive or malignant stage. In response to this threat, the World Health Organization has outlined strategies to reduce the global burden of cervical cancer. These include achieving 90% HPV vaccination coverage among girls by age 15, screening 70% of women between 35 and 45 years using high-performance tests, and ensuring that 90% of women with precancerous lesions receive treatment by 2030[3, 4].

Colposcopy is typically indicated for women with abnormal Pap smear results, high-risk HPV test outcomes, or suspicious cervical appearances[1]. It is a simple, non-invasive procedure that helps determine the location, size, and extent of abnormal lesions, guiding biopsies to areas of greatest concern [7].

Reid's Colposcopic Index (RCI) offers a systematic and objective method for grading the severity of premalignant cervical lesions during colposcopy [8]. The RCI evaluates four key colposcopic signs: lesion margin, acetowhite colour, blood vessel patterns within the lesion, and iodine staining [8]. This scoring system can accurately differentiate between low-grade and high-grade cervical disease, achieving a 97.0% overall accuracy in correlation with histological findings [8-10]. By using RCI, clinicians can target biopsies to the most significant abnormal areas, enhancing the accuracy of colposcopic impressions [8]. Moreover, RCI can help reduce over-treatment associated with the 'see and treat' protocol following visual inspection with acetic acid (VIA) [10].

Although several studies have evaluated the accuracy of RCI compared to histological diagnoses, there is a lack of data from our specific environment. This study, therefore, aimed to assess the accuracy of colposcopic impressions using Reid's Colposcopic Index in predicting the histological diagnosis of cervical lesions at the Federal Medical Centre, Abuja.

METHODOLOGY

Study Design and Setting

This was a nine-year retrospective comparative study conducted at the colposcopy clinic of the Department of Obstetrics & Gynaecology, Federal Medical Centre (FMC), Abuja, from August 6, 2015, to August 5, 2024. FMC Abuja serves as a referral centre for private, cottage, general, and specialist hospitals in the North Central region of Nigeria. The colposcopy clinic, established in 2015, is managed by consultant gynaecologists certified by the International Federation for Cervical Pathology and Colposcopy (IFCPC). The clinic offers both ablative and excisional therapy for cervical intraepithelial lesions on an outpatient basis.

Study Population

The study included all patients who underwent colposcopy-directed biopsies with confirmed histological diagnoses at FMC Abuja during the study period. Patients without histological diagnoses, incomplete information, or who fell outside the study period were excluded.

Study Method/Procedure

The records of all the eligible patients who had colposcopy-directed biopsies and their corresponding histologic diagnoses, during the study period, were examined and data obtained imputed into a structured proforma.

Colposcopy was usually performed on women presenting with indications such as abnormal Papanicolaou (Pap) smears, high-risk HPV test results, abnormal vaginal bleeding, post-coital bleeding, or suspicious cervical lesions. During the examination, the transformation zone of the cervix was assessed using a Carl Ranner video colposcope. The procedure involved applying normal saline, 5% acetic acid, and Lugol's iodine solution sequentially to the cervix.

The colposcopist evaluated four key signs using Reid's Colposcopic Index (RCI): lesion margin, acetowhite colour, blood vessel patterns within the lesion, and iodine staining. Each category was assigned a score from 0 to 2, with 0 indicating a benign condition, 1 suggesting mild to moderate dysplasia, and 2 predicting severe dysplasia. The total RCI score [9] ranged as follows:

0-2: Low-grade disease (HPV changes/CIN I)

3-5: Intermediate-grade disease (CIN I–II)

6-8: High-grade disease (CIN II–III)

RCI scoring facilitated the formulation of colposcopic impressions and guided the biopsy of the most significant abnormal cervical lesions. Colposcopy-directed punch biopsies were taken from suspicious areas indicative of low-grade lesions (HPV changes/CIN I), high-grade lesions (CIN II/III), and invasive lesions (microinvasive/carcinoma-in-situ). Biopsy samples were sent to the Department of Anatomic Pathology for histological diagnosis. Patients with normal colposcopy impressions were not subjected to biopsy.

Data Collection and Analysis

Data on colposcopy-directed biopsies were retrieved from the computerized colposcopy database and supplemented by histology reports from the Department of Anatomic

Pathology. Information extracted included patient age, parity, indication for colposcopy, colposcopic findings based on RCI scoring, and histological diagnoses. The primary outcome of interest was the correlation between colposcopic findings and histological diagnosis.

