Gynecology

Cytology vs. colposcopy: Evaluation of its performance in detecting cervical dysplasia: A study of single-center diagnostic tests.

Yuliana Elizabeth Villa Hernandez [1ID] *, Manuel Alejandro Rodríguez Espinoza de los Monteros [1ID], Oswaldo Vicente Jácome Córdova [1ID].

1. Medical career, Faculty of Medical Sciences, Universidad de Guayaquil.

Abstract

Introduction: The sensitivity and specificity of diagnostic tests between cytology and colposcopy for the treatment of cervical dysplasia vary by population characteristics, type of sample collection, and personnel training, among other factors. This study aimed to compare the sensitivity and specificity of diagnostic tests between cervical cytology and colposcopy as diagnostic methods for detecting cervical dysplasia in a reference hospital in Guayaquil, Ecuador.

Methods: This diagnostic test study was conducted at the Guasmo Sur General Hospital, Guayas, Ecuador, from February 2017 to February 2020. Records of women who were diagnosed with cervical lesions with cytological and colposcopic reports of possible results included atypical squamous cells of undetermined significance (ASCUS), low-grade intraepithelial lesions (LIEBGs), and high-grade intraepithelial lesions (LIEAGs). The sample was probabilistic. The sensitivity (S), specificity (E), positive predictive value (PPV), false-positive (FP), negative predictive value (NPV), false-negative (FN), and diagnostic accuracy are presented.

Results: A total of 278 patients were admitted. There were 120 women (43.16%) aged 26--35 years. LIEBG cases were the most prevalent type of cervical cytology (170 (61.1%)). In colposcopy, LIEAG cases were the most predominant (144 [51.8%]). Cytology had an S of 77%, an E of 57.6%, a PPV of 55%, an FP of 25.1%, an NPV of 76.9%, and an FN of 6%. Colposcopy had an S of 72.7%, an E of 71%, a PPV of 64.6%, an FP of 14%, an NPV of 78.7%, and an FN of 12.5%.

Conclusions: Combining different tests, such as cytology and colposcopy, and adequately interpreting the results is essential for improving the early detection of cervical cancer.

Keywords:

Cervical dysplasia, cytology, colposcopy, diagnostic tests, high-grade intraepithelial injury

Abbreviations

HPV: human papillomavirus.
ASCUS: atypical squamous cells of undetermined significance.
LIEBG: low-grade intraepithelial lesion
LIEAG: high-grade intraepithelial lesion.

Supplementary information

No supplementary materials are declared.

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Authors' contributions

Yuliana Elizabeth Villa Hernández: Conceptualization, data curation, formal analysis, acquisition of funds, research, writing - original draft.
Manuel Alejandro Rodríguez Espinoza de los Monteros: conceptualization, data curation, formal analysis.
Oswaldo Vicente Jácome Córdova: Acquisition of funds, Research, Methodology, Resources, Supervision, Validation, Visualization, Writing - original draft, Writing - review and edition.
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Availability of data and materials

The datasets used and analyzed during the present study are available from the corresponding author upon reasonable request.

Introduction

Cervical dysplasia and cervical intraepithelial neoplasia constitute a public health problem as precursor entities of squamous cell carcinoma. Approximately 80–90% of cervical injuries are of this type. They are distinguished by both structural and proliferative disorders of almost differentiated atypical cells, whose changes are rarely progressive. Studies performed two to three years after the intraepithelial neoplasia diagnosis revealed the presence of squamous cell carcinomas. In most developed countries, the incidence and mortality of cervical cancer have been reduced with early detection and accessible diagnostic procedures [1]. In developing countries, there are discrepancies in the performance of diagnostic methods such as cervical cytology and colposcopy [2].

Data from 175 countries, representing 2.9 billion women aged 15 years and over, revealed that approximately 566,911 women were diagnosed with cervical cancer (95% CI: 565,462–568,360). It is estimated that 56.9% of these women (322,686) would require surgery for diagnosis, treatment, or palliation (95% CI: 321,955–323,417). Cervical cancers that require surgery account for less than 1% of cancers in high-income countries and nearly 10% of cancers in low-income countries [3]. The presence of two types of HPV has been associated with the etiology of 70% of premalignant lesions and cervical cancer, 16 and 18. In the region of the Americas in 2018, 72 thousand women were diagnosed with cervical cancer, and approximately 34 thousand passed away. The mortality rate is 3 times higher in Latin America and the Caribbean than in North America, indicating enormous inequalities in health [4]. Due to higher levels of poverty and health inequities, Indigenous women around the world are more vulnerable to cervical cancer than their non-Indigenous counterparts are. However, despite constituting almost 10% of the population of Latin America and the Caribbean (LAC), the true extent of the burden of cervical cancer among the indigenous peoples of this region remains largely unknown [5].

