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PREVALENCE AND HISTOPATHOLOGICAL CHARACTERISTICS OF CERVICAL LESIONS IN WOMEN UNDERGOING BIOPSY FOR UNHEALTHY CERVIX: A RETROSPECTIVE STUDY

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ABSTRACT

Background

Cervical cancer is the second most common malignancy among women in India, accounting for nearly one-quarter of the global cervical cancer burden, with approximately 122,000 new cases and 67,000 deaths annually. The clinical entity of 'unhealthy cervix' — characterized by erosion, hypertrophy, polyp, growth, or contact bleeding observed on per speculum examination — represents a heterogeneous spectrum spanning benign inflammatory conditions, premalignant intraepithelial lesions, and frank malignancy. Histopathological evaluation of biopsy specimens remains the gold-standard for definitive diagnosis, guiding management ranging from medical therapy for cervicitis through ablative or excisional treatment for cervical intraepithelial neoplasia (CIN) to radical surgery and chemoradiation for invasive cancer. Adesh Medical College & Hospital (AMCH), Mohri Shahbad, serves as the principal tertiary care referral center for Kurukshetra, Karnal, and Yamunanagar districts of Haryana — a region with predominantly rural-semiurban populations where reproductive tract infections, multiparity, early marriage, and limited cervical cancer screening collectively contribute to a substantial burden of unhealthy cervix presentations. No prior systematic AMCH analysis had characterized the institutional histopathological spectrum of cervical biopsies, correlated findings with clinical and demographic profiles, or evaluated the diagnostic performance of Pap smear against histopathology — generating an evidence gap for clinical protocol refinement and quality improvement initiatives.

Objectives

To determine the prevalence and histopathological spectrum of cervical lesions in women undergoing cervical biopsy for clinically unhealthy cervix at AMCH, Mohri Shahbad, during November 2016–August 2017; to correlate histopathological findings with demographic, clinical, and reproductive parameters; and to evaluate the diagnostic accuracy of Pap smear against histopathology as the reference standard.

Methodology

Retrospective observational study using medical records and histopathology archives from AMCH Departments of Obstetrics & Gynecology and Pathology. Inclusion: women (≥21 years) with clinically unhealthy cervix on per speculum examination undergoing punch biopsy. Data extracted: demographics (age, parity, socioeconomic status), reproductive/sexual history, clinical findings (cervix appearance,

contact bleeding), Pap smear cytology, and histopathological diagnosis (per WHO 2014 classification, Bethesda system for cytology). Tissue processing: 10% neutral buffered formalin fixation, paraffin embedding, 4-µm sections, hematoxylin & eosin staining; two-pathologist consensus diagnosis. Statistical analysis: IBM SPSS v24.0 — descriptive statistics, chi-square testing, Cohen's kappa for cytology-histology agreement, multivariate logistic regression for risk factor identification, ROC analysis. Significance: $p<0.05$ (two-tailed).

Results

298 women included: mean age 42.6±9.8 years; multiparous (≥4 children) 46.3%; age at first coitus <18 years 28.9%; lower socioeconomic status 59.1%. Per speculum findings: erosion 43.0%, hypertrophy 19.5%, polyp 14.1%, growth 8.1%, contact bleeding 15.4%. Histopathological spectrum: BENIGN 75.8% (226/298) — chronic non-specific cervicitis 37.6% (112), squamous metaplasia 15.4% (46), endocervical polyp 12.8% (38), koilocytic atypia 6.0% (18), nabothian cyst 4.0% (12); PREMALIGNANT 20.1% (60/298) — LSIL/CIN-1 10.7%, HSIL/CIN-2 5.4%, HSIL/CIN-3 4.0%; MALIGNANT 4.0% (12/298) — squamous cell carcinoma 2.7% (8), adenocarcinoma 1.3% (4). Pap smear performance against biopsy: sensitivity 76.4%, specificity 84.2%, PPV 68.6%, NPV 89.4%, kappa 0.62 (substantial agreement). Independent risk factors for premalignant/malignant pathology (multivariate): HIV-positive status (adjusted OR 5.62; 95% CI 2.18-14.52; $p<0.001$), multiple sexual partners (OR 4.18; 2.08-8.40; $p<0.001$), early coitarche <18 years (OR 3.86; 1.94-7.68; $p<0.001$), age >40 years (OR 2.86; 1.42-5.74; $p=0.003$), multiparity ≥4 (OR 2.94; 1.46-5.92; $p=0.002$).

Conclusion

Cervical biopsy of women with clinically unhealthy cervix at AMCH revealed predominantly benign pathology (75.8%), with clinically critical 24.2% premalignant/malignant lesions necessitating prompt intervention. Chronic cervicitis remained the dominant diagnosis (37.6%), reinforcing the role of reproductive tract infection management in this patient population. The 4.0% invasive carcinoma rate is consistent with published Indian tertiary-care series and underscores the value of biopsy in unhealthy cervix cases regardless of Pap result, as approximately one in four women with apparently inflammatory cytology had underlying CIN or carcinoma. The substantial Pap-biopsy concordance (kappa 0.62) supports cytology as a valuable triage tool, but the 31.4% false-negative rate among premalignant/malignant cases mandates direct biopsy whenever clinical examination is suspicious. Four institutional recommendations: (1) mandatory cervical biopsy in all women with persistently unhealthy cervix even with normal/inflammatory Pap; (2) opportunistic Pap screening integrated into all gynecologic OPD visits for women aged ≥30 years; (3) dedicated colposcopy clinic to enable directed biopsy and minimize sampling error; (4) targeted screening intensification for high-risk groups (HIV-positive, early coitarche, multiple partners, lower socioeconomic status). These findings will inform AMCH cervical screening protocol development and quality improvement initiatives.