Data were entered and analyzed using Epi Info version 7.2.6.0 (2023) [11]. Descriptive statistics were used to summarize continuous variables (e.g., age) as means and standard deviations, while categorical variables (e.g., colposcopic impressions) were summarized as frequencies and percentages. The accuracy of colposcopic impressions was assessed by comparing them with histological diagnoses. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated for the different categories of cervical intraepithelial neoplasia (CIN). The agreement between colposcopic impressions and histological findings was evaluated using the Kappa statistic, with values interpreted as follows: <0.2 (poor agreement), 0.2-0.4 (fair agreement), 0.41-0.6 (moderate agreement), 0.61-0.8 (substantial agreement), and >0.8 (almost perfect agreement). Statistical significance was set at $p < 0.05$.

Ethical Consideration

Ethical approval was obtained from the Federal Medical Centre Abuja Health Research and Ethics Committee.

RESULTS

A total of 304 colposcopic procedures were performed during the study period, of which 145 who underwent colposcopy-directed-biopsy and had corresponding histological diagnosis formed the study group. The remaining 159 who either had colposcopic finding that did not require biopsy for histology, incomplete information or had colposcopy-directed-biopsy with unsatisfactory colposcopic impression were excluded from the study.

Socio-Demographic characteristics of the Study Group

Their ages ranged between 23 to 75 years with median age of 43 years. The majority were between ages 40 to 49 years (33.10%), married (89.66%), multipara 2-5 children (64.14%) with median parity of 3, had tertiary education (77.93%), were self-employed (52.51%) and premenopausal (71.72%). These were represented in Table 1 below:

Table 1. sociodemographic characteristics of the patients

Variables	Frequency (n=145)	Percentage (%)
Age group (years)		
20-29	12	8.28
30-39	41	28.28
40-49	48	33.10
50-59	32	22.07
60-69	9	6.21
70-79	3	2.07
Parity		
0-1	43	29.66
2-5	93	64.14
6 and above	9	6.21
Education level		
Primary	2	1.38
Secondary	30	20.69
Tertiary	113	77.93
Occupation		
Civil servant	58	40.00
Private servant	11	7.59
Self employed	76	52.51
Marital status		
Single	11	7.59
Married	130	89.66
Previously married	4	2.76

Median age- 43 years, mean age- 44 .27±10.72, median parity-3, mean partiy-2.8 ±2.04,

Indication for colposcopy

The most common indication for colposcopy was an abnormal Pap smear (51.72%), followed by post-coital bleeding (22.76%), visible cervical lesions (13.79%), abnormal uterine bleeding (8.28%), and high-risk HPV test results (3.45%). Among those with abnormal Pap smears, low-grade squamous intraepithelial lesions (LSIL) were the most frequent.

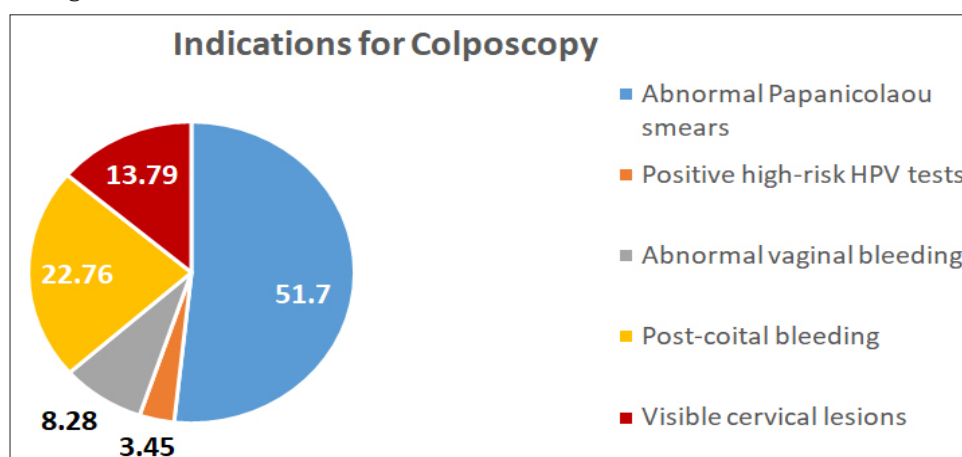This was presented in Figure 1 below:

Figure 1. Indication for colposcopy

Colposcopy Impression Using Reid's Colposcopic Index Parameters

Colposcopic impressions based on Reid's Colposcopic Index (RCI) showed that 53.79% of cases were premalignant/ microinvasive lesion, while 46.21% were benign (consisting of 45 chronic cervicitis, 13 metaplasia and 9 polyps). Most benign conditions (84.0%) had RCI scores of 0-2. For intermediate-grade lesions (RCI 3-5), 55.32% were classified as CIN I, while high-grade lesions (RCI 6-8) mostly consisted of CIN II (43.48%) and microinvasive carcinoma (39.13%). These findings were detailed in Table 2.