These reports lead to a debate and controversy between different studies on the prevalence of the disease and especially on the sensitivity and specificity of the diagnostic tests between cytology and colposcopy, which vary by population characteristics, type of sample collection, and training personnel, among others.

This study aimed to compare the sensitivity and specificity of diagnostic tests between cervical cytology and colposcopy as diagnostic methods for detecting cervical dysplasia in a reference hospital in Guayaquil, Ecuador.

Materials and methods

Study design

The present study is an observational diagnostic test. The source is retrospective.

Stage

The study was carried out at the Guasmo Sur General Hospital, level II, Guayas Province, Ecuador, from February 1, 2017, to February 27, 2020.

Participants

The records of women undergoing a diagnostic study of the cervix, with two reports, cytological and colposcopic, were included. Women registered in consultation with a diagnosis of cervical dysplasia were also included.

Variables

The variables were age, cervical cytology report, and colposcopy report.

Data sources/measurements

The source was indirect; an electronic form was created from the institutional medical history data of the patients who entered the hospitalization period. The following results were obtained from the cervical cytology report: atypical squamous cells of undetermined significance (ASCUS), low-grade intraepithelial lesions (LIEBGs), and high-grade intraepithelial lesions (LIEAGs). The following results were obtained from the colposcopy results: negative, low-grade intraepithelial lesion (LIEBG) and high-grade intraepithelial lesion (LIEAG).

Biases

Applying the participant selection criteria avoided observation and selection bias. To prevent interviewer, information, and memory biases, the principal investigator always maintained the data with a guide and records approved in the research protocol. Two researchers independently analyzed each record in duplicate, and the variables were recorded in the database once their agreement was verified.

Study size

The sample was probabilistic. During the study period, 997 possible cases were recorded. The EPI info ™ program (Version 7.2.5, CDC, Atlanta, USA, September 2022.) With an expected frequency of 50%, a confidence limit of 5%, and a confidence interval of 95% for the sample size of 277 cases.

Quantitative variables

Descriptive statistics were used. The results are expressed as frequencies and percentages. The categorical variables were not converted into quantitative variables.

Statistical analysis

For descriptive analysis, frequencies and percentages are presented. For the analysis of diagnostic tests, sensitivity, specificity, positive predictive value, false positives, negative predictive value, false negatives, and diagnostic accuracy are presented. The tests included cervical cytology and colposcopy. The statistical package used was IBM Corp. (released in 2017). IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.

Results

Participants

The study included 278 cases.

Main characteristics of the study group

The largest group studied was women between the ages of 26 and 35. These data are presented in Table 1. Low-grade intraepithelial lesions were the most prevalent lesions on cervical cytology, and in colposcopy, high-grade intraepithelial lesions were the most prevalent (Table 1).

Table 1. Descriptive characteristics of the study group.

Variable		N=278	%
Age	<25 años	35	12.58%
	26 a 35 años	120	43.16%
	36 a 45 años	58	20.87%
	>46 años	65	23.39%
Cervical cytology	ASCUS	38	13.70%
	LIEBG	170	61.10%
	LIEAG	70	25.20%
Colposcopy	Negative	31	11.10%
	LIEBG	103	37.10%
	LIEAG	144	51.80%

ASCUS: atypical squamous cells of undetermined significance. LIEBG: low grade intraepithelial lesion. LIEAG: high-grade intraepithelial lesion.

Prevalence comparisons

There were differences between the proportions of patients who had a negative result by cytology versus colposcopy. These results were proportionally different in the diagnoses of ASCUS: atypical squamous cells of undetermined significance; LIEBG: low-grade intraepithelial lesion; and LIEAG: high-grade intraepithelial lesion (Table 2).

Diagnostic tests

Comparatively, there were no statistically significant differences between the diagnostic tests performed by cytology and colposcopy (Table 2).

Table 2. Studies of diagnostic tests for cytology and colposcopy.

