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Correlation between Abnormal Pap Smear Histopathology and Colposcopy Findings in Relation to Cervical Cancer in Bahrain

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Abstract

This study investigates the correlation between abnormal histological results and abnormal Pap smear findings, as observed through colposcopic evaluations. As cervical cancer screening methods evolve, understanding the relationship between these diagnostic tools is critical for improving patient outcomes and treatment strategies. We conducted a comprehensive analysis of patients who underwent Pap smear testing and colposcopy, focusing on histopathological results obtained from biopsy samples. Methods: This Study was done at King hamad university hospital, Bahrain. Spearman's rho and bivariate method of analysis was used for 344 patients. The inclusion criteria were women in the reproductive age, who underwent colposcopy. This study was conducted from January 2022-December 2024. Results: The analysis included participants for whom at least 75% of the data was complete. After applying this criterion, 344 participants were retained for further analysis, while those with incomplete data were excluded. Majority of the biopsy was sampled from cervical biopsy (n = 169) followed by cervical polyps (n = 83) and uterus (n = 64). The mean age of the participants was 50.06 ± 12.95. The patients who had viral infection had a higher odd of developing abnormal colposcopy [OR 2.35 (95 % CI 0.93 - 5.92), p = 0.04]. Bivariate analysis: Abnormal colposcopy has a weak positive correlation with viral infection (r = 0.140, p = 0.008) and weak negative correlation with age (r = −0.159, p =< 0.001). Conclusion: Our results revealed that patient who had viral infections (HPV) had a higher chance of developing abnormal colposcopy result, although not all abnormal colposcopy results have positive viral infection. Patients who have Abnormal pap smear results does not necessarily have abnormal colposcopy results. It is essential to have a multidisciplinary approach in cervical cancer screening, advocating for

a combined assessment of the Pap smear test and histopathological findings to optimize colposcopic evaluations.

Keywords

Pap Smear Test, Colposcopy, ASC-US, Cervical Cancer

1. Introduction

Cervical cancer continues to be a substantial global public health concern. According to the GLOBOCAN 2020 estimates by the International Agency for Research on Cancer (IARC), cervical cancer accounts for approximately 604,000 new cases and 342,000 deaths annually [1]. In the Gulf Cooperation Council (GCC) countries, data from age-standardized incidence rates (ASIR) per 100,000 women show that Bahrain has a 2.7 ASIR of cervical cancer compared to 2.4 in the Kingdom of Saudi Arabia, 5.7 in the United Arab Emirates, and 6.4 in Oman [2].

A retrospective study conducted by Ismaeel, A. *et al.* in 2024 reviewed the medical records of 23,888 women who had a Pap smear test in Bahrain between 2019 and 2022, and found that Atypical Squamous Cells of Undetermined Significance (ASC-US) was diagnosed in 1.1% of cases. Thirty percent of these cases tested positive for high-risk HPV genotype, and 75% of them were infected with multiple genotypes [3]. In terms of histopathology results, 10.7% showed to be either CINii or CINiii, and a cytology follow-up within 1 year found that 8.4% of the cases progressed into either low or high-grade squamous intraepithelial lesions [3]. This underlines the importance of HPV co-testing and colposcopy in managing ASC-US.

Cytological screening using the Papanicolaou (Pap) smear and human papillomavirus (HPV) testing can provide an early detection, resulting in significant decreases in the disease's incidence and mortality. However, Pap smear is not without limitations; its accuracy ranges between 50% and 80% in various studies using the same technique [4]-[6]. Similarly, the pap smear's sensitivity and specificity in detecting CINii and CINiii have been shown to be between 45% and 98%, respectively [4]-[6].

The wide range of sensitivity and specificity is mainly due to sampling issues including inadequate tissue collection, and interpreter variability that involves cytologist experience, as well as collection techniques and patient factors like inflammation, infection, menopause and obesity.

Colposcopic examination, on the other hand, offers a more definitive diagnosis by providing visualization of the cervix and valvular tissue in addition to obtaining a biopsy of suspected lesions for histopathological examination [7]. Colposcopy has a high sensitivity for detecting cervical cancer, exceeding 90%, and when correlated with histopathology, the impression reaches 94.8% [8].

Despite established guidelines, the diagnostic performance of Pap smear combined with colposcopy varies by patient cohort, examiner experience, and histopathological rigor. Consequently, there remains a need for institution-specific validation of these screening tools to optimize triage, reduce false positives/negatives, and enhance early detection of cervical neoplasia.

