

# Changing Epidemiological Patterns and High-Risk Sexual Behaviour among HIV-Syphilis Co-Infected Individuals: A Case Series from Chandauli District, Eastern Uttar Pradesh

Running title: High risk sexual behavior among HIV syphilis co infected individuals.

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## ABSTRACT

HIV–syphilis co-infection is facilitated by shared transmission routes and biological interactions, yet data from rural Eastern Uttar Pradesh remain limited. We retrospectively reviewed records of four individuals with confirmed co-infection from Chandauli district, focusing on clinical, behavioural, laboratory, treatment, and follow-up characteristics. Cases were detected through dental, community-based, and medical screening and showed varied clinical presentations. CD4 counts ranged from 170–286 cells/μL; hepatitis B co-infection, poor antiretroviral therapy adherence, and loss to follow-up were documented. The findings highlight the importance of opportunistic screening, partner services, inclusive sexual-health assessment, and sustained linkage to care in rural settings.

**Keywords:** HIV, Syphilis, High risk behaviour.

## INTRODUCTION

Human immunodeficiency virus (HIV) and syphilis continue to pose significant public health challenges worldwide because of their shared routes of transmission, bidirectional interaction, and association with high-risk sexual behaviour[1]. Syphilis facilitates both the acquisition and transmission of HIV by disrupting mucosal barriers and increasing local inflammatory responses, while HIV infection may alter the clinical course of syphilis, leading to atypical presentations, rapid progression, and delayed diagnosis. Consequently, individuals diagnosed with either infection should be routinely screened for the other to ensure timely diagnosis and comprehensive management [2-4]. Under NACO's Community-Based Screening (CBS) strategy, biannual HIV–syphilis screening is conducted using rapid dual test kits with pre- and post-test counselling. Reactive individuals are referred to Integrated Counselling and Testing Centres (ICTCs) for confirmation and subsequently linked to ART centres or appropriate STI treatment

services[5]. Despite sustained efforts by the National AIDS Control Organisation (NACO) to expand HIV prevention, counselling, testing, and treatment services, HIV-syphilis co-infection continues to pose a significant public health challenge in India, particularly among populations with ongoing behavioural risk factors and limited access to sexual health services[6].

Chandauli, a predominantly rural district bordering Bihar, experiences considerable population mobility, socioeconomic constraints, and variable access to healthcare services, all of which may influence the epidemiology of sexually transmitted infections. In addition, limited awareness, social stigma, and delayed healthcare-seeking behaviour may contribute to missed opportunities for early diagnosis, partner notification, and interruption of transmission. Understanding the behavioural and epidemiological characteristics of HIV-syphilis co-infection in such settings is therefore essential for strengthening targeted screening strategies, risk-reduction interventions, and linkage to

comprehensive HIV care. Although several studies have described the epidemiology of HIV-syphilis co-infection from metropolitan cities and tertiary care centres, published data from rural districts of Eastern Uttar Pradesh remain limited. To the best of our knowledge this is the first documented case series from Chandauli district demonstrating the changing epidemiology and diverse high-risk behaviours among newly diagnosed HIV-syphilis co-infected individuals detected through routine screening and community-based testing.

## METHODOLOGY

Clinical and epidemiological data were retrospectively collected from hospital records maintained at the Integrated Counselling and Testing Centres (ICTCs), Antiretroviral Therapy (ART) Centres, and Sexually Transmitted Infection (STI) clinics. Patient confidentiality and privacy were strictly maintained.

## CASE PRESENTATION

### **CASE 1: Opportunistic detection in a married woman without apparent high-risk behaviour**

A 35-year-old married homemaker presented to the dental outpatient department with persistent toothache. Clinical examination revealed dental caries, and she was advised root canal treatment. During routine pre-procedural screening, a rapid HIV–Syphilis combination test was reactive. She was referred to the Integrated Counselling and Testing Centre (ICTC), where HIV-1 infection was confirmed. Syphilis was confirmed by a reactive treponemal rapid test with a Rapid Plasma Reagin (RPR) titre of 1:64. On detailed history-taking, she reported intermittent low-grade fever, generalized weakness, and easy fatigability for approximately 2–3 weeks, which she had attributed to her dental condition and, consequently, had not sought medical evaluation for these symptoms. She described herself as being in a monogamous marital relationship. She had received education till primary school. She vehemently denied any history of multiple sexual partners, blood transfusion, intravenous drug use, tattooing, or previous sexually transmitted infections. She reported undergoing tubectomy at a private healthcare facility approximately one year earlier but was unable to provide procedural records. Physical examination revealed mild pallor, erythematous maculopapular lesions over both palms, suggestive of secondary syphilis, with no genital ulcer or other significant systemic abnormalities. Lab investigations (Table 2) revealed liver enzyme abnormalities which may be associated with fatty liver or syphilitic hepatitis. Her CD4 count was 245 cells/ $\mu$ L. As part of partner notification, her husband underwent counselling and testing and was also diagnosed with HIV-1 infection and syphilis. Despite detailed interviews, neither partner acknowledged recognized high-risk sexual behaviour, and the source of infection could not be established because of limited historical information and the absence of previous medical