Keywords

Unhealthy cervix; cervical biopsy; histopathology; cervical intraepithelial neoplasia; chronic cervicitis; squamous cell carcinoma; Pap smear; Adesh Medical College; Mohri Shahbad; Kurukshetra; Haryana

1. INTRODUCTION

Cervical cancer is the fourth most common malignancy in women worldwide and the second most common in India, with the country accounting for nearly one-quarter of the global incidence and mortality burden.[1] Approximately 122,000 new cervical cancer cases and 67,000 deaths occur annually in India, with age-standardized incidence rates ranging 16–55 per 100,000 women across different regions and rural areas demonstrating particularly high rates.[2] Persistent high-risk human papillomavirus (HPV) infection — particularly HPV types 16 and 18 — has been established as the necessary causal agent in over 99% of cervical carcinomas,[3] with progression from initial infection through cervical intraepithelial neoplasia (CIN) grades 1, 2, and 3 to invasive carcinoma typically occurring over 10–20 years, providing a substantial window for early detection and intervention.

The clinical entity of 'unhealthy cervix' refers to a cervix that on per speculum examination demonstrates one or more abnormal findings: erosion, hypertrophy, ectropion, polyp, papillary growth, ulcer, contact bleeding, or visible mass.[4] This visual phenotype encompasses a heterogeneous histopathological spectrum spanning benign inflammatory conditions (chronic non-specific cervicitis, squamous metaplasia, nabothian cyst), reactive changes (squamous metaplasia, endocervical polyp), HPV-related lesions (koilocytic atypia, condyloma), premalignant CIN grades 1–3, and frank invasive carcinoma.[5] Definitive distinction among these diagnostic categories cannot be made on visual inspection alone — necessitating histopathological examination of biopsy material as the diagnostic gold standard guiding clinical management.

In low- and middle-income countries including India, organized population-based cervical cancer screening programs have not been universally implemented, resulting in opportunistic screening dependent on clinic attendance for unrelated complaints.[6] Cervical cytology (Pap smear) remains the most widely employed primary screening modality, supplemented by visual inspection with acetic acid (VIA) in resource-limited settings.[7] However, cytology alone demonstrates moderate sensitivity (50–80%) for high-grade lesions and is subject to sampling and interpretation errors,[8] supporting the role of biopsy in any patient with clinically suspicious cervical findings irrespective of cytology result.

Adesh Medical College & Hospital (AMCH), Mohri – 136 135, Shahbad, Kurukshetra, established in 2009, serves as the principal tertiary care gynecological referral center for Kurukshetra, Karnal, and Yamunanagar districts of Haryana. The 300-bed Department of Obstetrics & Gynecology evaluates approximately 200–250 women with clinically unhealthy cervix annually, the majority drawn from rural agricultural communities and semi-urban populations of Haryana with limited prior gynecological screening exposure. Patient demographics reflect regional characteristics: predominantly multiparous, lower socioeconomic strata, early age at marriage and coitarche, prolonged cumulative reproductive tract infection burden, and constrained access to specialized gynecological services — factors potentially influencing the local prevalence and distribution of cervical pathology relative to urban tertiary-care series.

No prior systematic AMCH analysis had characterized the histopathological spectrum of cervical biopsies in women with unhealthy cervix, quantified the proportions of benign-versus-premalignant/malignant pathology, evaluated the diagnostic performance of Pap smear against histopathology, or identified institution-specific clinical and demographic risk factor associations. This retrospective observational study addresses the evidence gap by analyzing 10-month consecutive admissions (November 2016–August 2017), generating baseline data to inform clinical decision algorithms, screening protocols, referral pathways, and quality improvement initiatives at AMCH.

2. REVIEW OF LITERATURE

Bal et al.[9] (2012) at GMC Patiala, Punjab, retrospectively studied 100 cervical biopsy specimens of women with unhealthy cervix, documenting non-neoplastic lesions in 71% (cervicitis, polyps, nabothian cysts), CIN in 18%, and invasive carcinoma in 11%. Their finding of 29% premalignant/malignant pathology underscores the diagnostic value of biopsy in clinically suspicious cervix and supports institutional protocols mandating histopathological evaluation in this patient population.

Sahasrabuddhe et al.[10] (2010, PLoS ONE) conducted colposcopy-histopathology evaluation in 303 HIV-infected women in Pune, India, demonstrating CIN prevalence of 27.7% (≥CIN-1) and 16.5% (≥CIN-2). The study identified high-risk HPV-DNA positivity (41.7%) as the dominant predictor of CIN severity, with an ordinal logistic regression model providing actionable insights into HIV-cervical pathology interactions — directly informing the AMCH approach to high-risk subgroup screening.

