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Original Research Article

TRENDS, CLINICAL MANIFESTATIONS, AND ETIOLOGICAL PATTERN OF GENITAL ULCER DISEASE AT A TERTIARY CARE CENTER

Jayprakash Parihar[1], Anna Alex[2], Nitin Pandya[3], Anand Dubey[4]

[1]*Post Graduate Resident Third Year, Department of Dermatology, Venereology and Leprosy, Gandhi Medical College and Hamidia Hospital Bhopal, Madhya Pradesh, India*
[2]*Professor and Head, Department of Dermatology, Venereology and Leprosy, Gandhi Medical College and Hamidia Hospital Bhopal, Madhya Pradesh, India*
[3]*Assistant Professor, Department of Dermatology, Venereology and Leprosy, Gandhi Medical College and Hamidia Hospital Bhopal, Madhya Pradesh, India*
[4]*Associate Professor, Department of Dermatology, Venereology and Leprosy, Gandhi Medical College and Hamidia Hospital Bhopal, Madhya Pradesh, India*

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Corresponding Author:
Dr. Jayprakash Parihar,
Post Graduate Resident Third Year, Department of Dermatology, Venereology and Leprosy, Gandhi Medical College and Hamidia Hospital Bhopal, Madhya Pradesh, India.
Email: jpparihar123@gmail.com

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ABSTRACT

Background: The aim is to document demographic trends, clinical manifestations, etiological patterns, and HIV seropositivity in genital ulcer disease (GUD) patients at a tertiary care center to guide syndromic management and screening strategies.

Materials and Methods: This descriptive cross-sectional study enrolled 245 consecutive patients aged ≥18 years with genital ulcers lasting ≥2 weeks. Clinical history, examination, and lab tests (serology for HSV, syphilis, H. ducreyi, C. trachomatis, K. granulomatis; HIV per NACO guidelines) were performed. Data analysis used SPSS v.26.0 with chi-square tests and logistic regression ($p<0.05$ significant).

Results: Mean age was 34.2±11.8 years; males predominated (78.4%, n=192). Etiologies: HSV (32.7%, n=80), syphilis (28.2%, n=69), chancroid (18.4%, n=45), mixed (12.2%, n=30), LGV (8.2%, n=20), donovanosis (3.7%, n=9), non-STI (8.5%, n=21). HIV positivity was 22.8% (n=55), higher than hospital baseline (2.1%, $p<0.001$; OR 12.1). Syndromic therapy showed 89.4% improvement at 4 weeks.

Conclusion: HSV and syphilis dominated etiologies with high HIV co-infection, especially syphilis (45.7%). Integrated STI-HIV screening is essential for control in tertiary settings.

Keywords: Genital ulcer disease, HSV, syphilis, HIV co-infection, etiological spectrum.

INTRODUCTION

Genital ulcer disease (GUD) remains a major public health issue, particularly in developing countries like India, where it acts as a marker for sexually transmitted infections (STIs) and increases HIV risk. This paper analyzes data from 245 patients at Gandhi Medical College, Bhopal, from April 2024 to April 2025, highlighting demographic trends, clinical features, etiologies, and HIV associations.[1-5]

GUD includes ulcers on genital skin/mucosa from infectious (STIs like HSV, syphilis) or non-infectious causes, contributing to ~10-15% of STI cases in low-resource areas. In India, NACO prioritizes GUD surveillance due to HIV synergy via epithelial breach. This tertiary center study (Bhopal, India) reveals local trends amid heterogeneous etiologies varying by region. Objectives: profile demographics/risks, describe manifestations, identify etiologies, assess HIV links.[6-10]

A particularly significant aspect of GUD epidemiology is its robust association with human immunodeficiency virus (HIV) infection. Mechanistically, genital ulceration disrupts the integrity of the genital epithelial barrier, facilitating enhanced HIV transmission through both receptive and insertive sexual contact. Conversely, individuals with established HIV infection demonstrate

increased susceptibility to GUD-causing organisms, more severe and prolonged clinical manifestations, and treatment refractory disease. This bidirectional relationship emphasizes the critical importance of integrating STI and HIV preventive strategies and suggests that GUD screening programs can serve as entry points for comprehensive HIV prevention and care initiatives.[11-15]