throughout the study, and all data were handled in accordance with institutional ethical standards.

Testing for HIV infections at the ICTC centre were carried out according to National AIDS Control Organisation (NACO) HIV Testing Strategy III in all individuals [7]. All patients were linked to the ART Centre and initiated on standard first-line antiretroviral therapy with tenofovir–lamivudine–dolutegravir (TLD), in accordance with NACO recommendations. Syphilis was treated with benzathine penicillin G according to the stage of disease after excluding penicillin allergy. Pre- and post-test counselling, partner notification, risk-reduction counselling, and linkage to follow-up services were provided to all patients. Baseline laboratory investigations (Table 2) and screening for common co-infections were performed as clinically indicated.

records. Standard treatment protocols were followed for both the individuals. They were counselled regarding treatment adherence, partner management, and safer sexual practices and remained under regular follow-up.

This case highlights HIV–syphilis co-infection as a clinically silent and easily overlooked condition, with nonspecific symptoms being attributed to a more apparent local complaint, resulting in delayed healthcare seeking. It underscores the importance of opportunistic screening and maintaining a high index of suspicion for hidden infections in routine clinical settings.

### **CASE 2: Community-based diagnosis in a rural farmer with multiple sexual exposures**

A 37-year-old married male farmer tested positive on HIV-syphilis rapid dual test kit during a routine community screening camp. The presence of intermittent fever, generalized weakness, easy fatigability and intermittent painful oral ulcers encouraged him to visit the health camp. He was referred to the Integrated Counselling and Testing Centre (ICTC). He had received primary school education, and reported regular alcohol consumption but denied smoking, intravenous drug use, blood transfusion, tattooing, or previous surgery. A detailed sexual history revealed multiple unprotected heterosexual contacts over several years, in addition to regular sexual intercourse with his spouse. The patient also admitted to a limited history of consensual homosexual encounters on a few occasions in the past. He admitted to never using barrier contraceptive methods in any of the encounters. His spouse had not undergone prior HIV or sexually transmitted infection (STI) screening. On examination, the patient was cachectic with mild pallor and bilateral cervical lymphadenopathy. Multiple painful oral ulcers and a solitary, indurated, painless penile ulcer consistent with a syphilitic chancre were noted. Mild hepatomegaly

was noted. No other significant cutaneous lesions or systemic abnormalities were identified. At the ICTC, HIV-1 infection was confirmed, while syphilis was established by a reactive treponemal rapid test and RPR titre of 1:32. Baseline investigations (Table 2) revealed mild eosinophilia and elevated transaminases with alkaline phosphatase, suggestive of hepatic injury, possibly associated with regular alcohol consumption. The baseline CD4+ T-lymphocyte count was 286 cells/ $\mu$ L. The patient was initiated on standard treatment protocol for HIV & syphilis. He was counselled regarding ART adherence, consistent condom use, partner notification, and screening of family members. At one-month follow-up, the patient reported complete healing of the oral ulcers, improvement in generalized weakness, and good adherence to ART. He remained under regular follow-up at the ART Centre.

This case underscores the role of multiple heterosexual partnerships, inconsistent condom use, delayed partner screening, and limited awareness of STI prevention in facilitating HIV–syphilis co-infection. It highlights how unrecognized sexual risk and delayed testing can sustain transmission within rural communities, emphasizing the need for timely screening, counselling, and partner notification.