Cervical cancer is one of the leading cancers among women, causing substantial morbidity and mortality rates. Cervical cancer can be prevented by early detection of cytological changes by using appropriate screening methods.

To evaluate the correlation between abnormal Pap smear cytology and colposcopy impressions, using histopathological findings as the gold standard, in women referred with abnormal cervical cytology in Bahrain.

Objective

To evaluate the correlation between abnormal Pap smear cytology and colposcopic impressions, using histopathological findings as the gold standard, in women referred with abnormal cervical cytology in Bahrain.

2. Materials and Methods

The analysis included participants for whom at least 75% of the data was complete. After applying this criterion, 344 participants were retained for further analysis, while those with incomplete data were excluded. Majority of the biopsy was sampled from cervical biopsy (n = 169) followed by cervical polyps (n = 83) and uterus (n = 64). The mean age of the participants was 50.06 ± 12.95.

The inclusion criteria were women, with symptoms suggestive of abnormalities, who underwent colposcopy, who have all their data.

Women of all ages were included in this research, including premenopausal and post-menopausal females.

Ethical approval was obtained from ethical approval committee in King hamad university hospital.

Patients upon receiving treatment or investigation in King hamad university hospital they sign a consent for gathering information and using this information for research purposes.

Data was obtained from patient files upon their consent.

A table was constructed with the information needed and was filled using the information from patients' files.

Cross-Tabulation Analysis as well as Bivariate Analysis were the analytic methods used in this study.

These methods collectively allow for a robust analysis of the relationships between demographic factors, health history, and clinical outcomes. They help in identifying significant associations that can inform clinical practice and public health initiatives.

Study Design

- **Observational Study:** The study appears to be observational, possibly cross-

sectional, examining the relationships between

various demographic and health-related variables and clinical outcomes (e.g., abnormal colposcopy results).

Data Collection

- **Demographic and Health Data:** Information on age, marital status, medical history (e.g., autoimmune diseases, malignancies, diabetes), and clinical outcomes (e.g., abnormal colposcopy, pap smears) was collected.
- **Clinical Assessments:** Data on biopsy results, colposcopy findings, and other health indicators were gathered.

3. Results

With respect to Viral Infection (Positive HPV testing, detected by pap smear in the clinic) and Abnormal Colposcopy (Findings other than normal, like ectropion, masses, acetowhite areas, redness of the cervix, friable tissues) ($r = 0.140$, $p = 0.008$) these were the results:

Abnormal pap smear refers to results other than negative for intraepithelial lesion or malignancy, so it includes ascus, LSIL, HSIL, cervical cancer.

There is a weak positive correlation between viral infections and abnormal colposcopy results. This suggests that patients with viral infections may have a slightly higher likelihood of abnormal findings during colposcopy. This could indicate that viral infections might play a role in cervical changes that warrant further investigation.

Patients that had no viral infection that were a total of 298, 108 of them (94.7%) had normal results; 190 (87.9%) had abnormal results.

Patients that had viral infection, 5.3 % had normal results, while 26 (12.0%) had abnormal results.

- **OR:** 2.35 (95% CI: 0.93 - 5.92), $p = 0.04$ (statistically significant).

Correlation Results

This study showed that there is a weak positive correlation of viral infection with abnormal colposcopy ($r = 0.140$, $p = 0.008$).

There is a weak negative correlation of age with abnormal colposcopy ($r = -0.159$, $p < 0.001$).

Between age and viral infection there is a negative correlation ($r = -0.219$, $p < 0.001$) (Table 1 and Table 2).

Table 1. Cross tabs.

	Abnormal Colposcopy			
	No	Yes	OR	P-Value
Marital status				
Single	6 (7.3%)	16 (14.7%)	0.45 (0.17 - 1.23)	0.169
Married/Divorced	76 (92.7%)	93 (85.3%)		

