International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

High-Risk HPV (16/18) Detection and Its Correlation with Graded Cervical Cytology Abnormalities: A Comprehensive Cross-Sectional Assessment from a Tertiary Care Centre in Agra, India

Dr Itishree Jena[1], Dr Urvashi Verma[2], Dr Rajkamal[3], Dr Geetika Munjal[4], Dr Shatakshi Jaiswal[4], Dr Anshu Gautam[4], Dr Neelam Singh[5]

[1]Senior Resident, Department Of Obstetrics and Gynaecology, S N Medical College Agra
[2]Professor, Department Of Obstetrics and Gynaecology, S N Medical College Agra
[3]Scientist E, Department Of Obstetrics and Gynaecology, S N Medical College Agra
[5]Associate Professor, Department Of Obstetrics and Gynaecology, S N Medical College Agra
[4]Junior Resident, Department Of Obstetrics and Gynaecology, S N Medical College Agra

ABSTRACT

Background: Cervical cancer remains one of the most preventable yet prevalent cancers in low- and middle-income countries. Persistent infection with high-risk HPV types—especially HPV-16 and HPV-18—is the strongest predictor of high-grade cervical lesions. Combined Pap smear and HPV DNA testing is increasingly recommended to improve early detection.

Aim: To determine the prevalence of high-risk HPV 16/18 infection and evaluate its association with different grades of cervical cytological abnormalities among women attending a tertiary-care hospital in Agra.

Materials and Methods: A cross-sectional study was conducted on 110 sexually active women aged 18–49 years attending the gynecology OPD at SN Medical College, Agra (2023–2025). Pap smears were reported according to the Bethesda System. Cervical samples were tested for HPV-16/18 DNA using PCR. Demographic variables, reproductive risk factors, symptom profiles, and cervical appearance were correlated with cytology grades and HPV positivity.

Results: Of 110 women, 47 (42.7%) were NILM; 21 (19.0%) ASC-US; 4 (3.6%) ASC-H; 24 (21.8%) LSIL; and 14 (12.7%) HSIL. Overall HPV positivity was 44.5% (49/110). High-risk HPV was markedly associated with increasing cytological severity. HPV-16 was most prevalent in HSIL (57.1%), followed by HPV-18 (14.3%). Women >30 years, parity ≥3, early sexual debut (<19 years), and history of RTI/STD showed significantly higher dysplasia rates. The strongest association with high-risk HPV was seen in HSIL (prevalence ratio 3.1).

Conclusion: High-risk HPV 16/18 shows a robust correlation with progressive cytological abnormalities. Integrating HPV DNA testing with Pap screening can substantially enhance early detection and reduce

cervical cancer burden in tertiary-care settings.

Keywords: HPV 16, HPV 18, Cervical cytology, Pap smear, HSIL, LSIL, HPV PCR, Agra

INTRODUCTION

Cervical cancer remains the **fourth most common cancer in women worldwide**, with the majority of cases reported from developing regions. According to **World Health Organization (WHO)**, nearly **90%** of cervical cancer deaths occur in low-resource countries due to inadequate screening and delayed diagnosis (1).