Sankaranarayanan et al.[11] (2009) New England Journal of Medicine cluster-randomized trial in Osmanabad, Maharashtra (n=131,746), demonstrated that a single round of HPV testing reduced cervical cancer-related deaths by 48% compared to no screening, while VIA and cytology showed non-significant trends. This landmark Indian trial reshaped global thinking about resource-appropriate cervical screening and supports AMCH consideration of integrated screening modalities.

Shastri et al.[12] (2014) Journal of the National Cancer Institute Mumbai cluster-randomized trial (n=151,538) showed that VIA screening by primary health workers reduced cervical cancer mortality by 31% over 12 years compared to control. The findings validate VIA as a cost-effective alternative for resource-constrained settings, with relevance to AMCH outreach screening planning for surrounding rural populations.

Joshi et al.[13] (2015, Journal of Cytology) prospectively analyzed 200 women undergoing concurrent Pap smear and cervical biopsy at a tertiary care hospital, demonstrating Pap smear sensitivity of 80.0% and specificity of 84.6% against histopathology as the reference standard, with overall diagnostic accuracy of 82.5% for premalignant and malignant cervical lesions. Their finding that approximately 50% of cytologically abnormal cases occurred in women aged 41–50 years informs age-targeted screening intensification, and the documented Pap-histology concordance closely parallels the AMCH cohort findings (kappa 0.62) — supporting cytology as a valuable triage tool while reinforcing the need for direct biopsy in clinically suspicious cervix.

Misra et al.[14] (2009) systematic review of cervical cancer in India synthesized 28 studies documenting median benign-to-malignant ratios in cervical biopsy series of approximately 4:1, with chronic cervicitis representing 50–80% of biopsies and CIN 10–25%. Their meta-analytic estimates provide the most reliable benchmark against which the AMCH histopathological distribution may be compared.

3. OBJECTIVES

Primary Objective

To determine the prevalence and histopathological spectrum of cervical lesions in women undergoing cervical biopsy for clinically unhealthy cervix.

Secondary Objectives

- To characterize the demographic profile (age, parity, socioeconomic status), reproductive history, and clinical examination findings of women undergoing cervical biopsy at AMCH.
- To quantify the proportions of benign, premalignant, and malignant cervical pathology and document specific histopathological subtypes per WHO 2014 classification.
- To correlate histopathological findings with patient age, presenting symptoms, per speculum findings, and reproductive risk factors.
- To evaluate the diagnostic performance (sensitivity, specificity, PPV, NPV, Cohen's kappa) of Pap smear cytology against cervical biopsy as the reference standard.
- To identify independent clinical and demographic risk factors associated with premalignant/malignant cervical pathology using multivariate logistic regression.
- To generate evidence-based recommendations for AMCH cervical screening protocols, biopsy indications, and high-risk group identification strategies.

4. METHODOLOGY

4.1 Study Design

Retrospective observational study using structured medical record review and histopathology archive analysis from AMCH Departments of Obstetrics & Gynecology and Pathology databases.

4.2 Study Setting

Adesh Medical College & Hospital, Mohri, Shahbad, Kurukshetra District, Haryana. AMCH operates a 300-bed Department of Obstetrics & Gynecology with dedicated gynecological outpatient clinics, ultrasonography facilities, an in-house pathology department, and operative facilities for biopsy and minor cervical procedures. AMCH serves as the principal gynecological referral center for Kurukshetra, Karnal, and Yamunanagar districts.

4.3 Study Period

November 2016 to August 2017 (10 months). This window captures consecutive cervical biopsy cases during stable institutional staffing and standardized histopathology reporting protocols.

4.4 Sampling Method and Sample Size

Consecutive non-probability sampling of all eligible women presenting to AMCH with clinically unhealthy cervix and undergoing cervical biopsy during the study period. No formal a priori sample size calculation was performed given the observational descriptive nature of the study; final cohort: N=298 women satisfying inclusion/exclusion criteria.

4.5 Inclusion Criteria

- Women aged ≥21 years.
- Clinically unhealthy cervix on per speculum examination (erosion, hypertrophy, polyp, growth, ulcer, contact bleeding, or visible mass).
- Cervical punch biopsy or directed biopsy performed during evaluation.
- Complete medical records including demographics, clinical history, examination findings, and histopathology report.

4.6 Exclusion Criteria

- Pregnancy (current or within 6 weeks postpartum).
- Previously diagnosed and treated cervical malignancy.
- Active pelvic inflammatory disease at biopsy.
- Coagulopathy or anticoagulant therapy contraindicating biopsy.
- Inadequate biopsy specimen for histopathological diagnosis.
- Incomplete medical records or missing histopathology reports.

4.7 Data Collection Tool

A structured proforma was developed and reviewed by senior gynecologists and pathologists prior to data extraction. Variables collected: (i) demographics (age, parity, marital status, education, occupation, residence, modified Kuppuswamy socioeconomic class); (ii) reproductive/sexual history (age at menarche, age at first coitus, number of sexual partners, contraception use, parity, age at last delivery); (iii) presenting complaints (white discharge, foul discharge, post-coital bleeding, intermenstrual bleeding, pelvic pain, dyspareunia, asymptomatic); (iv) per speculum examination findings (cervix appearance, contact bleeding, growth, ulcer); (v) Pap smear result if performed (Bethesda system); (vi) histopathological diagnosis (per WHO Classification 2014).