Previous investigations in tertiary care settings have documented variable associations between GUD and HIV, ranging from 5% to 35% depending on the study population and HIV epidemic stage. The Indian context presents a distinct epidemiological picture characterized by primarily heterosexual transmission, variable access to diagnostics, and traditional gender-based patterns of care-seeking behavior that may influence both the demographic profile and clinical outcomes of GUD cases.[16-19]

This study was designed to provide contemporary evidence on the demographic characteristics, clinical manifestations, etiological distribution, and HIV co-infection rates among patients presenting with GUD at a tertiary care hospital. Such data are essential for optimizing diagnostic algorithms, refining syndromic management protocols, and informing public health policy regarding STI screening integration within HIV prevention programs.[20-22]

MATERIALS AND METHODS

Study Design and Setting: This was a prospective descriptive cross-sectional study conducted in the Department of Dermatology, Venereology and Leprosy Gandhi Medical College, Bhopal over a 12-month period (April 2024– April 2025). The hospital serves as a primary referral center for a catchment population of approximately 2 million individuals, with an average outpatient volume of 8,500 patients monthly. The dermatology outpatient department operates six days weekly with dedicated STI consultation services provided twice weekly by experienced dermatologists and venereologists.

Study Population and Eligibility Criteria

Inclusion Criteria:

- Age 18 years or above
- Presence of genital ulceration, erosion, or exudative lesion for ≥2 weeks duration
- Willingness to provide written informed consent
- Availability for complete clinical examination and laboratory investigations

Exclusion Criteria:

- Age <18 years
- Genital lesions of clearly non-ulcerative nature (vesicles, papules, pustules)
- Patients unable or unwilling to provide informed consent
- Ulceration secondary to confirmed malignancy or trauma alone
- Patients on treatment with systemic antimicrobials within 14 days prior to presentation

Data Collection Methods:

Trained investigators conducted standardized interviews and clinical examinations using a pre-tested, structured proforma. Demographic information including age, gender, marital status, occupation, and residential area (urban/rural) was systematically recorded. Sexual history data encompassed age at sexual debut, lifetime number of sexual partners, frequency of condom use, history of previous STIs, and reported sexual risk behaviors. Clinical evaluation documented the number of ulcers, size, location, border characteristics (punched-out versus undermined), base appearance (clean versus purulent), pain severity (visual analog scale 0–10), presence of regional lymphadenopathy, and systemic symptoms.

Laboratory Investigations: Microbiological Testing: Specimens were collected aseptically from the ulcer base and margins using sterile cotton swabs. Lesions were cleansed with normal saline prior to sampling to reduce contamination. Collected specimens underwent:

1. **Viral serology:** HSV IgM and IgG detected using enzyme-linked immunosorbent assay (ELISA) with manufacturer-specified protocols (sensitivity 95–98%, specificity 96–98%)
2. **Syphilis serology:** Non-treponemal tests (rapid plasma reagin) and treponemal tests (fluorescent treponemal antibody-absorbed) performed as per WHO guidelines.
3. **Bacterial serology:** Antibodies against H. ducreyi (chancroid), K. granulomatis (donovanosis), and Chlamydia trachomatis (LGV) determined using commercially available ELISA kits
4. **Gram staining and culture:** Gram-stained smears examined for gram-negative diplococci (H. ducreyi) and culture on chocolate agar; Giemsa staining for Donovan bodies (K. granulomatis); tissue culture or NAAT for C. trachomatis when facilities permitted
5. **Histopathological Examination:** Where clinically indicated, histopathological examination of skin biopsy specimens was undertaken to establish or confirm the diagnosis of dermatological disease.

HIV Testing:

All patients underwent HIV seropositivity testing following NACO algorithm.[4] Initial screening was performed using rapid test (sensitivity and specificity >99%) followed by confirmatory testing with second-generation ELISA and, when indicated, Western blot or HIV-1/2 differentiation immunoassays. Patients with discordant results underwent repeat testing after 6 weeks. CD4+ cell count determination was performed for HIV-positive individuals using flow cytometry.