### **CASE 3: HIV–syphilis co-infection in a transgender woman with delayed healthcare seeking behaviour**

A 45-year-old transgender woman presented to the Medicine Outpatient Department with recurrent non-bloody diarrhoea, intermittent fever, generalized weakness, loss of appetite, and significant weight loss for 2–3 weeks. She was living in a destitute condition with limited social support. She consumed alcohol regularly but denied smoking, intravenous drug use, blood transfusion, or previous surgery. On further, detailed history taking revealed high-risk behaviours. The patient reported a history of multiple sexual encounters with other men a current partner aged 24 years. She admitted to never using barrier protection, and her partner had never undergone screening for HIV or other sexually transmitted infections and was not amenable to further testing. On examination, she was cachectic, poorly nourished, and had pallor and icterus. Bilateral cervical and inguinal lymphadenopathy, right upper quadrant tenderness, and ulcerative palmar lesions suggestive of secondary syphilis were noted. Other systemic examination findings were unremarkable. At the Integrated Counselling and Testing Centre (ICTC), HIV-1 infection was confirmed. Syphilis testing showed a reactive treponemal rapid test with an RPR titre of 1:128. Further screening also revealed HBsAg positivity, while hepatitis C virus serology was non-reactive. There is a relative discordance between the patient's clinically significant HIV–syphilis–HBV co-infection and the largely preserved laboratory profile (Table 2), with normal haemoglobin, leukocyte count,

transaminases, bilirubin, albumin, and renal function. Mild eosinophilia and borderline thrombocytopenia were the only notable haematological abnormalities, despite the underlying multiple infections. Her baseline CD4+ T-lymphocyte count was 280 cells/ $\mu$ L. The patient was counselled and initiated on standard treatment protocol. Despite repeated counselling, she declined treatment for syphilis and hepatitis B virus infection and demonstrated poor adherence to ART, discontinuing therapy after approximately three weeks. She subsequently defaulted from care and was lost to follow-up despite repeated attempts at contact.

This case highlights the coexistence of multiple behavioural (MSM activity, multiple sexual partners, inconsistent condom use), social (destitution), and healthcare-related (poor treatment adherence and loss to follow-up) risk factors contributing to HIV–syphilis co-infection in a vulnerable key population.

### **CASE 4: Advanced HIV–syphilis co-infection associated with poor ART adherence**

A 41-year-old unmarried male daily-wage labourer presented to a community health camp with complaints of progressive weight loss, generalized weakness, severe nocturnal pruritus, and painful oral ulcers of one month's duration. He also reported intermittent abdominal discomfort for six months and reduced appetite. The patient worked predominantly in the city and returned intermittently to his native village, which contributed to irregular healthcare access and follow up. The patient had been diagnosed with HIV-1 infection a few months earlier during a community screening programme and had been initiated on antiretroviral therapy (ART) at a urban healthcare centre. However, he admitted to poor adherence to ART and irregular follow-up, attributing this to occupational commitments and inadequate understanding of the importance of lifelong treatment. The individual denied any history of blood transfusion or intravenous drug use. However, he reported multiple unprotected heterosexual encounters with different partners, including commercial sex workers, and acknowledged never using barrier contraceptive methods, even after his HIV diagnosis. On examination, the patient appeared thinly built and poorly nourished, with clinically evident pallor. He was conscious, oriented, and cooperative, with stable vital signs. Multiple excoriated papules and burrows were noted over the interdigital spaces and other characteristic sites, clinically suggestive of scabies; no laboratory confirmation was performed. Oral examination revealed painful ulcerative lesions over the oral mucosa. Genital examination revealed a solitary, painless, indurated penile ulcer with well-defined margins, clinically suggestive of a syphilitic chancre. Regional inguinal lymphadenopathy was noted. There was no icterus. Abdominal examination did not reveal any clinically significant hepatosplenomegaly. The remainder of the systemic

examination was unremarkable. Laboratory investigations revealed moderate anaemia (haemoglobin 8.4 g/dL) with predominantly cholestatic/mixed hepatic biochemical abnormalities (elevated ALP with mild transaminitis) and reduced serum albumin. (Table 2) Syphilis serology showed a reactive treponemal rapid test with an RPR titre of 1:64. His baseline CD4+ T-lymphocyte count was 170

cells/ $\mu$ L, indicating advanced immunosuppression. The patient was treated following standard treatment protocol. At follow-up, he demonstrated improved adherence to ART, complete resolution of pruritus and genital lesions, improvement in appetite and weight, and remained under regular follow-up at the ART Centre till the time of case documentation.

