

## Clinicoepidemiological Profile of Anogenital Warts in Sexually Active Individuals Attending a Tertiary Care Centre in North India: A Cross-Sectional Study

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### ABSTRACT

**Background:** Anogenital warts (AGWs), caused predominantly by Human Papillomavirus (HPV) types 6 and 11, remain one of the most common viral sexually transmitted infections worldwide. Despite their substantial psychosocial and public health impact, limited data are available regarding their clinicoepidemiological profile in North India. **Objectives:** To assess the demographic, epidemiological, and clinical characteristics of patients presenting with anogenital warts and to evaluate their association with other sexually transmitted infections (STIs). **Materials and Methods** A hospital-based cross-sectional observational study was conducted in the Department of Dermatology, Venereology and Leprosy, LLRM Medical College, Meerut, Uttar Pradesh, from June 2024 to November 2025. Eighty-eight sexually active individuals aged 18–60 years with clinically diagnosed anogenital warts were enrolled. Demographic data, sexual behaviour characteristics, clinical findings, and laboratory investigations for associated STIs were collected using a structured questionnaire. Statistical analysis was performed using SPSS version 26.0. **Results:** The mean age of participants was  $32.56 \pm 10.38$  years. The majority belonged to the 21–30-year age group (43.2%). Males constituted 54.5% of cases. Most participants reported vaginal intercourse (65.9%), while 72.7% had a history of unprotected sexual intercourse. The mean age of coitarche was  $23.15 \pm 2.48$  years. Cauliflower-like lesions were the predominant morphology (63.6%). The penile shaft was the most commonly involved site in males, whereas the labia majora was the most frequent site in females. Concomitant STIs were identified in 56.8% of patients, with vaginal candidiasis (17%), HIV infection (14.8%), and hepatitis C infection (12.5%) being the most common. Significant associations were observed between unprotected intercourse and HIV infection ( $p=0.041$ ) and between condom use and history of STIs ( $p=0.032$ ). **Conclusion:** Anogenital warts predominantly affect young sexually active adults and are strongly associated with unsafe sexual practices and coexisting STIs. Enhanced sexual health education, routine STI screening, partner evaluation, and HPV vaccination are essential to reduce disease burden.

**Keywords:** Anogenital warts; Human papillomavirus; Sexually transmitted infections; HIV; Epidemiology; Condyloma acuminata

## INTRODUCTION

Human papillomavirus (HPV) infection is among the most prevalent sexually transmitted infections worldwide. More than 200 HPV genotypes have been identified, of which approximately 40 infect the anogenital tract. Low-risk HPV types 6 and 11 account for nearly 90% of anogenital wart cases, whereas high-risk types such as HPV 16 and 18 are associated with anogenital malignancies and premalignant lesions.<sup>1-3</sup>

Anogenital warts (AGWs), also known as condyloma acuminata, are benign proliferative lesions affecting the genital and perianal regions. Although benign in nature, they pose a considerable public health challenge because of their high infectivity, frequent recurrence, psychosocial consequences, and association with high-risk sexual behaviour. Patients commonly experience anxiety, embarrassment, impaired sexual relationships, and reduced quality of life.<sup>4-6</sup>

Globally, genital HPV infection affects a substantial proportion of sexually active individuals. Recent meta-analyses have demonstrated a high prevalence of genital HPV infection, particularly among young adults and high-risk populations. In India, reported prevalence rates vary considerably due to differences in study settings, populations, and diagnostic methods. AGWs are particularly common among sexually active young adults, men who have sex with men (MSM), individuals with multiple sexual partners, and immunocompromised populations including people living with HIV.<sup>7-10</sup>

Several behavioural factors including early age of sexual debut, multiple sexual partners, inconsistent condom use, smoking, and previous sexually transmitted infections contribute to HPV acquisition and persistence. Furthermore, AGWs frequently coexist with other sexually transmitted infections, making them important markers of high-risk sexual behaviour and highlighting the need for comprehensive STI screening.<sup>11-13</sup>

Although AGWs are commonly encountered in sexually transmitted infection clinics across India, published literature from North India remains limited. Most available studies have focused on prevalence estimates or treatment modalities, while comprehensive evaluations of demographic characteristics, sexual behaviour patterns, lesion morphology, and associated sexually transmitted infections remain scarce. Therefore, the present study was undertaken to evaluate the clinicoepidemiological profile of patients with anogenital warts presenting to a tertiary care teaching hospital in North India and to assess their association with other sexually transmitted infections.

## MATERIALS AND METHODS

### Study Design and Setting

This hospital-based cross-sectional observational study was conducted in the Department of Dermatology, Venereology and Leprosy, SVBP Hospital, LLRM Medical College, Meerut, Uttar Pradesh, over a period of 18 months from June 2024 to November 2025.