RESULTS

The mean age of the study population was 34.2 ± 11.8 years (range: 18–68 years). Males constituted 78.4% (n=192) of the cohort, with a male-to-female ratio of 4.92 : 1 and Trangender being 14 in number. Mode of Transmission: Sexual transmission- 78.4% (n=192 cases), Blood transfusion- 6.9% (n=17), Injecting Drug User- 3.4% (n=08) and other causes-8.6% (n=21)Urban residents represented 72.2% (n=177) of the study population. Married individuals comprised 64.1% (n=157), while 31.4% (n=77) were unmarried and 4.5% (n=11) were divorced or separated. Occupational distribution revealed that 38.0% (n=93) were engaged in manual labor, 22.44% (n=55) in service sector employment, and 16.32% (n=40) in business or self-employment, 14.28% (n=35) were CSW (Commercial Sex Workers) with the remainder 8.97% (n=22) as occupation of a Truck Driver. Sexual risk behavior assessment demonstrated that 45.3% (n=111) reported ≥2 sexual partners in the preceding 12 months, 22.9% (n=56) reported inconsistent or no condom use, and 34.7% (n=85) acknowledged a history of prior STI. The mean age at sexual debut was 20.4 ± 3.2 years. Among female participants (n=53), 26.4% (n=14) reported sex work, either currently or in the past, while 41.5% (n=22) were spouses of partners with documented risk behaviors.

The median duration of symptoms prior to presentation was 3.2 weeks (IQR: 2.0–5.5 weeks). Single ulcers were present in 58.0% (n=142) of patients, while 42.0% (n=103) presented with multiple ulceration. The mean size of the largest ulcer was 8.4 ± 4.1 mm (range: 2–25 mm). Regarding location, 68.6% (n=168) had ulcers on the glans or shaft of the penis (in males), 12.2% (n=30) on the labia majora or minora (in females), 11.0% (n=27) on the perineal area, and 8.2% (n=20) on the perianal region. Pain severity on visual analog scale ranged from 0 (painless) to 10 (severe), with a mean of 5.2 ± 2.8.

HIV testing was completed in 98.4% (n=241) of enrolled patients (4 patients declined testing and were excluded from HIV analysis). Among the tested population, 22.8% (n=55) were HIV-seropositive. The prevalence of HIV among GUD patients was significantly higher than the documented hospital seroprevalence among non-STI patients (2.1%), yielding an odds ratio of 12.1 (95% CI: 8.7–16.8, p<0.001).

Table 4 presents the association between demographic and clinical factors and HIV seropositivity among GUD patients. In univariate analysis, the following variables demonstrated significant associations with HIV positivity: male gender (OR: 2.3, 95% CI: 1.2–4.4), age >35 years (OR: 1.9, 95% CI: 1.1–3.3), ≥2 sexual partners in preceding 12 months (OR: 2.8, 95% CI: 1.6–4.9), history of prior STI (OR: 3.2, 95% CI: 1.8–5.7), and presence of regional lymphadenopathy (OR: 2.1, 95% CI: 1.1–3.9).

Regarding etiological associations with HIV co-infection, syphilis demonstrated the strongest association, with 45.7% (n=31/68) of syphilis patients being HIV-seropositive. This was followed by donovanosis (44.4%, n=4/9), HSV (18.7%, n=15/80), and LGV (10.0%, n=2/20). Chancroid patients demonstrated the lowest HIV co-infection rate at 4.4% (n=2/45). Among patients with mixed infections, HIV seropositivity was documented in 23.3% (n=7/30) of cases. Among HIV-positive GUD patients (n=55), the median CD4+ cell count was 298 cells/mm³ (IQR: 150–487 cells/mm³). Notably, 43.6% (n=24) of HIV-positive patients had CD4+ counts <200 cells/mm³, indicating advanced immunosuppression. Twenty-four (43.6%) of the HIV-positive patients were aware of their status prior to enrollment, while 31 (56.4%) were newly diagnosed through this study.