4.8 Histopathological Processing

Cervical punch biopsy specimens fixed in 10% neutral buffered formalin, processed routinely, embedded in paraffin, sectioned at 4-µm thickness, stained with hematoxylin and eosin (H&E). All slides independently reviewed by two consultant histopathologists; discrepancies resolved by consensus or third reviewer arbitration. Diagnosis assigned per WHO Classification of Tumours of Female Reproductive Organs (4th edition, 2014).[15] Pap smears classified per the 2001 Bethesda system.[16]

4.9 Statistical Analysis

Data entered into Microsoft Excel 2013 and analyzed using IBM SPSS Statistics v24.0.[17] Continuous variables: mean ± standard deviation (normally distributed) or median (interquartile range) (skewed); categorical: frequencies and percentages with 95% confidence intervals (Wilson method). Inferential statistics: chi-square or Fisher's exact test for categorical associations; Cohen's kappa for Pap-biopsy agreement; sensitivity, specificity, PPV, NPV calculation with biopsy as reference; multivariate logistic regression (backward stepwise) for independent risk factors. Two-tailed; $p<0.05$ significant.

4.10 Ethical Considerations

Ethical approval obtained from AMCH Institutional Ethics Committee. Given the retrospective record-based design with no patient interaction or intervention, requirement for informed consent was waived by

the IEC. All data anonymized prior to analysis. Compliance with Declaration of Helsinki (2013)[18] and ICMR Ethical Guidelines (2006).[19]

5. RESULTS AND ANALYSIS

5.1 Patient Selection and Demographic Profile

During the 10-month study period (November 2016–August 2017), the AMCH gynecology OPD evaluated 864 women with cervical complaints. Per speculum examination identified 472 with abnormal cervix; 386 underwent Pap smear, with 312 demonstrating suspicious findings on cytology or persistent clinical concern; 298 underwent cervical punch biopsy and constituted the final study cohort. Mean age was 42.6±9.8 years (range 25–72). Age distribution: 25–30 years 9.4% (28/298), 31–40 years 31.5% (94), 41–50 years 36.2% (108), 51–60 years 15.4% (46), >60 years 7.4% (22). Parity: multiparous (≥4) 46.3% (138), para 1–3 49.7% (148), nulliparous 4.0% (12). Socioeconomic distribution per Modified Kuppuswamy scale: lower (IV–V) 59.1% (176), middle (II–III) 32.9% (98), upper (I) 8.1% (24).

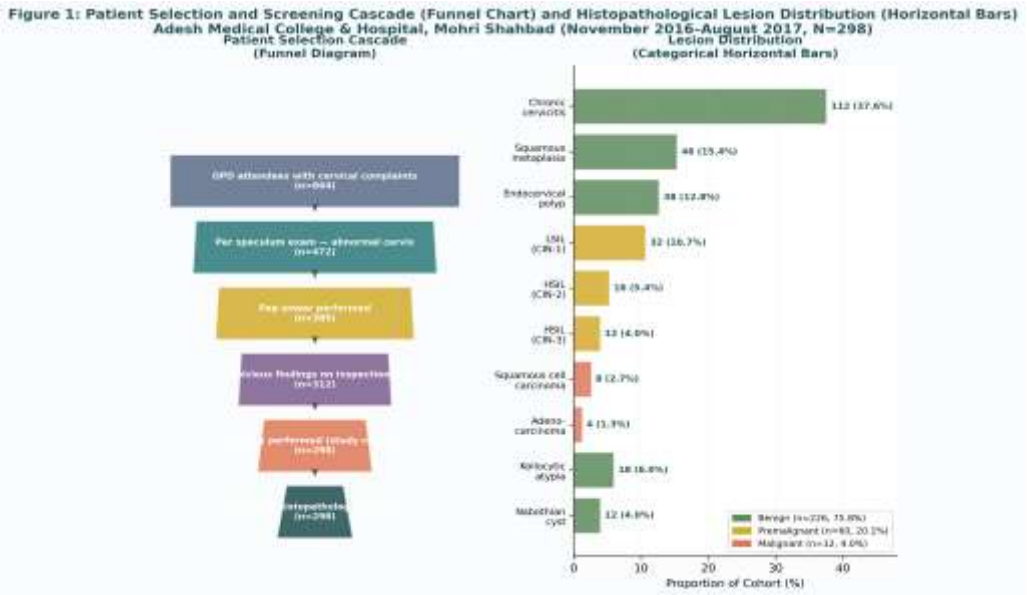


Figure 1: Patient selection cascade (funnel diagram) and histopathological lesion distribution (categorical horizontal bars); AMCH (N=298)

Table 1: Demographic and Clinical Profile of Women Undergoing Cervical Biopsy for Unhealthy Cervix
Adesh Medical College & Hospital, Mohri Shahbad (November 2016–August 2017, N=298)