**Table 1: Comprehensive clinical, epidemiological and behavioural summary of the four cases**

| Variable                                               | Case 1                                                                                           | Case 2                                                                              | Case 3                                                                                                           | Case 4                                                                                                          |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Age(years)                                             | 35                                                                                               | 37                                                                                  | 45                                                                                                               | 41                                                                                                              |
| Gender                                                 | Female                                                                                           | Male                                                                                | Transgender                                                                                                      | Male                                                                                                            |
| Occupation                                             | Homemaker                                                                                        | Farmer                                                                              | Unemployed                                                                                                       | Labourer                                                                                                        |
| Education                                              | Primary school                                                                                   | Primary school                                                                      | Illiterate                                                                                                       | Primary school                                                                                                  |
| Rural/Urban                                            | Rural                                                                                            | Rural                                                                               | Rural                                                                                                            | Rural                                                                                                           |
| Marital status                                         | Married                                                                                          | Married                                                                             | Unmarried                                                                                                        | Unmarried                                                                                                       |
| Social and behavioural factors                         | Monogamous marital relationship                                                                  | Regular alcohol consumption                                                         | Destitute condition with limited social support; regular alcohol consumption                                     | Occupational mobility between city and native village                                                           |
| Mode of detection                                      | Dental outpatient department during routine pre-procedural screening before root canal treatment | Routine community-based HIV–syphilis screening camp                                 | Medicine outpatient department followed by ICTC evaluation                                                       | Community health camp                                                                                           |
| Reason for healthcare visit                            | Persistent toothache due to dental caries                                                        | Intermittent fever, weakness, easy fatigability and painful oral ulcers             | Recurrent non-bloody diarrhoea, intermittent fever, weakness, anorexia and significant weight loss               | Progressive weight loss, generalized weakness, severe nocturnal pruritus and painful oral ulcers                |
| Duration of presenting symptoms                        | Low-grade fever, weakness and easy fatigability for approximately 2–3 weeks                      | Intermittent fever, weakness, fatigue and oral ulcers; exact duration not specified | Approximately 2–3 weeks                                                                                          | Approximately 1 month for major presenting symptoms; intermittent abdominal discomfort for 6 months             |
| HIV detection                                          | Reactive rapid HIV–syphilis combination test; HIV-1 subsequently confirmed at ICTC               | Reactive HIV–syphilis dual test at community screening; HIV-1 confirmed at ICTC     | HIV-1 confirmed at ICTC                                                                                          | Previously diagnosed HIV-1 infection a few months earlier during community screening                            |
| Syphilis detection / confirmation                      | Reactive treponemal rapid test; RPR 1:64                                                         | Reactive treponemal rapid test; RPR 1:32                                            | Reactive treponemal rapid test; RPR 1:128                                                                        | Reactive treponemal rapid test; RPR 1:64                                                                        |
| Clinical stage / suggestive manifestations of syphilis | Palmar erythematous maculopapular lesions suggestive of secondary syphilis; no genital ulcer     | Solitary indurated painless penile ulcer consistent with syphilitic chancre         | Ulcerative palmar lesions suggestive of secondary syphilis                                                       | Solitary painless indurated penile ulcer with well-defined margins, clinically suggestive of syphilitic chancre |
| Other important clinical findings                      | Mild pallor; dental caries                                                                       | Cachexia, mild pallor, bilateral cervical lymphadenopathy, multiple painful         | Cachexia, poor nutrition, pallor, icterus, bilateral cervical and inguinal lymphadenopathy, right upper-quadrant | Thinly built, poorly nourished, pallor, multiple excoriated papules and burrows suggestive of scabies,          |