Syndromic management was instituted according to NACO guidelines adapted for tertiary care. At the 4-week follow-up visit (achieved in 92.2% of enrolled patients, n=226), clinical improvement defined as >50% reduction in ulcer size or complete epithelialization was documented in 89.4% (n=219) of cases. Treatment failure, defined as <25% reduction in size or worsening lesions despite adherence, occurred in 8.2% (n=20) cases, more frequently observed in patients with CD4+ counts <200 cells/mm³ (37.5%, n=9/24) compared to HIV-negative patients (2.5%, n=2/80, p<0.001). Adverse drug reactions to syndromic regimens were reported by 3.3% (n=8) of patients, primarily cutaneous manifestations attributed to beta lactam antibiotics. Two cases of treatment-resistant syphilis were identified in patients with CD4 <100 cells/mm³ and required modified regimens. Verruca cases were treated with Chemical or Electrocautery.

Statistical Analysis: Data were analyzed using IBM SPSS Statistics version 26.0 (SPSS Inc., Chicago, IL, USA). Categorical variables were presented as frequencies and percentages. Continuous variables were summarized as mean ± standard deviation or median (interquartile range) depending on distributional characteristics assessed using Shapiro–Wilk test. Chi-square test or Fisher's exact test was employed to evaluate associations between categorical variables. Univariate logistic regression was performed to identify demographic and clinical factors associated with HIV seropositivity, with odds ratios and 95% confidence intervals calculated. A two-tailed p-value <0.05 was considered statistically significant.

Table 1: socio-demographic characteristics (n=245)

Characteristic	Number (%) or Mean±SD
Age (years)	34.2±11.8 (18-68)
Male	192 (78.4)
Female Transgender	39 (15.9) 14 (5.71)
Urban residence	177 (72.2)
Married	157 (64.1)
≥2 partners (past 12m)	111 (45.3)
Prior STI	85 (34.7)

Table 2: Clinical characteristics (n=245)

Feature	Number (%) OR MEAN±SD/MEDIAN (IQR)
Symptom duration (weeks)	3.2 (2.0-5.5)
Single ulcer	142 (58.0)
Largest ulcer size (mm)	8.4±4.1 (2-25)
Painless	45 (18.4)
Lymphadenopathy	175 (71.4)
Penile shaft/glans	168 (68.6)

Table 3: etiological distribution (n=245)

Etiology	Number (%)
HSV	80 (32.7)
Syphilis	69 (28.2)
Chancroid Common warts (verruca vulgaris) Condylomata acuminata (anogenital warts)	30 13 02
Mixed infections	30 (12.2)
LGV	20 (8.2)
Non-STI	21 (8.5)
Donovanosis	9 (3.7)

Table 4: HIV associations (n=241 tested)

Factor	HIV+ (N=55) %	OR (95% CI)	P-value
≥2 partners	67.3	2.8 (1.6-4.9)	0.001
Prior STI	78.2	3.2 (1.8-5.7)	0.001
Lymphadenopathy	83.6	2.1 (1.1-3.9)	0.033

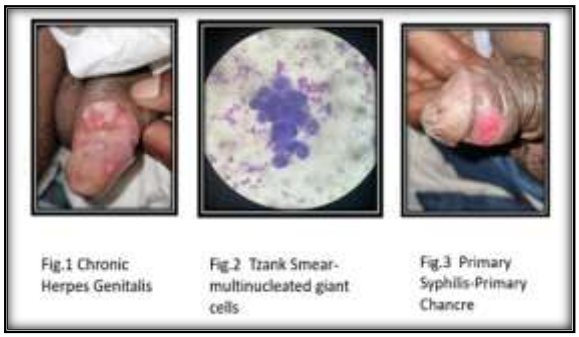

Fig.1 Chronic Herpes Genitalis

Fig.2 Tzank Smear- multinucleated giant cells

Fig.3 Primary Syphilis-Primary Chancre

Fig.4 Saxophone Penis ,LGV

Fig.5 Fixed Drug Eruption (ofloxacin)