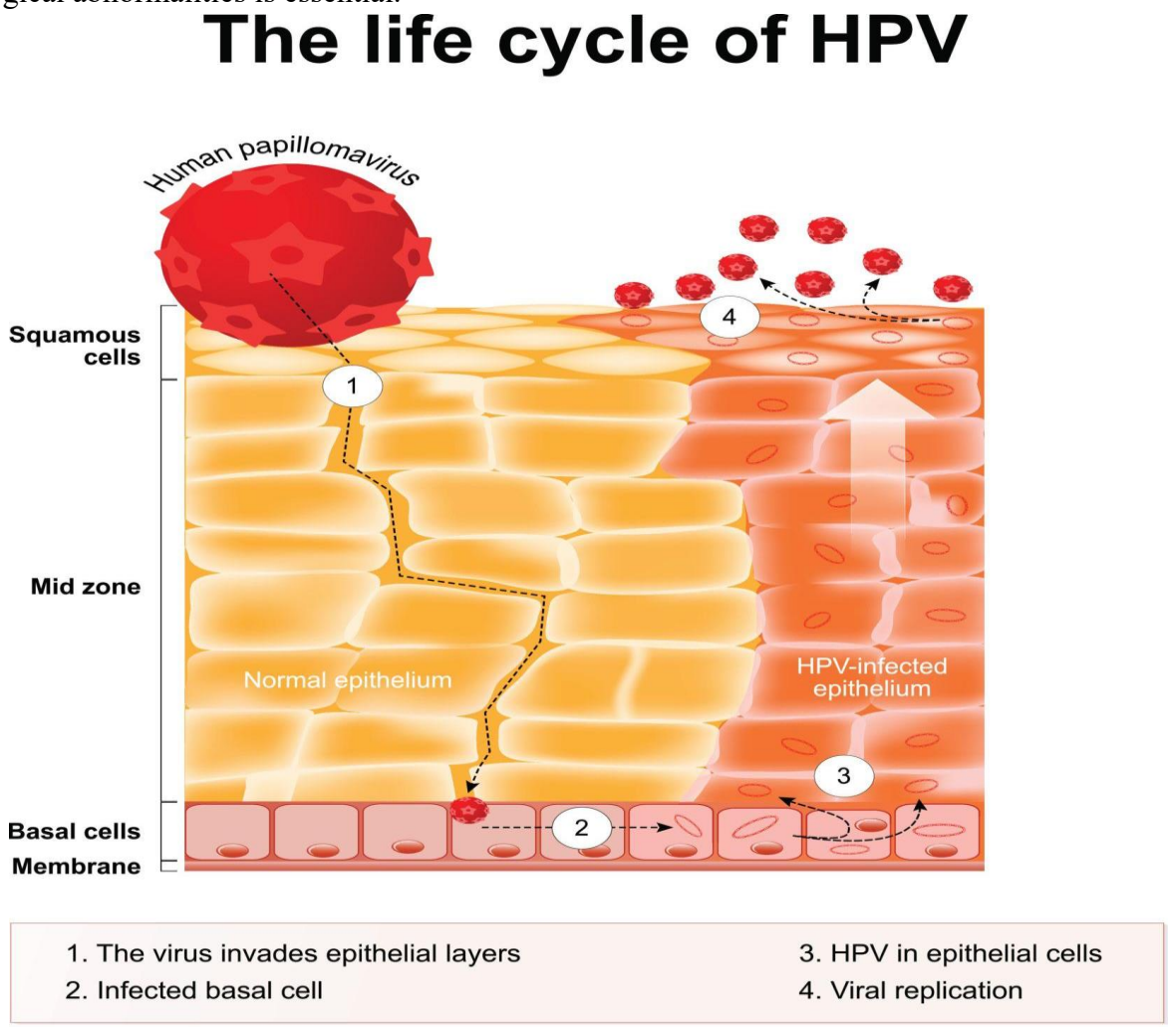
Human Papillomavirus (HPV) infection is central to cervical carcinogenesis.