|                                 |                                                                                                                        |                                                                                                                                                                   |                                                                                          |                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|                                 |                                                                                                                        | oral ulcers, mild hepatomegaly                                                                                                                                    | tenderness                                                                               | oral ulcerative lesions, inguinal lymphadenopathy                                                      |
| Oral manifestations             | None specifically documented                                                                                           | Multiple painful oral ulcers                                                                                                                                      | None specifically documented                                                             | Painful oral ulcerative lesions                                                                        |
| Genital manifestations          | No genital ulcer                                                                                                       | Solitary painless indurated penile ulcer                                                                                                                          | No genital lesion specifically documented                                                | Solitary painless indurated penile ulcer                                                               |
| Lymphadenopathy                 | Not significant                                                                                                        | Bilateral cervical lymphadenopathy                                                                                                                                | Bilateral cervical and inguinal lymphadenopathy                                          | Regional inguinal lymphadenopathy                                                                      |
| Sexual history                  | Reported monogamous marital relationship                                                                               | Multiple unprotected heterosexual contacts over several years in addition to regular intercourse with spouse; limited history of consensual homosexual encounters | History of multiple sexual encounters with men; current partner aged 24 years            | Multiple unprotected heterosexual encounters with different partners, including commercial sex workers |
| Barrier/condom use              | No recognised high-risk behaviour reported; denied multiple sexual partners                                            | Never used barrier contraceptive methods                                                                                                                          | Never used barrier protection                                                            | Never used barrier contraceptive methods, including after HIV diagnosis                                |
| Other Risk factors              | Denied blood transfusion, IV drug use, tattooing and previous STI; history of tubectomy approximately one year earlier | Regular alcohol use; denied smoking, IV drug use, blood transfusion, tattooing and previous surgery                                                               | Regular alcohol use; denied smoking, IV drug use, blood transfusion and previous surgery | Denied blood transfusion and IV drug use                                                               |
| Partner-related findings        | Husband counselled and tested; also diagnosed with HIV-1 and syphilis                                                  | Spouse had never undergone previous HIV/STI screening; partner screening advised                                                                                  | Current partner had never undergone HIV/STI screening and was not amenable to testing    | Partner details not documented                                                                         |
| Hepatitis B status              | Non-reactive                                                                                                           | Non-reactive                                                                                                                                                      | HBsAg positive                                                                           | Non-reactive                                                                                           |
| Hepatitis C status              | Non-reactive                                                                                                           | Non-reactive                                                                                                                                                      | Non-reactive                                                                             | Non-reactive                                                                                           |
| HIV stage                       | Stage 1                                                                                                                | Stage 2                                                                                                                                                           | Stage 3                                                                                  | Stage 2                                                                                                |
| Syphilis stage                  | Secondary                                                                                                              | Primary                                                                                                                                                           | Secondary/latent                                                                         | Primary                                                                                                |
| CD4 count cells/mm <sup>3</sup> | 245                                                                                                                    | 286                                                                                                                                                               | 280                                                                                      | 170                                                                                                    |
| ART status                      | Initiated after diagnosis                                                                                              | Initiated after diagnosis                                                                                                                                         | Initiated on ART but discontinued after approximately 3 weeks                            | Previously diagnosed HIV but poorly adherent to ART                                                    |
| Syphilis treatment              | Standard treatment protocol with benzathine penicillin G according to disease stage                                    | Standard treatment protocol                                                                                                                                       | Declined treatment for syphilis                                                          | Standard treatment protocol                                                                            |
| HBV management                  | Not applicable                                                                                                         | Not applicable                                                                                                                                                    | Declined treatment for                                                                   | Not applicable                                                                                         |

|                               |                                                                                                            |                                                                                                            |                                                                                                                                                  |                                                                                                                                             |
|-------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
|                               |                                                                                                            |                                                                                                            | hepatitis B                                                                                                                                      |                                                                                                                                             |
| Counselling provided          | Adherence, partner management and safer sexual practices                                                   | ART adherence, condom use, partner notification and family screening                                       | Repeated counselling regarding treatment and follow-up                                                                                           | ART adherence and importance of continued treatment                                                                                         |
| Follow-up                     | Remained under regular follow-up                                                                           | At 1-month, oral ulcers healed and weakness improved; good ART adherence                                   | Discontinued ART after ~3 weeks and was subsequently lost to follow-up                                                                           | Improved ART adherence and remained under ART-centre follow-up                                                                              |
| Clinical outcome              | Stable on follow-up                                                                                        | Favourable clinical response with healing of oral ulcers and improved weakness                             | Unfavourable care-continuity outcome: poor adherence and loss to follow-up                                                                       | Favourable clinical response: resolution of pruritus and genital lesion, improved appetite and weight                                       |
| Major epidemiological message | HIV-syphilis co-infection may remain hidden even in patients reporting no conventional high-risk behaviour | Multiple heterosexual exposures, absence of condom use and delayed partner screening facilitated detection | Demonstrates vulnerability of a transgender individual with multiple sexual exposures, HBV co-infection and major barriers to continuity of care | Demonstrates advanced immunosuppression associated with poor ART adherence, occupational mobility and continued unprotected sexual exposure |
| Major healthcare lesson       | Importance of opportunistic screening and couple/partner testing                                           | Importance of community screening, risk-reduction counselling and partner notification                     | Need for inclusive sexual-health services, social support and sustained linkage to care                                                          | Need for adherence support, continuity of care and accessible services for mobile/occupationally vulnerable populations                     |