Table 2. Reid's colposcopic index and colposcopy impression

	Colposcopy impression					
RCI score	**Benign**	**CIN I**	**CIN II**	**CIN III**	**MI/CIS**	**Total**
0 - 2 low grade disease HPV -CIN 1	63(84.00)	12(16.00)	0(0.0)	0(0.00)	0(0.0)	75(51.72)
3 - 5 intermediate grade disease CIN I-II	4(8.51)	26(55.32)	17(36.17)	0(0.00)	0(0.0)	47(32.41)
6 -8 high grade disease CIN II-III	0(.00)	0(0.00)	10(43.48)	4(17.39)	9(39.13)	23(15.86)
TOTAL	67(46.21)	38(26.21)	27(18.62)	4(2.76)	9(6.21)	145(100)

MI/CIS- microinvasive/carcinoma-in-situ, CIN-cervical intraepithelial neoplasia

Colposcopy impression and Histological diagnosis

The colposcopic impressions made using RCI were compared with histological diagnoses (Table 3). Out of 67 cases identified as benign through colposcopy, 63 (94.03%) were confirmed histologically. For CIN I, 25 out of 38 cases (65.79%) matched the histological diagnosis, while 22 out of 27 cases (81.48%) of CIN II and 3 out of 4 cases (75.00%) of CIN III had corresponding histological confirmation. All nine cases of microinvasive carcinoma (MI/CIS) identified through colposcopy were accurately diagnosed histologically.

Further analysis showed overestimation in some cases: CIN I and CIN II were overestimated in 7 (18.42%) and 5 (18.52%) cases, respectively. Conversely, underestimation occurred in 4 (5.97%) cases identified as benign and 6 (15.79%) of CIN I cases.

Table 3. Colposcopy impression and Histologic diagnosis

	Histologic diagnosis					
Colposcopy impression	**Benign**	**CIN I**	**CIN II**	**CIN III**	**MI/CIS**	**Total**
Benign	63(94.03)	3(4.48)	1(1.49)	0(0.00)	0(0.00)	67(46.21)
CIN I	7(18.42)	25(65.79)	5(13.16)	1(2.63)	0(0.00)	38(26.21)
CIN II	2(7.41)	3(11.11)	22(81.48)	0(0.00)	0(0.00)	27(17.20)
CIN III	0(0.00)	0(0.00)	0(0.00)	3(75.0)	1(25.00)	4(2.76)
MI/CIS	0(0.00)	0(0.00)	0(0.00)	0(0.00)	9(100.0)	9(6.21)
TOTAL	72(49.66)	31(21.38)	28(19.31)	4(2.76)	10(6.90)	145(100.0)

MI/CIS- microinvasive/carcinoma-in-situ, CIN-cervical intraepithelial neoplasia

Diagnostic Performance of Colposcopy

The diagnostic performance of colposcopy in comparison to histology the gold standard was assessed through sensitivity and specificity analysis as shown below in table 4.

The results indicate that colposcopy has variable sensitivity and specificity across different histological categories, with the highest accuracy observed in diagnosing MI/CIS. The overall sensitivity of colposcopy for CIN I, CIN II, CIN III, and microinvasive carcinoma ranged from 75% to 90%, while specificity ranged from 88.6% to 100%.

Table 4. Sensitivity, Specificity, and Predictive Values of Colposcopy Compared to Histology Findings

Colposcopy impression	Histologic diagnosis (gold standard)			
	Sensitivity	**Specificity**	**Positive Predictive Value**	**Negative Predictive Value**
CINI	80.6	88.6	65.8	94.4
CINII	78.6	95.7	81.5	94.9
CINIII	75.0	99.3	75.0	99.3
MI/CIS	90.0	100	100.0	99.3
Benign	87.5	94.5	94.0	88.5

Correlation Between Colposcopic Impression and Histological Diagnosis:

Table 5 illustrates the level of agreement between colposcopy and histology using the Kappa statistic. The Kappa values, along with their 95% confidence intervals (CIs), were reported for each category: CIN I: Kappa = 0.63 (95% CI: 0.47–0.79), indicating substantial agreement.