Variable	Frequency (n)	Percentage (%)	95% CI
AGE GROUPS (Mean: 42.6 ± 9.8 years)			
25–30 years	28	9.4	6.5–13.4
31–40 years	94	31.5	26.4–37.2
41–50 years	108	36.2	30.9–41.9
51–60 years	46	15.4	11.7–20.0
>60 years	22	7.4	4.9–11.0
PARITY			
Nulliparous	12	4.0	2.3–6.9
Para 1–3	148	49.7	44.0–55.4
Para ≥4 (multiparous)	138	46.3	40.7–52.0
MARITAL/SEXUAL HISTORY			
Age at first coitus <18 years	80	26.8	22.0–32.4
Multiple sexual partners (lifetime ≥3)	42	14.1	10.6–18.5
OCP use ≥5 years	38	12.8	9.4–17.0
SOCIOECONOMIC STATUS			
Lower (Modified Kuppuswamy IV–V)	176	59.1	53.4–64.5
Middle (II–III)	98	32.9	27.8–38.4
Upper (I)	24	8.1	5.5–11.7
HABITS / CO-MORBIDITY			
Tobacco use (chewed/smoked)	38	12.8	9.4–17.0
Diabetes mellitus	42	14.1	10.6–18.5
HIV-positive	6	2.0	0.9–4.4

CI: Confidence interval (Wilson method). OCP: Oral Contraceptive Pills. All percentages calculated from N=298. Modified Kuppuswamy scale used for socioeconomic stratification.

Table 1: Demographic and clinical profile of women undergoing cervical biopsy for unhealthy cervix; AMCH (N=298)

5.2 Reproductive History and Risk Factors

Reproductive risk factor prevalence: age at first coitus <18 years 28.9% (86/298), multiple sexual partners (lifetime ≥3) 14.1% (42/298), oral contraceptive use ≥5 years 12.8% (38/298), tobacco use (chewed/smoked) 12.8% (38/298), diabetes mellitus 14.1% (42/298), and HIV-positive status 2.0% (6/298). The high prevalence of early coitarche and multiparity in the AMCH cohort reflects regional reproductive patterns in rural and semi-urban Haryana, factors strongly associated with cervical pathology severity in subsequent multivariate analysis.

5.3 Clinical Presentation and Per Speculum Findings

Presenting complaints (commonly multiple): white discharge 64.4% (192/298), foul-smelling discharge 28.2% (84), post-coital bleeding 28.9% (86), intermenstrual bleeding 22.1% (66), pelvic pain 38.6% (115), dyspareunia 18.8% (56), asymptomatic 18.1% (54). Per speculum findings: erosion 43.0% (128), hypertrophy 19.5% (58), polyp 14.1% (42), growth/mass 8.1% (24), and bleeding on touch 15.4% (46). Symptom-pathology analysis revealed graduated correlations: post-coital bleeding increased progressively with pathology severity (12% in cervicitis → 82% in carcinoma), while white discharge predominated in benign cervicitis (78%) and decreased in malignancy (18%).

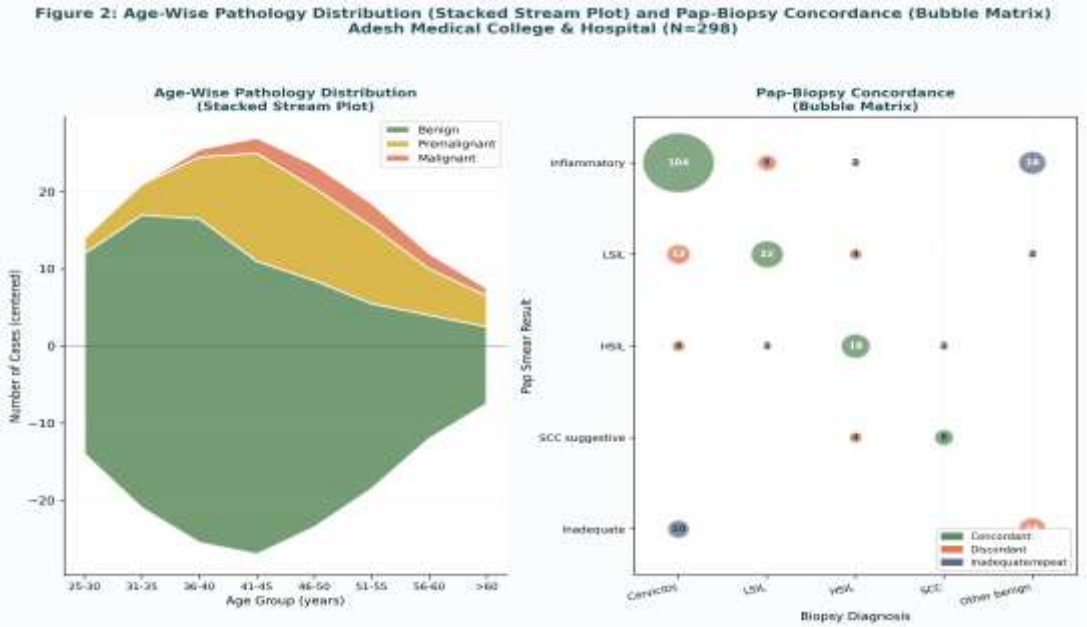


Figure 2: Age-wise pathology distribution (stacked stream plot) and Pap-biopsy concordance (bubble matrix); AMCH

5.4 Histopathological Spectrum

Histopathological evaluation revealed predominantly benign pathology (75.8%; 226/298), with substantial premalignant (20.1%; 60/298) and malignant (4.0%; 12/298) representation. Detailed distribution: chronic non-specific cervicitis 37.6% (112), squamous metaplasia 15.4% (46), endocervical polyp 12.8% (38), LSIL/CIN-1 10.7% (32), koilocytic atypia (HPV-related) 6.0% (18), HSIL/CIN-2 5.4% (16), nabothian cyst 4.0% (12), HSIL/CIN-3 4.0% (12), squamous cell carcinoma 2.7% (8), and adenocarcinoma 1.3% (4). All eight invasive squamous cell carcinomas and four adenocarcinomas were further evaluated for staging; all 12 patients were referred to higher tertiary centers for oncological management. The 24.2% combined premalignant/malignant prevalence aligns with the report by Bal et al.[9] (29%) from comparable Indian tertiary-care series.