**Table 2: - Baseline laboratory investigations and interpretation of findings among the four cases**

| HEMATOLOGY VARIABLES                        | CASE 1 | CASE 2 | CASE 3 | CASE 4 |
|---------------------------------------------|--------|--------|--------|--------|
| Haemoglobin (g/dl)                          | 11.7   | 14.9   | 16.3   | 8.4    |
| WBC(TLC) cells/mm <sup>3</sup>              | 5900   | 5700   | 7800   | 7300   |
| Neutrophils %                               | 58.3   | 62.4   | 59.1   | 75.7   |
| Lymphocytes %                               | 33.5   | 28.7   | 22.6   | 19.1   |
| Eosinophils %                               | 8.2    | 8.9    | 8.3    | 5.2    |
| Platelet count (lac cells/mm <sup>3</sup> ) | 2.49   | 1.87   | 1.46   | 2      |
| Total bilirubin mg/dl                       | 0.43   | 0.71   | 0.71   | 0.53   |
| Direct bilirubin mg/dl                      | 0.13   | 0.25   | 0.19   | 0.2    |
| SGOT IU/L                                   | 35.2   | 135.9  | 39.3   | 60.5   |
| SGPT IU/L                                   | 106.1  | 210.6  | 19     | 68.2   |
| Alkaline phosphate IU/L                     | 235    | 402    | 138.6  | 475    |
| Serum protein gm/dl                         | 8.12   | 7.71   | 7.2    | 6.71   |
| Serum albumin gm/dl                         | 3.97   | 4.03   | 4.3    | 2.89   |
| Serum urea mg/dl                            | 24     | 13     | 33.7   | 35     |
| Serum creatinine mg/dl                      | 0.63   | 0.73   | 0.9    | 1.12   |

## DISCUSSION

HIV–syphilis co-infection represents an important intersection of sexually transmitted infections (STIs), as both infections share routes of transmission and may facilitate one another biologically and epidemiologically. Syphilitic mucosal inflammation and disruption of epithelial barriers can increase susceptibility to HIV acquisition, while HIV-associated immune dysfunction may influence the clinical expression of syphilis. A systematic review and meta-analysis have demonstrated an increased risk of HIV acquisition following syphilis infection, reinforcing the close relationship between these infections [2]. Globally, people living with HIV also carry a substantial burden of other STIs, supporting the integration of STI screening into routine HIV care [8]. Case scenarios of this study have been compared with published literature. (Table 3)

The present case series is noteworthy for the diversity of epidemiological profiles and pathways to diagnosis within a rural district of Eastern Uttar Pradesh. Although all four individuals belonged to the same district, their infections came to light through very different healthcare encounters dental pre-procedural screening, community health camps, and medical outpatient evaluation. This suggests that HIV–syphilis co-infection may remain hidden across routine healthcare settings rather than presenting exclusively through dedicated STI services. Recent national surveillance data from India reported syphilis seropositivity of 1–1.84% among HIV-positive populations, further supporting the need for integrated surveillance and screening [9].

A recurring feature across the cases was delayed or irregular engagement with healthcare. Occupational

commitments (Case 2), mobility between urban workplaces and rural homes (Case 4), limited awareness (Case 3), and attribution of symptoms to other illnesses (Case 1) appeared to contribute to delayed evaluation. The cases illustrate how infection may remain clinically overlooked until an opportunity for screening arises.

The first case particularly highlights the hidden nature of infection. Despite reporting a monogamous marital relationship and no recognised conventional risk factors, the woman was diagnosed through opportunistic screening, and subsequent partner testing identified HIV–syphilis co-infection in her husband. The direction and timing of transmission could not be established. Rather than implying a particular source, this finding demonstrates the limitations of relying solely on self-reported sexual history and the value of partner notification and couple-based testing.

The remaining cases demonstrate a broader spectrum of sexual exposures, including multiple heterosexual partnerships, inconsistent condom use, occasional same-sex exposure, and multiple sexual partners. The transgender patient additionally highlights the importance of inclusive sexual-health assessment and continuity of care; recent Indian data continue to identify transgender populations as vulnerable to HIV and STI-related health disparities. [10,11].