CIN II: Kappa = 0.75 (95% CI: 0.59–0.91), suggesting substantial to almost perfect agreement.

CIN III: Kappa = 0.74 (95% CI: 0.58–0.90), indicating substantial agreement.

MI/CIS: Kappa = 0.94 (95% CI: 0.78–1.10), reflecting almost perfect agreement.

Benign Conditions: Kappa = 0.82 (95% CI: 0.66–0.98), indicating greater agreement.

The overall Kappa value was 0.76, demonstrating substantial agreement between colposcopic impressions and histological findings. The result shows that colposcopy exhibits strong diagnostic accuracy, particularly for more severe lesions like microinvasive carcinoma.

Table 5. Level of Agreement Between Colposcopy and Histology Using Kappa Statistics

Colposcopy impression	Kappa (95% CI)
CIN I	0.63 (0.47-0.79)
CIN II	0.75 (0.59-0.91)
CIN III	0.74 (0.58-0.90)
MI/CIS	0.94 (0.78-1.10)
Benign	0.82 (0.66-0.98)

CI - confidence interval, kappa: <0.2-poor agreement, 0.2-0.4-fair agreement, 0.41-0.6-moderate agreement, 0.61-0.8-substantial agreement, >0.8-greater agreement

DISCUSSION

This study evaluated the accuracy of colposcopic impressions using Reid's Colposcopic Index (RCI) in predicting histological diagnoses of cervical lesions. The findings indicate that RCI is a reliable method, with substantial agreement between colposcopy and histology.

Cervical intraepithelial neoplasia (CIN) and microinvasive lesions were observed in 53.79% of the patients, consistent with previous studies by Arora et al. [12] and Verma et al. [13]. The prevalence of benign lesions (46.21%) underscores the need for precise colposcopic assessment to avoid overtreatment.

Utilizing RCI facilitated more accurate grading of lesions, aiding targeted biopsies and minimizing the risk of missing significant abnormalities [8, 10].

Histological evaluation revealed CIN and microinvasive lesions in 50.34% of cases, a rate between the 82.29% reported by Kulshreshtha et al. [14] and the 13.00% reported by Raska et al. [15]. This variation could stem from differences in colposcopy indications, practitioner expertise, and scoring methods. Nevertheless, the lesion distribution was generally consistent with colposcopic impressions.

The overall agreement between RCI-based colposcopy and histological diagnosis was substantial (Kappa = 0.76),

aligning with studies by Mousavi et al. [16] and Durdi et al. [17]. This agreement was higher than those reported by Boonlikit [10] and significantly greater than studies that did not use RCI, such as Fan et al. [19] and Ale et al. [20]. This emphasizes the importance of RCI in enhancing diagnostic accuracy.

Diagnostic performance varied across categories, with sensitivity ranging from 75% to 90% and specificity from 88.6% to 100%. Microinvasive carcinoma (MI/CIS) showed the highest accuracy (sensitivity 90%, specificity 100%), consistent with findings from Kulshreshtha et al. [14] and Mousavi et al. [16]. However, the variability across categories highlights the need for histological confirmation to ensure accurate diagnosis and management.

High negative predictive values (>90%) for all CIN grades support colposcopy's role in ruling out high-grade lesions, particularly in settings with limited access to histopathology. Although positive predictive values (PPVs) for CIN II and above exceeded 75%, discrepancies between colposcopic impressions and histological findings, particularly in LEEP histology, point to inter-observer variability among pathologists [22].

Overestimation and underestimation were noted, especially with benign conditions being overestimated as CIN I (18.42%) and CIN II (18.52%). These findings underscore the critical role of histological evaluation in guiding patient management.

Limitations

The retrospective design and potential documentation gaps could have affected data accuracy. Variations in colposcopist expertise may also have influenced the consistency of impressions.

CONCLUSIONS

This study confirms a substantial correlation between RCI-based colposcopic impressions and histological diagnoses. RCI enhances colposcopy's diagnostic quality and improves its accuracy in predicting histologic diagnosis, hence a better alternative to visual inspection with acetic acid (VIA) 'see and treat' strategies, especially in resource-limited settings.

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