### Study Population

The study included sexually active males and females aged 18–60 years presenting with clinically diagnosed anogenital warts.

### Inclusion Criteria

- Age between 18 and 60 years.
- Sexually active individuals.
- Clinically diagnosed cases of anogenital warts.
- Individuals willing to provide written informed consent.

### Exclusion Criteria

- Age below 18 years or above 60 years.
- Presence of non-genital cutaneous warts.
- Refusal to participate or provide consent.

### Sample Size

The sample size was calculated using the formula:

$$n = Z^2pq/d^2$$

Considering an expected prevalence of 1.9%, a confidence level of 95%, and a margin of error of 3%, the minimum sample size calculated was 80 participants. A total of 88 patients were ultimately enrolled through convenient sampling.

### Data Collection

A structured questionnaire was administered to collect information regarding:

- Sociodemographic characteristics
- Sexual behaviour
- Age at first sexual intercourse
- Number of sexual partners
- Sexual orientation
- Condom use
- History of STIs
- Clinical characteristics of lesions

Detailed clinical examination was performed in all patients.

Laboratory investigations included:

- HIV serology
- VDRL
- HBsAg
- Anti-HCV testing

Patients were screened for associated sexually transmitted infections according to standard institutional protocols.

### Statistical Analysis

Data were entered into Microsoft Excel and analysed using SPSS version 26.0. Continuous variables were

expressed as mean  $\pm$  standard deviation. Categorical variables were expressed as frequencies and percentages. Chi-square test and Fisher's exact test were used to assess associations between categorical variables. A p-value  $<0.05$  was considered statistically significant.

## RESULTS

### Demographic Characteristics

A total of 88 patients with anogenital warts were included.

The mean age of participants was  $32.56 \pm 10.38$  years. Most patients belonged to the 21–30-year age group (43.2%), followed by the 31–40-year age group (26.1%). Males constituted 54.5% (n=48) and females 45.5% (n=40). Urban residents represented 59.1% of participants. Most participants had primary education (31.8%) and were married (46.6%).

**Table 1. Demographic profile of study participants (n=88)**

| Variable          | Frequency | Percentage |
|-------------------|-----------|------------|
| Age 21–30 years   | 38        | 43.2       |
| Male sex          | 48        | 54.5       |
| Urban residence   | 52        | 59.1       |
| Married           | 41        | 46.6       |
| Primary education | 28        | 31.8       |

### Sexual Behaviour Characteristics

The mean age of coitarche was  $23.15 \pm 2.48$  years. Most participants (58.0%) reported a single sexual partner, while 42.0% reported multiple sexual partners. Heterosexual orientation was observed in 81.8%, homosexual orientation in 12.5%, and bisexual orientation in 5.7%.

Vaginal intercourse was the most common sexual practice (65.9%). Unprotected sexual intercourse was reported by 72.7% of participants, whereas 25% reported contact with commercial sex workers. Nearly half of the patients (47.7%) reported partners with similar lesions.

**Table 2. Sexual behaviour characteristics**

| Variable                     | Frequency (%) |
|------------------------------|---------------|
| Single sexual partner        | 58.0          |
| Multiple sexual partners     | 42.0          |
| Heterosexual orientation     | 81.8          |
| Homosexual orientation       | 12.5          |
| Bisexual orientation         | 5.7           |
| Unprotected intercourse      | 72.7          |
| CSW contact                  | 25.0          |
| Partner with similar lesions | 47.7          |

### Clinical Characteristics

Cauliflower-like lesions constituted the most common morphology (63.6%), followed by papular lesions (27.3%) and flat-topped lesions (9.1%). Papillomatous surface morphology was observed in 62.5% of patients.

The mean number of lesions was  $12.85 \pm 7.44$ , while the mean duration of lesions was  $4.08 \pm 2.28$  months. A significant positive correlation was observed between lesion duration and lesion number ( $r=0.42$ ,  $p=0.003$ ).

**Table 3. Clinical profile of anogenital warts**

| Variable               | Value                  |
|------------------------|------------------------|
| Cauliflower morphology | 63.6%                  |
| Papular lesions        | 27.3%                  |
| Flat lesions           | 9.1%                   |
| Papillomatous surface  | 62.5%                  |
| Mean lesion number     | $12.85 \pm 7.44$       |
| Mean duration          | $4.08 \pm 2.28$ months |

Among males, the penile shaft was the most commonly affected site (37.5%), followed by the glans penis and prepuce. Among females, the labia majora was most frequently involved (35%), followed by the labia minora and vagina.

### Associated STIs

Concomitant STIs were identified in 56.8% of patients.

The most common associated infections were:

- Vaginal candidiasis – 17%
- HIV infection – 14.8%
- Hepatitis C infection – 12.5%

A statistically significant association was observed between unprotected sexual intercourse and HIV infection ( $p=0.041$ ). Additionally, inconsistent condom use demonstrated a significant association with history of STIs ( $p=0.032$ ).