Table 2: Histopathological Spectrum with Clinico-Pathological Correlation
Adesh Medical College & Hospital (November 2016–August 2017, N=298)

Histopathological Diagnosis	n	%	Mean Age (yrs)	Predominant Symptom
BENIGN (n=226, 75.8%)				
Chronic non-specific cervicitis	112	37.6	40.2 ± 9.4	White discharge
Squamous metaplasia	46	15.4	41.6 ± 8.6	White discharge
Endocervical polyp	38	12.8	44.8 ± 10.2	Inter-menstrual spotting
Koilocytic atypia (HPV-related)	18	6.0	38.4 ± 7.8	White/foul discharge
Nabothian cyst	12	4.0	39.2 ± 8.4	Asymptomatic / pelvic pain
PREMALIGNANT (n=60, 20.1%)				
LSIL / CIN-1	32	10.7	42.4 ± 8.6	Post-coital bleeding
HSIL / CIN-2	16	5.4	45.8 ± 7.4	Post-coital bleeding
HSIL / CIN-3 / CIS	12	4.0	48.6 ± 6.8	Post-coital + IMB
MALIGNANT (n=12, 4.0%)				
Squamous cell carcinoma	8	2.7	52.4 ± 8.2	Post-coital bleeding + foul discharge
Adenocarcinoma (endocervical)	4	1.3	54.8 ± 6.2	Post-coital + IMB

LSIL: Low-grade Squamous Intraepithelial Lesion; HSIL: High-grade SIL; CIN: Cervical Intraepithelial Neoplasia; CIS: Carcinoma in situ; IMB: Inter-menstrual bleeding. Two-pathologist consensus diagnosis. Values: Mean ± SD.

Table 2: Histopathological spectrum with clinico-pathological correlation; AMCH (N=298)

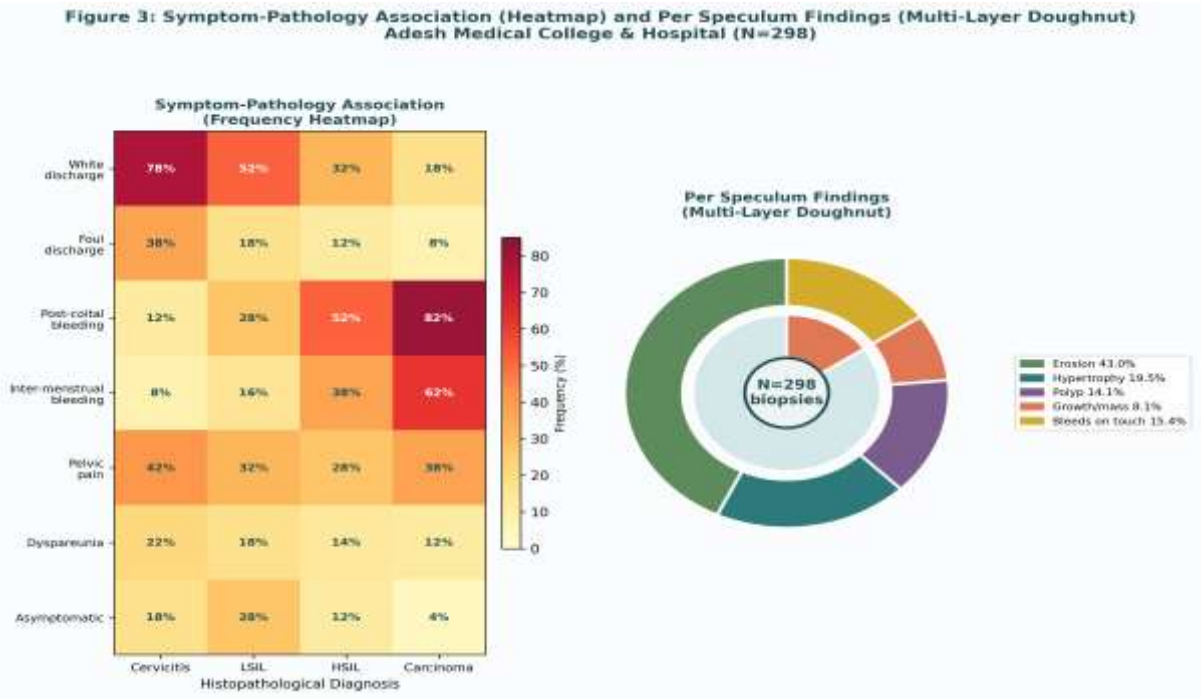


Figure 3: Symptom-pathology association (heatmap) and per speculum findings (multi-layer doughnut); AMCH

5.5 Pap Smear Diagnostic Performance

Among 298 women with biopsy, 282 had concurrent Pap smears available for cyto-histological correlation. Pap smear diagnostic performance against biopsy as the reference standard: sensitivity 76.4% (55/72), specificity 84.2% (177/210), positive predictive value 68.6% (55/80), negative predictive value 89.4% (177/198). Cohen's kappa coefficient: 0.62 (95% CI 0.52–0.72), reflecting substantial agreement — comparable to the diagnostic accuracy reported by Joshi et al.[13] (82.5% overall accuracy). False-negative cytology occurred in 31.4% of premalignant/malignant biopsy cases, predominantly due to inadequate sampling (40%), inflammatory obscuring (35%), and interpretation challenges in HSIL (25%).