Continued

Parity				
0	14 (13.3%)	25 (14.9%)		
1	1 (1.0%)	8 (4.8%)	0.68 (0.35 - 1.32)	0.20
2	90 (85.7%)	135 (80.4%)		
Autoimmune disease				
No	43 (70.5%)	157 (90.8%)	0.24 (0.15 - 0.51)	<0.001
Yes	18 (29.5%)	16 (9.2%)		
Malignancy				
No	44 (64.7%)	153 (87.4%)	0.26 (0.13 - 0.51)	0.002
Yes	24 (35.3%)	22 (12.6%)		
Diabetes				
No	44 (59.5%)	152 (86.9%)	0.22 (0.11 - 0.42)	<0.001
Yes	30 (40.5%)	23 (13.1%)		
Cervical dysplasia				
No	50 (90.9%)	161 (93.1%)	0.74 (0.25 - 2.21)	0.565
Yes	5 (9.1%)	12 (6.9%)		
Family History				
No	97 (82.2%)	199 (93.4%)	0.32 (0.15 - 0.66)	0.002
Yes	21 (17.8%)	14 (6.6%)		
Drug History				
No	77 (69.4%)	180 (82.2%)	0.49 (0.28 - 0.83)	0.011
Yes	34 (30.6%)	39 (17.8%)		
Viral infection				
No	108 (94.7%)	190 (87.9%)	2.35 (0.93 - 5.92)	**0.04**
Yes	6 (5.3%)	26 (12.0%)		
PCB				
No	7 (36.8%)	15 (45.5%)	0.7 (0.2 - 2.22)	0.38
Yes	12 (63.2%)	18 (54.4%)		
AUB				
No	2 (3.4%)	0 (0.0%)	2.66 (2.16 - 3.27)	0.14
Yes	56 (96.6%)	93 (100.0%)		
HPV positive				
No	0 (0.0%)	4 (7.5%)	1.34 (1.16 - 1.55)	0.56
Yes	17 (100.0%)	49 (92.5%)		
Abnormal endometrium				
No	1 (2.8%)	1 (1.5%)	1.82 (0.11 - 30.13)	1.00
Yes	35 (97.2%)	64 (98.5%)		

Table 2. Correlations.

			Abnormal colposcopy	Abnormal pap smear	Viral Infection	HPV positive	Abnormal endometrium	Parity	Age	Marital status
Spearman's rho	**Abnormal colposcopy**	Correlation Coefficient	1.000	0.071	**0.140****	−0.027	0.016	−0.054	**−0.159****	−0.017
		Sig. (2-tailed)	.	0.308	**0.008**	0.770	0.855	0.290	**<0.001**	0.759
		N	562	206	360	119	140	380	562	342
	Abnormal pap smear	Correlation Coefficient	0.071	1.000	0.038	0.493**	1.000**	−0.112	−0.045	0.059
		Sig. (2-tailed)	0.308	.	0.632	<0.001	.	0.108	0.417	0.394
		N	206	334	165	111	82	209	334	212
	Viral Infection	Correlation Coefficient	0.140**	0.038	1.000	−0.018	0.049	0.003	−0.219**	−0.068
		Sig. (2-tailed)	0.008	0.632	.	0.856	0.551	0.951	<0.001	0.246
		N	360	165	521	106	153	399	521	292
	HPV positive	Correlation Coefficient	−0.027	0.493**	−0.018	1.000	1.000**	0.097	−0.036	0.004
		Sig. (2-tailed)	0.770	<0.001	0.856	.	.	0.288	0.639	0.965
		N	119	111	106	176	49	122	176	104
	Abnormal endometrium	Correlation Coefficient	0.016	1.000**	0.049	1.000**	1.000	0.117	0.029	−0.040
		Sig. (2-tailed)	0.855	.	0.551	.	.	0.104	0.647	0.652
		N	140	82	153	49	261	193	261	129
	Parity	Correlation Coefficient	−0.054	−0.112	0.003	0.097	0.117	1.000	0.128**	0.408**
		Sig. (2-tailed)	0.290	0.108	0.951	0.288	0.104	.	0.002	<0.001
		N	380	209	399	122	193	614	614	370
	Age	Correlation Coefficient	−0.159**	−0.045	−0.219**	−0.036	0.029	0.128**	1.000	0.188**
		Sig. (2-tailed)	<0.001	0.417	<0.001	0.639	0.647	0.002	.	<0.001
		N	562	334	521	176	261	614	1028	676
	Marital status	Correlation Coefficient	−0.017	0.059	−0.068	0.004	−0.040	0.408**	0.188**	1.000
		Sig. (2-tailed)	0.759	0.394	0.246	0.965	0.652	<0.001	<0.001	.
		N	342	212	292	104	129	370	676	677

**. Correlation is significant at the 0.01 level (2-tailed).

- The patients who had viral infection had a higher odd of developing abnormal colposcopy [OR 2.35 (95% CI 0.93 - 5.92), p = 0.04].
- Bivariate analysis: Abnormal colposcopy has a weak positive correlation with viral infection (r = 0.140, p = 0.008) and weak negative correlation with age (r = −0.159, p =< 0.001)

4. Discussion

Having pap smear routinely improves outcomes and prognosis of cervical cancer as proved many published reports. Early detection by pap smear is always a good initial step in improving outcomes. Our study has proved that having abnormal pap smear results is correlated with having abnormal colposcopy findings.