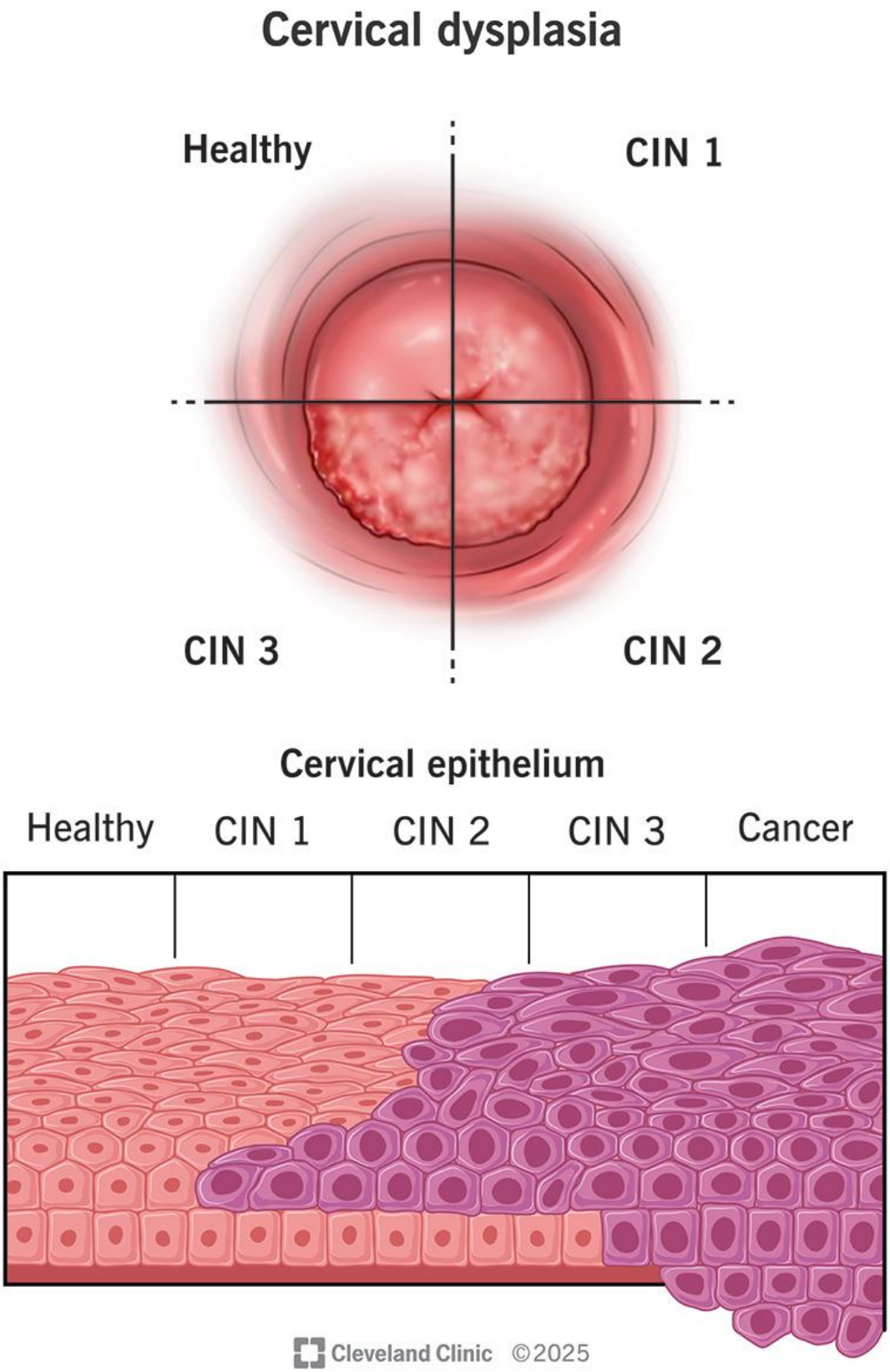
- HPV-16 and HPV-18 alone contribute to approximately **70% of invasive cervical cancers** (2).
- Persistent high-risk HPV infection is associated with CIN II+, HSIL, and progression to invasive carcinoma.

Pap smear cytology has long been used for screening; however:

- It has **moderate sensitivity** and can miss early lesions (3).
- HPV testing has **higher sensitivity and negative predictive value**, making it a strong adjunct to cytology (4).

Given the rising burden of cervical precancer in India, assessing HPV-16/18 distribution alongside cytological abnormalities is essential.




Cervical dysplasia
Healthy
CIN 1
CIN 3
CIN 2
Cervical epithelium
Healthy
CIN 1
CIN 2
CIN 3
Cancer
Cleveland Clinic ©2025

This study evaluates the pattern of cytological abnormalities and correlates them with high-risk HPV positivity among women attending a tertiary-care hospital in Agra.

MATERIALS AND METHODS

Study Design: Cross-sectional observational study.

Study Setting and Duration: Departments of Obstetrics & Gynaecology and Pathology, **S. N. Medical College, Agra**, from **October 2023 to September 2025**.

Sample Size: 110 sexually active women aged 18–49 years.

Inclusion Criteria:

- Sexually active women
- No prior cervical cancer treatment
- Provided informed consent

Exclusion Criteria:

- Post-hysterectomy
- Previously diagnosed malignancy
- Inadequate cytology sample

Procedures:

1. Pap smear was collected and reported according to the **Bethesda System** (6).
2. Cervical swabs were stored at –20°C and transported for HPV-16/18 DNA PCR.
3. Detailed demographic, reproductive, and sexual history was obtained.
4. Clinical symptoms and cervical findings were recorded during examination.

Statistical Analysis: Chi-square test/Fisher's exact test; $p<0.05$ considered significant. Prevalence ratios were calculated to assess association between HPV and cytology severity.