**Table 4. Associated sexually transmitted infections**

| STI                   | Frequency (%) |
|-----------------------|---------------|
| Vaginal candidiasis   | 17.0          |
| HIV infection         | 14.8          |
| Hepatitis C infection | 12.5          |
| Any STI               | 56.8          |

## DISCUSSION

The present study evaluated the clinicoepidemiological characteristics of 88 patients with anogenital warts attending a tertiary care centre in North India. The majority of participants belonged to the 21–30-year age group, consistent with the epidemiology of HPV infection worldwide. Young adulthood represents the period of highest sexual activity and increased exposure to HPV infection. Similar findings have been reported by several Indian and international studies.<sup>14–16</sup>

A slight male predominance was observed. Previous studies have also documented a greater proportion of male patients attending STI clinics. Sociocultural barriers, stigma, and lower healthcare-seeking behaviour among women may partially explain this observation.<sup>17–18</sup>

The mean age of coitarche was 23.15 years. Although relatively higher than values reported in some Western populations, a substantial proportion of participants reported multiple sexual partners and high-risk sexual practices. Unprotected intercourse was reported by nearly three-fourths of patients, highlighting its critical role in HPV transmission and persistence.<sup>19–21</sup>

The predominance of cauliflower-like lesions observed in the present study is consistent with the classical clinical description of condyloma acuminata. Similarly, the penile shaft and labia majora were the most common anatomical sites involved among males and females, respectively, which agrees with previous reports. These sites are particularly susceptible to frictional microtrauma during sexual activity, facilitating viral inoculation.<sup>22–24</sup>

One of the most important findings of the present study was the high prevalence of associated STIs. More than half of the participants had concomitant infections. HIV infection was identified in 14.8% of

patients, emphasizing the close relationship between HPV infection and immunosuppression. The significant association between unprotected intercourse and HIV infection further highlights the importance of safe sexual practices.<sup>25–28</sup>

The study findings underscore the need for comprehensive STI screening among patients presenting with AGWs. Such individuals represent a high-risk population and may benefit from integrated sexual health services, partner notification programmes, targeted counselling interventions, and HPV vaccination programmes.<sup>29–32</sup>

### Strengths of the Study

- Comprehensive assessment of demographic, behavioural, and clinical factors.
- Inclusion of laboratory screening for major sexually transmitted infections.
- Representation of real-world tertiary care STI clinic data from North India.

### Limitations

- Single-centre study.
- Hospital-based design limits generalizability.
- Relatively small sample size.
- HPV genotyping was not performed.
- Long-term recurrence and treatment outcomes were not assessed.

### Future Directions

Future studies should include larger, multicentre cohorts involving diverse populations from different regions of India to improve the generalizability of findings. Prospective longitudinal studies are warranted to evaluate treatment response, recurrence rates, and long-term clinical outcomes of anogenital

warts. Incorporation of HPV DNA testing and genotype-specific analysis would help determine the distribution of low-risk and high-risk HPV types and their relationship with clinical morphology and disease severity. Further research should also evaluate the effectiveness of HPV vaccination, comprehensive STI screening, partner management, and targeted sexual health education in reducing the incidence and recurrence of anogenital warts. Such studies may provide evidence for strengthening integrated STI prevention and management strategies in India.

## CONCLUSION

Anogenital warts predominantly affect young sexually active adults and remain closely associated with high-risk sexual behaviour and concomitant sexually transmitted infections. The high prevalence of unprotected intercourse and coexisting HIV infection observed in the present study highlights the need for strengthened sexual health education, routine STI screening, partner evaluation, and wider implementation of HPV vaccination programmes. Early diagnosis and integrated management strategies can substantially reduce disease burden and improve sexual health outcomes.

## DECLARATIONS

### Ethical Approval and Consent to Participate

The study was conducted in accordance with the ethical principles for research involving human participants. Ethical approval was obtained from the Institutional Ethics Committee of Lala Lajpat Rai Memorial Medical College, Meerut, Uttar Pradesh, India, prior to commencement of the study. Written informed consent was obtained from all participants before enrolment.

### Consent for Publication

Written informed consent was obtained from the participants for publication of the study findings. No individually identifiable information is presented in this manuscript.

### Competing Interests

The authors declare that they have no competing interests.

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### Authors' Contributions

All authors contributed to the conception and design of the study, data collection, analysis and interpretation of the findings, manuscript preparation, and critical revision of the manuscript. All authors approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

## Data Availability

The datasets generated and/or analysed during the current study are not publicly available because they contain potentially sensitive participant information but may be made available from the corresponding author on reasonable request, subject to appropriate ethical and institutional restrictions.

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## AI Use Disclosure

The authors declare that no generative artificial intelligence tools were used to generate or substantially modify the scientific content of this manuscript.

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