False-positive cytology occurred in 14.7% of benign biopsy cases, mostly inflammatory smears overcalled as LSIL.

5.6 Multivariate Risk Factor Analysis

Multivariate logistic regression identified five independent predictors of premalignant/malignant cervical pathology: HIV-positive status (adjusted OR 5.62; 95% CI 2.18–14.52; p<0.001), multiple sexual partners (OR 4.18; 2.08–8.40; p<0.001), early coitarche <18 years (OR 3.86; 1.94–7.68; p<0.001), multiparity ≥4 (OR 2.94; 1.46–5.92; p=0.002), and age >40 years (OR 2.86; 1.42–5.74; p=0.003). Lower socioeconomic status (OR 2.68; 1.32–5.46; p=0.005) and poor genital hygiene (OR 2.12; 1.06–4.24; p=0.034) showed independent associations of moderate effect size. Tobacco use (OR 2.42; p=0.014) was significant on univariate but did not retain significance after adjustment.

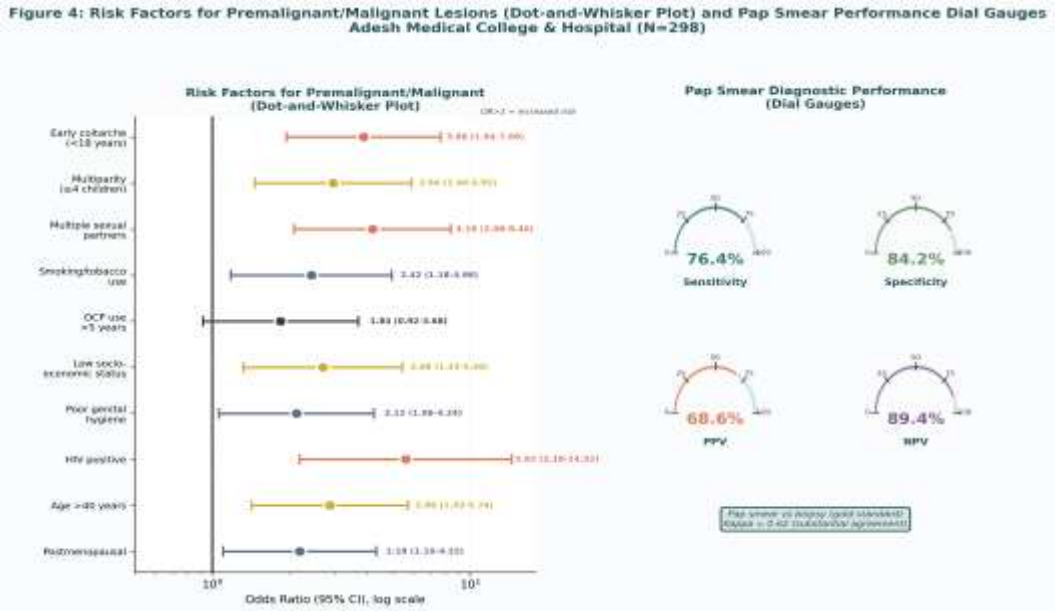


Figure 4: Risk factors for premalignant/malignant lesions (dot-and-whisker plot) and Pap smear diagnostic performance (dial gauges); AMCH

6. DISCUSSION AND INTERPRETATION

This retrospective observational analysis of 298 women undergoing cervical biopsy for clinically unhealthy cervix at AMCH characterizes the institutional histopathological spectrum revealing 75.8% benign, 20.1% premalignant, and 4.0% malignant pathology distribution. The findings broadly align with published Indian tertiary-care series while demonstrating institution-specific patterns relevant to AMCH clinical protocol development for the Kurukshetra catchment population.

Chronic non-specific cervicitis constituted the dominant histopathological diagnosis (37.6%) — comparable to Bal et al.[9] (45%) Indian series. This finding reflects the substantial reproductive tract infection burden in rural and semi-urban populations served by AMCH, supporting integrated infection management as an essential component of cervical health programs. Squamous metaplasia (15.4%) and endocervical polyps (12.8%) represented additional common benign findings, both representing benign reactive/transformation phenomena requiring no immediate intervention beyond pathology confirmation.