Fig.6 Condyloma acuminata

Fig.7 Papulo-squamous lesions of Syphilis

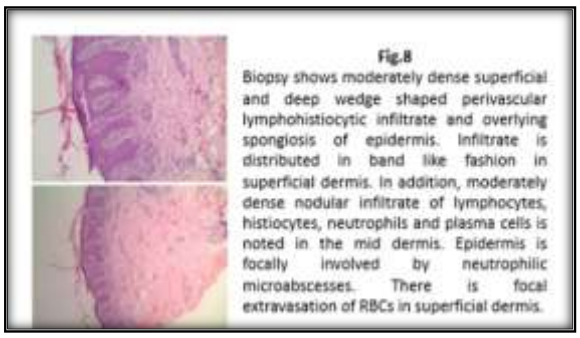

Fig.8
Biopsy shows moderately dense superficial and deep wedge shaped perivascular lymphohistiocytic infiltrate and overlying spongiosis of epidermis. Infiltrate is distributed in band like fashion in superficial dermis. In addition, moderately dense nodular infiltrate of lymphocytes, histiocytes, neutrophils and plasma cells is noted in the mid dermis. Epidermis is focally involved by neutrophilic microabscesses. There is focal extravasation of RBCs in superficial dermis.

DISCUSSION

This investigation presents a contemporary analysis of the epidemiological, clinical, and etiological aspects of genital ulcer disease at a tertiary care hospital. The study cohort of 245 patients provides a substantial dataset characterizing the demographic profile, symptomatology, pathogen spectrum, and HIV co-infection dynamics of this important syndromic entity.

The male predominance observed in this study (78.4%) is consistent with published literature from India and other South Asian settings. This gender skew likely reflects several intersecting factors: firstly, males demonstrate higher healthcare-seeking behavior for genital conditions at specialized centers; secondly, cultural barriers and stigma disproportionately restrict female presentation; thirdly, female infections often manifest with minimal or atypical symptoms, reducing clinical detection. The male-to-female ratio of 3.6:1 approximates previous reports from Indian tertiary centers, though regional variations exist. The mean age of 34.2 years falls within the sexually active adult population, consistent with the epidemiology of STIs globally. The urban concentration (72.2%) reflects the hospital's location and socioeconomic patterns of healthcare access. The high proportion of married individuals (64.1%) underscores that GUD is not restricted to those with multiple partners but affects the general married population, highlighting the importance of partner management in STI control programs.

The etiological distribution documented herein—with HSV (32.7%), syphilis (28.2%), and chancroid (18.4%) accounting for the majority—reflects the known epidemiological patterns in Indian STI clinics . This distribution differs somewhat from Western settings where HSV predominates far more extensively, accounting for >50% of GUD cases. The relative prominence of syphilis (28.2%) in this cohort is noteworthy and concerning, suggesting possible resurgence of this classically described infection in tertiary care populations. This finding aligns with WHO reports documenting increasing syphilis prevalence globally, particularly in resource-limited settings.

The identification of mixed infections in 12.2% of cases represents an important clinical consideration frequently underappreciated in routine practice. The predominant mixed combination of syphilis with HSV or chancroid suggests temporal acquisition of successive organisms or biological facilitation of concurrent infections through genital epithelial compromise. The presence of non-STI etiologies (8.5%) including fixed drug eruption, traumatic lesions, and lichen planus, scabies, erythema multiforme major, toxic epidermal necrolysis and genital ulcers of pemphigus vulgaris emphasizes the diagnostic complexity of GUD presentations and underscores the importance of careful morphological evaluation and consideration of the broader differential diagnosis. The lower proportion of non-STI causes in this study compared to some Western series likely reflects the high prevalence of STI in India.