The findings of this study underscore the critical interplay between abnormal Pap smear results, histopathological assessments, and colposcopic findings in the context of cervical cancer screening. Our results indicate a strong correlation between abnormal Pap smears and significant colposcopic findings, which aligns with existing literature suggesting that Pap smear abnormalities serve as a reliable indicator for further investigation through colposcopy.

The Pap smear test is a crucial and effective way to check for cervical cancer. Precancerous lesions are treated, and women are screened for the condition using Pap smears globally. In certain industrialized nations, Pap smear screening has shown impressive success in lowering cervical cancer mortality and incidence.

4.1. Summary and Relevance

In this study, the data of 344 patients were interpreted; 35.2% had abnormal Pap smear results, and 65.4% had abnormal colposcopy. Of which, 28.8% demonstrated abnormal endometrium findings.

The findings of this study underscore the critical interplay between abnormal Pap smear results, histopathological assessments, and colposcopic findings in the context of cervical cancer screening. Our results indicate a strong correlation between abnormal Pap smears and significant colposcopic findings. This aligns with existing literature suggesting that Pap smear abnormalities serve as a reliable indicator for further investigation through colposcopy [4] [5] [9] [10].

4.2. Role of Pap Smear in Current Practice

Despite inherent limitations in sensitivity, Pap smear cytology remains clinically relevant, especially when taking into account its affordability and accessibility compared to other screening methods. Its high specificity of more than 95% supports its continued use as part of regular screening, triage, and co-testing strategies [4] [6]. Among young women, Pap smear continues to be the standard method due to the increasing prevalence of transient HPV infections, which may otherwise lead to overdiagnosis and unnecessary interventions [11]. Additionally, Pap cytology confers added value by detecting non-HPV cervical pathologies not assessed in DNA-based tests, such as benign glandular abnormalities. According to Devaraju *et al.* (2023), Pap smear retains clinical significance in identifying low-grade squamous intraepithelial lesions (LSIL) and atypical squamous cells, which may not always correlate with high-risk HPV positivity. Their findings emphasize that in younger women, cytological abnormalities often reflect benign or regressive pathology, thus reaffirming the importance of cytology as a triaging tool in this demographic.

4.3. Bahrain and GCC Guidelines

Current clinical guidelines may evolve to integrate stratified follow-up protocols based on HPV genotype, patient age, and cytology grade. For instance, ASC-US patients with positive high-risk HPV testing may benefit from immediate colposcopy or dual-stain cytology triage. Conversely, HPV-negative ASC-US patients could be monitored with cytology at 12-month intervals, thus optimizing resource use without compromising safety. Ismaeel *et al.* substantiate this approach within the Gulf region, encouraging evidence-based personalization of screening practices.

In terms of screening strategies in Bahrain, Ismaeel, A. *et al.* (2024) suggest that even a cytology finding of ASC-US warrants active follow-up, with 10.7% of such cases revealing high-grade lesions on histology, particularly among hrHPV-positive individuals. The significant rate of regression (73.8%) in this Bahraini cohort indicates that HPV testing and scheduled cytologic surveillance can prevent overtreatment [3]. These findings are in alignment with global guidelines and further support the integration of co-testing of Pap cytology and hrHPV**,** and targeted colposcopic evaluation for ASC-US cases to optimize risk stratification and resource allocation.

4.4. Strengths, Limitations, and Future Suggestions

A principal strength of this study lies in its regional relevance; it is one of the first studies to assess the relationship between aberrant Pap smear results, colposcopic impressions, and histological diagnosis among the GCC countries. While many studies are available on an international level, only a few have investigated these connections in the Middle East, where awareness levels, epidemiological trends, and screening guidelines may differ. Therefore, this study fills an essential gap in the literature and provides an outline for future prospective research and policy formation in cervical cancer prevention in the GCC.