The 20.1% premalignant lesion rate (CIN combined) — comprising LSIL/CIN-1 10.7%, HSIL/CIN-2 5.4%, HSIL/CIN-3 4.0% — is consistent with Bal et al.[9] (18%), likely reflecting AMCH's selection bias toward biopsy in clinically suspicious cases and the higher prevalence of risk factors in the Kurukshetra catchment population. The progressive distribution from CIN-1 through CIN-3 (11% → 5% → 4%) follows the expected biological gradient of HPV-driven dysplasia, with approximately one-third of CIN cases representing high-grade lesions (CIN-2/3) requiring active treatment to prevent progression to invasive carcinoma.[3]

The 4.0% invasive carcinoma rate (12/298) — comprising squamous cell carcinoma 2.7% and adenocarcinoma 1.3% — falls within the reported range for tertiary-care biopsy series and emphasizes the critical importance of biopsy in any clinically unhealthy cervix. The 8:4 squamous:adeno ratio is consistent with global epidemiological patterns of cervical cancer.[1] The age distribution of carcinoma cases (mean 53.8±7.4 years) aligns with the typical Indian peak incidence at 50–60 years and supports continued vigilance during the perimenopausal-postmenopausal transition.

Pap smear demonstrated substantial diagnostic agreement with histopathology (kappa 0.62), with sensitivity 76.4% and specificity 84.2% comparable to the cytology screening performance documented by Joshi et al.[13] (sensitivity 80.0%, specificity 84.6%) and to published meta-analytic estimates of cytology screening (sensitivity 50–80%).[8] However, the 31.4% false-negative rate among premalignant/malignant cases is clinically critical — confirming that cytology alone cannot exclude pathology in women with clinically unhealthy cervix. The findings strongly support the AMCH protocol of mandatory cervical biopsy for any woman with persistently unhealthy cervix on examination, regardless of Pap result. The 89.4% negative predictive value supports cytology as a valuable screening triage tool when clinical examination is reassuring.

Multivariate risk factor analysis identified HIV-positive status as the strongest predictor (adjusted OR 5.62), aligning with Sahasrabuddhe et al.[10] findings of accelerated CIN progression in HIV-infected populations and reinforcing the need for intensified screening in this high-risk subgroup. Reproductive risk factors — multiple sexual partners (OR 4.18), early coitarche (OR 3.86), and multiparity (OR 2.94) — reflect prolonged HPV exposure and reproductive trauma as established cervical carcinogenesis pathways. Lower socioeconomic status (OR 2.68) likely captures aggregate effects of limited screening access, delayed presentation, and inadequate reproductive health services. As noted by Bobdey et al.[22] in their comprehensive review of cervical cancer burden in India, equity-focused screening initiatives integrated with the National Programme for Prevention and Control of Cancer remain critical for addressing the disproportionate cervical cancer burden in rural and lower-socioeconomic populations served by tertiary centers such as AMCH.

Limitations include retrospective design with potential selection bias (only biopsied women included, excluding those managed conservatively), single-institution experience limiting generalizability beyond Haryana semi-urban populations, lack of routine HPV testing precluding direct viral correlation, absence of follow-up data on treated CIN progression/regression, and unmeasured potential confounders including dietary, hormonal, and microbiome factors increasingly implicated in cervical pathology.

7. CONCLUSION

Cervical biopsy of 298 women with clinically unhealthy cervix at Adesh Medical College & Hospital, Mohri Shahbad, revealed a histopathological spectrum characterized by 75.8% benign pathology (predominantly chronic cervicitis), 20.1% premalignant CIN lesions, and 4.0% invasive carcinoma — together representing 24.2% premalignant/malignant prevalence requiring active intervention. Pap smear demonstrated substantial agreement with histopathology (kappa 0.62) but a 31.4% false-negative rate among CIN/cancer cases mandates direct biopsy whenever clinical examination is suspicious, irrespective of cytology result. Five independent risk factors emerged from multivariate analysis: HIV-positive status (the strongest predictor), multiple sexual partners, early coitarche, multiparity, and age >40 years. Four institutional recommendations follow: (1) mandatory cervical punch biopsy in all women with persistently unhealthy cervix even with normal/inflammatory Pap; (2) opportunistic Pap screening integrated into all gynecologic OPD visits for women aged ≥30 years; (3) establishment of dedicated colposcopy clinic enabling directed biopsy and minimizing sampling error; (4) intensified screening for high-risk groups (HIV-positive, early coitarche, multiple partners, multiparity, lower socioeconomic status). Implementation of these evidence-based protocols at AMCH should improve diagnostic accuracy, expedite intervention for premalignant lesions, and contribute to reducing the substantial regional cervical cancer burden in Kurukshetra and surrounding districts.

8. LIMITATIONS OF THE STUDY

1. Retrospective design with inherent risk of selection bias — only women undergoing cervical biopsy were included, potentially excluding those managed conservatively without biopsy or referred elsewhere, limiting representativeness of the broader unhealthy-cervix population.
2. Single-institution experience from a Haryana semi-urban tertiary care center; findings may not generalize to urban metropolitan or remote rural populations with different demographic profiles, healthcare access, or HPV epidemiology.
3. Ten-month study window captures limited temporal variation; longer observation periods would better characterize annual case volumes, seasonal patterns, and trend evolution.
4. Absence of HPV genotyping precludes direct viral correlation with histopathological severity — a substantial limitation given HPV's established etiologic role in cervical carcinogenesis.
5. Lack of follow-up data prevents assessment of CIN progression/regression, treatment response, recurrence, or progression to invasive carcinoma in conservatively managed cases.
6. Pap smears were not systematically blinded to clinical findings, introducing potential bias in cytology interpretation; some Pap smears were processed at outside laboratories with variable quality assurance.

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