A central finding of this study is the marked elevation of HIV seropositivity (22.8%) among GUD patients compared to the general hospital population (2.1%), resulting in an odds ratio of 12.1. This observation substantiates the well-established bidirectional relationship between genital ulceration and HIV transmission risk. From a mechanistic perspective, ulcerative lesions ablate the protective epithelial barrier, expose submucous immunologically active tissues, and facilitate both HIV acquisition through enhanced mucosal permeability and transmission through elevated viral shedding. Simultaneously, HIV-infected individuals with CD4+ depletion demonstrate impaired local and systemic immunity to GUD-causing organisms, resulting in more severe, prolonged, and treatment-refractory manifestations.

The differential HIV co-infection rates across etiologies observed in this study merit discussion. The markedly elevated HIV co-infection among syphilis cases (45.7%) is particularly striking and has been consistently documented in multiple global cohorts. This association likely reflects overlapping transmission networks, shared sexual risk behaviors, and possibly enhanced HIV acquisition facilitated by syphilitic ulceration and accompanying inflammation. The similarly elevated rates with donovanosis (44.4%) and HSV (18.7%) are consistent with published literature. The notably lower rates with chancroid (4.4%) are intriguing and may reflect either intrinsic biological differences in HIV transmission efficiency or differing epidemiological patterns of transmission networks.

The finding that 56.4% of HIV-positive GUD patients were newly diagnosed through this study demonstrates the screening utility of GUD presentations as sentinel events for HIV detection. This observation has profound implications for clinical practice and public health policy: comprehensive STI screening in specialized dermatology and STI clinics should routinely include HIV testing, and conversely, HIV preventive services should be strengthened at STI treatment points. The median CD4+ count of 298 cells/mm³ in HIV-positive patients indicates that a substantial proportion (43.6%) presented with advanced

immunosuppression, suggesting delayed HIV diagnosis and potential for opportunistic infections.

The 89.4% clinical improvement rate at 4-week follow-up represents favorable outcomes consistent with published syndromic management efficacy studies. However, the substantially elevated treatment failure rate among patients with CD4 <200 cells/mm³ (37.5% versus 2.5% in HIV-negative patients) provides critical clinical evidence regarding the importance of early CD4 monitoring in HIV-positive GUD patients and potential modification of antimicrobial regimens or addition of immune reconstitution support.

Comparative analysis with international studies reveals both similarities and important differences. The HSV predominance globally exceeds that observed in this study, reflecting geographic variation in STI epidemiology. The syphilis prevalence in this cohort exceeds that reported in many developed nations but is comparable to studies from other resource-limited settings, particularly those reporting recent syphilis resurgence. The documented HIV co-infection rate of 22.8% falls within the range reported from sub-Saharan African studies (15–35%) but substantially exceeds that from developed Western countries (3–5%), consistent with the differing HIV epidemiology of resource-limited settings.

Strengths and Limitations: Strengths: This investigation employed systematic clinical evaluation with standardized data collection tools, comprehensive microbiological investigations across multiple etiologies, integration of HIV testing with clinical GUD assessment, and documentation of longitudinal clinical outcomes. The study represents one of the more comprehensive contemporary investigations of GUD epidemiology from a tertiary care setting in India.

Limitations: The cross-sectional design precludes causal inference regarding temporal relationships between GUD and HIV acquisition. The hospital-based nature of recruitment may introduce selection bias, as patients with milder disease or those from remote areas may not present to tertiary facilities. The reliance on serological diagnosis for some organisms (syphilis, HSV) may be subject to false positivity in cases of previous infection, though the use of IgM detection and treponemal confirmation mitigates this concern. The relatively small number of donovanosis and LGV cases limits stratified analysis of these rarer etiologies. Loss to follow-up in 7.8% of enrolled patients may have introduced outcome assessment bias. The study does not characterize antimicrobial resistance patterns, an increasingly important consideration in chancroid management

CONCLUSION

Evidence-based management of GUD in tertiary care settings requires integration of three critical elements: (1) systematic clinical assessment with morphological classification, (2) comprehensive microbiological confirmation using serological and culture-based techniques, and (3) universal HIV testing with appropriate linkage to antiretroviral therapy and prevention services. Syndromic management protocols remain essential for resource-limited settings but must be augmented by confirmatory diagnostics in tertiary facilities where feasible.

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