Variable	Cytology N=278	Colposcopy N=278	*P*
Negative	0 (0%)	31 (11.1%)	<0.0001
ASCUS	38 (13.7%)	0 (0%)	<0.0001
LIEBG	170 (61.1%)	103 (37.1%)	<0.0001
LIEAG	70 (25.2%)	144 (51.8%)	<0.0001
Sensitivity	77.0%	72.7%	0.7023
Specificity	57.6%	71.0%	0.1915
Vpp *	55.0%	64.6%	0.3406
False-positives	25.1%	14.0%	0.06775
Vpn *	76.9%	78.7%	0.8503
False-negatives	6%	12.5%	0.09272
Dx accuracy	60%		

Discussion

The study's main findings are that most participants were 26 to 35 years old, and the distribution among the other groups was relatively homogeneous. Low-grade intraepithelial lesions (LIEBGs) were the most prevalent in the cytology results. This suggests a high frequency of human papillomavirus (HPV) infection in this group of women, as it is the leading cause of these lesions. A significant proportion of cases with atypical cells of undetermined significance (ASCUS) were also found, indicating the need for follow-up studies to determine the nature of these atypical cells. In colposcopy, high-grade intraepithelial lesions (HILLs) are the most prevalent. This suggests that many women with abnormal cytology results have more advanced lesions requiring more detailed evaluation.

Significant differences were found in the proportions of negative and positive results between cytology and colposcopy, especially for ASCUS, LIEBG, and LIEAG diagnoses. Despite the proportions, no statistically significant differences were found between the diagnostic tests performed by cytology and colposcopy. This could be due to several factors, such as the sample size or the professional's experience in taking the samples.

Concerning diagnostic tests, although there is no exact threshold, in general, a sensitivity greater than 90% is considered high. However, this value can vary considerably depending on the test and the disease. For cervical cancer staging tests, the sensitivity of cytology varies but is generally considered moderate. It can detect precancerous lesions and some early invasive cancers. It has the limitation of not detecting all cancers, especially fast-growing ones, and it can generate false

negatives. Colposcopy is a visual examination of the cervix that identifies suspicious areas. A biopsy is the removal of a tissue sample for microscopic analysis. Both methods have high sensitivity for detecting precancerous lesions and invasive cancer but require a previous colposcopy.

Among the factors that affect sensitivity are screening intervals, which are avoided by performing regular screening tests to increase the likelihood of detecting lesions at an early stage. The sensitivity of a test can vary depending on the population to which it is applied, such as women with risk factors. The experience of the health care professional who takes the samples or interprets the results also influences the sensitivity, so the combination of different tests, such as cytology and the HPV test, together with an adequate interpretation of the results, is essential. to improve early detection of cervical cancer.

New diagnostic studies in Latin America present a sensitivity similar to that of the present study, with self-sampling samples [6].

This study has limitations, such as the number of patients and possible differences between samples taken by different professionals. Additionally, it was a retrospective study. Other prospective studies should resolve these weaknesses.

Conclusions

The sensitivity of diagnostic tests for cervical cancer varies and depends on several factors. Combining different tests, such as cytology and colposcopy, and adequately interpreting the results is essential to improving the early detection of cervical cancer.

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Declarations

Ethics committee approval and consent to participate

The bioethics committee of the Faculty of Medical Sciences of the University of Guayaquil approved the study.

Publication consent

This information was not needed because the present study did not publish images, radiographs, or specific patient studies.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Author information

Yuliana Elizabeth Villa Hernández, Physician from the University of Guayaquil (Guayaquil-Ecuador). Obstetrician from the University of Guayaquil (March 2014, Guayaquil-Ecuador). Master's in occupational risk prevention from the International University of La Rioja (Logroño, Spain, 2022).
E-mail:yuli_her91@hotmail.com
ORCID https://orcid.org/0009-0004-7986-1707

Manuel Alejandro Rodríguez Espinoza de los Monteros, Physician from the University of Guayaquil (December 2020, Guayaquil-Ecuador).
E-mail:manuelrodriguezedlm@hotmail.com
ORCID https://orcid.org/0009-0009-1962-3308

Oswaldo Vicente Jácome Córdova, Doctor of Medicine and Surgery from the University of Guayaquil (Guayaquil, 2002). Specialist in Pediatrics from the University of Guayaquil (2008, Guayaquil). Master of Health Management for Local Development, by the Private Technical University of Loja (Loja, 2004). Specialist in Management and Strategic Health Planning from the Private Technical University of Loja (Loja, 2003).
ORCID https://orcid.org/0009-0006-7979-8853.

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Correspondence: Yuliana Elizabeth Villa Hernández. Email:yuli_her91@hotmail.com
Address: R492 + MJF, Av. Kennedy, Guayaquil CP 090514, Guayaquil. Medical career, Faculty of Medical Sciences, University of Guayaquil. Phone: (04) 228-1148.