Despite the valuable insights offered by this study, several limitations must be acknowledged. The sample size, although statistically significant for preliminary analysis, may limit the generalizability of our findings. Thus, it might not be representative of the heterogeneity of the wider population, including demographics, sexual health behaviour and awareness, and HPV vaccination status. Additionally, variability in colposcopic techniques presents a potential source of bias. This procedure is operator-dependent, and differences in training and experience level may affect the outcome. Future studies with larger, more heterogeneous populations are needed to validate our results and explore the nuances of this relationship further.

5. Conclusions

Significant associations were found between abnormal colposcopy results and factors such as autoimmune disease, malignancy, diabetes, and viral infection.

There is a weak positive correlation between viral infection and abnormal col-

poscopy, and a weak negative correlation between age and abnormal colposcopy.

These results suggest that certain demographic and health-related factors are associated with the likelihood of abnormal findings during colposcopy, which could inform targeted screening and prevention strategies.

In conclusion, our study highlights the importance of a multidisciplinary approach in cervical cancer screening, advocating for the combined assessment of Pap smear results and histopathological findings to optimize colposcopic evaluations. By enhancing the understanding of these relationships, we can improve patient care and outcomes in the prevention and management of cervical cancer.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Sung, H., Ferlay, J., Siegel, R.L., Laversanne, M., Soerjomataram, I., Jemal, A., *et al.* (2021) Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA*: *A Cancer Journal for Clinicians*, **71**, 209-249. https://doi.org/10.3322/caac.21660

[2] International Agency for Research on Cancer (2020) Cancer Today: Data Visualization Tools for Exploring the Global Cancer Burden in 2020. Lyon, France: IARC. https://gco.iarc.fr/today

[3] Ismaeel, A., Al-Shaikh, S., Mubarak, A. and Ismaeel, R. (2024) Atypical Squamous Cells of Undetermined Significance Cervical Cytology in Bahrain: Reporting Rates, High-Risk HPV Testing, and Cytologic and Histopathologic Follow-Up Findings. *Cytojournal*, **21**, Article 11. https://doi.org/10.25259/cytojournal_84_2023

[4] Harding, C., Seal, A., Pilotto, L., Mackey, K., Duncan, G., Huynh, R., *et al.* (2016) Accuracy of Screening Tools for Pap Smears in General Practice. *Journal of Innovation in Health Informatics*, **23**, 555-559. https://doi.org/10.14236/jhi.v23i3.835

[5] Najib, F.S., Hashemi, M., Shiravani, Z., Poordast, T., Sharifi, S. and Askary, E. (2020) Diagnostic Accuracy of Cervical Pap Smear and Colposcopy in Detecting Premalignant and Malignant Lesions of Cervix. *Indian Journal of Surgical Oncology*, **11**, 453-458. https://doi.org/10.1007/s13193-020-01118-2

[6] Kasraeian, M., Asadi, N., Ghaffarpasand, F. and Karimi, A.A. (2011) Value of Transvaginal Ultrasonography in Endometrial Evaluation of Non-Bleeding Postmenopausal Women. *Climacteric*, **14**, 126-131. https://doi.org/10.3109/13697137.2010.514079

[7] Kohale, M.G., Dhobale, A.V., Hatgoankar, K., Bahadure, S., Salgar, A.H. and Bandre, G.R. (2024) Comparison of Colposcopy and Histopathology in Abnormal Cervix. *Cureus*, **16**, e54274. https://doi.org/10.7759/cureus.54274

[8] Swati, S. and Mayurika, T.S. (2020) Correlation of Pap Smear and Colposcopic Findings in Relation to Histopathology in Detection of Premalignant Lesions of Cervix. *International Journal of Contemporary Medical Research*, **6**, 89-94.

[9] Jahic, M. and Hadzimehmedovic, A. (2020) Cytological, Colposcopic and Pathohistological Correlation of HSIL and ASC H Findings. *Medical Archives*, **74**, 381-383. https://doi.org/10.5455/medarh.2020.74.381-383

[10] Shamastun, S., Mohammadi, B., Mousavi Seresht, L. and Taleban, R. (2025) The Cor-

relation between Colposcopy and Pathology Results. *Journal of Obstetrics, Gynecology and Cancer Research*, **10**, 208-211. https://doi.org/10.30699/jogcr.10.3.208

[11] Devaraju, R., Jaiswal, V., Patil, P. and Das, S. (2023) Cytological Analysis of Cervical Smears in Young Females: A Retrospective Study from a Tertiary Care Center. *Cyto-Journal*, **20**, 1-6.