RESULTS

Table 1. Distribution of Cases by Pap Smear Findings

Category	n (%)
NILM	47 (42.7)
ASC-US	21 (19.0)
ASC-H	4 (3.6)
LSIL	24 (21.8)
HSIL	14 (12.7)
Total	**110 (100)**

Table 2. Age, Socioeconomic Status & Barrier Contraception vs Cytology

Variable	NILM	ASC-US	ASC-H	LSIL	HSIL
Age ≤30 (n=40)	17	10	1	10	2
Age >30 (n=70)	30	11	3	14	12
Lower SES (n=79)	32	16	3	16	12
Barrier use (n=18)	7	5	0	5	1

Table 3. High-Risk Factors vs Cytology

Risk Factor	NILM	ASC-US	ASC-H	LSIL	HSIL
Parity ≥3	28	10	2	11	8
Sexual debut <19 yrs	19	8	1	12	7
RTI/STD history	40	16	3	18	13

Table 4. Symptoms vs Cytology

Symptoms	NILM	ASC-US	ASC-H	LSIL	HSIL
No complaints	2	0	0	0	0
Vaginal discharge	42	18	3	21	13
Post-coital bleeding	1	1	1	1	2
Lower abdominal pain	38	13	2	19	12

Table 5. Cervical Morphology vs Cytology

Finding	NILM	ASC-US	ASC-H	LSIL	HSIL
Congestion	40	10	3	20	12
Erosion	29	8	2	14	8
Hypertrophy	34	17	3	19	11

Table 6. High-Risk HPV Detection vs Cytology

HPV Status	NILM	ASC-US	ASC-H	LSIL	HSIL
HPV negative	40	15	1	5	0
HPV positive	7	6	3	19	14
HPV-16	0	1	2	1	8
HPV-18	0	0	0	0	2

Strongest association: HSIL with HPV-16/18 (Prevalence ratio = **3.1**)

DISCUSSION

This study demonstrates a significant correlation between high-risk HPV infection and progressive cervical dysplasia in women attending a tertiary-care centre in Agra. Similar to global data, NILM constituted the largest group (1,3), while HSIL accounted for 12.7%—higher than several population-based reports, likely due to symptomatic OPD-based sampling.

High-risk HPV 16/18 detection increased proportionally with severity of cytology:

- Minimal in NILM
- Mild in ASC-US
- Moderate in LSIL
- **Highest in HSIL**

This is consistent with global observations that HPV-16 is the most oncogenic genotype with rapid progr-

ession to CIN II/III (2,4,7).

Important associations noted:

- Women >30 years showed higher HSIL, aligning with age-related persistence.
- Early sexual debut and RTI/STD history increased dysplasia risk, similar to other Indian and international studies (8,9).
- High parity is known to promote cervical metaplasia, increasing susceptibility to HPV-induced oncogenesis.

Our data strongly supports combined Pap + HPV testing, especially in settings where single-test sensitivity may fail to detect high-grade lesions early. HPV-negative women can safely extend screening intervals—a strategy also endorsed by global cancer-prevention programs (1,4).

CONCLUSION

High-risk HPV 16/18 infection displays a clear, stepwise association with abnormalities on cervical cytology, with maximum positivity among HSIL cases. Co-testing using Pap smear and HPV DNA significantly enhances early detection, risk stratification, and cancer prevention. Implementing HPV-based screening in tertiary-care centres like SNMC Agra can reduce cervical cancer morbidity and improve long-term outcomes.

REFERENCES

1. **World Health Organization**. Human papillomavirus (HPV) and cervical cancer. WHO; 2018.
2. Chan CK, Aimagambetova G, Ukybassova T, et al. Human papillomavirus infection and cervical cancer: epidemiology, screening and vaccination. *J Oncol*. 2019;2019:3257939.
3. Lilliecreutz C, Karlsson H, Spetz-Holm AC. Follow-up for non-attendees in cervical cancer screening. *PLoS One*. 2020;15(7):e0235202.
4. Demarco M, Hyun N, Carter-Pokras O, et al. Type-specific HPV natural history and implications for screening. *EClinicalMedicine*. 2020;22:100293.
5. SNMC Institutional Ethics Committee Records, 2019–2021.
6. Nayar R, Wilbur DC. The Bethesda System for reporting cervical cytology. *Acta Cytol*. 2017;61:359–72.
7. Franchina C, Muscarà G, Bonura F, et al. HPV distribution across cervical cytology abnormalities. *Eur J Gynaecol Oncol*. 2019;40(4):580–6.
8. Bitarafan F, Hekmat MR, Khodaeian M, et al. HPV genotype distribution among Iranian women. *Int J Infect Dis*. 2021;111:295–302.
9. ICO HPV Information Centre. HPV and cervical cancer statistics in India. 2007.