Taken together, these cases suggest that the challenge is not simply identifying “high-risk” individuals, but recognising that HIV–syphilis co-infection can remain hidden across diverse populations and healthcare settings. Opportunistic and community-based screening, partner notification, integrated STI/HIV services, and sustained linkage to care may therefore be particularly valuable in rural settings

**Table 3: Comparison with published literature**

| Study                  | Population/setting                                                  | Principal finding                                                                                                                       | Relevance to present series                                                              |
|------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Sethi et al., 2024[12] | Systematic review/meta-analysis of MSM/transgender persons in India | Highlighted gaps in HIV prevention awareness and acceptability among key populations                                                    | Supports the behavioural and prevention issues illustrated by the transgender case.      |
| Kumar et al., 2025[9]  | National Indian surveillance under NACP                             | Syphilis seropositivity among HIV-positive populations was approximately 1–1.84%; substantial geographical and population heterogeneity | Supports the need for district-level surveillance and integrated HIV–syphilis screening. |
| Tuan et al., 2024[13]  | Review of STIs in people living with HIV                            | STIs remain common in PLHIV; shared behavioural and biological factors warrant integrated STI screening                                 | Supports routine assessment for syphilis among people diagnosed with HIV.                |
| Wu et al., 2024, [4]   | Long-term HIV/syphilis cohort                                       | Syphilis recurrence/reinfection and serofast states remained important despite ART                                                      | Supports the need for continued STI follow-up and adherence counselling.                 |
| Torane et al.,         | 500 STI/RTI clinic                                                  | Demonstrated co-occurrence of                                                                                                           | Supports integrated screening,                                                           |

| Study                    | Population/setting                                    | Principal finding                                                                                                 | Relevance to present series                                                             |
|--------------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 2023/24[14]              | attendees, India                                      | HIV, syphilis and viral hepatitis; HIV-positive individuals had increased risk of syphilis/HCV                    | particularly in the HBsAg-positive case.                                                |
| Tordoff et al., 2023[15] | Transgender/nonbinary patients                        | High syphilis and extragenital STI burden; exposure-based, trans-inclusive screening improved clinical assessment | Supports gender-sensitive and exposure-based STI screening.                             |
| Wu et al., 2021, [2]     | Systematic review/meta-analysis                       | Syphilis exposure was associated with increased risk of HIV acquisition                                           | Provides biological/epidemiological rationale for the observed co-infection.            |
| Present series           | Four rural patients, Chandauli, Eastern Uttar Pradesh | Diverse routes of detection, sexual behaviours, clinical presentations, adherence patterns and co-infections      | Adds district-level rural data from Eastern Uttar Pradesh, an underrepresented setting. |

### Strengths of the Case Series

The major strength of this case series is that it describes HIV–syphilis co-infection in a rural and relatively underrepresented setting of Eastern Uttar Pradesh. The four cases demonstrated diverse epidemiological profiles, sexual risk behaviours, clinical presentations, routes of detection, treatment adherence patterns, and associated co-infections. The inclusion of cases identified through dental pre-procedural screening, community-based screening, and medical outpatient evaluation highlights the importance of opportunistic and community-based screening beyond dedicated STI services. The case series also demonstrates the importance of partner notification, inclusive sexual-health assessment, adherence counselling, and sustained linkage to HIV and STI care, particularly among socially and occupationally vulnerable individuals.

### Limitations

This case series has several limitations. First, the sample size was small and included only four individuals; therefore, the findings cannot be generalized to the wider population of Chandauli district or Eastern Uttar Pradesh. Second, the retrospective nature of data collection depended on the availability and accuracy of existing medical records and patient-reported information. Sexual behaviour and other sensitive risk factors were largely based on self-report and may therefore be subject to recall or reporting bias. Third, the study did not include a control or comparison group and was not designed to establish causal relationships between specific behavioural factors and HIV–syphilis co-infection. The duration of follow-up also varied among cases, and one patient was lost to follow-up, limiting assessment of long-term treatment outcomes. Finally, the case series represents observations from a limited geographical and healthcare setting and should

therefore be interpreted as descriptive rather than population-level epidemiological evidence.

### Future Implications and Future Research

The findings highlight the need for strengthened integrated HIV–syphilis screening in rural and community healthcare settings, including opportunistic screening during routine medical and dental services. Future studies should include larger, multicentre and prospective cohorts to determine the prevalence and epidemiological patterns of HIV–syphilis co-infection in rural populations of Eastern Uttar Pradesh. Further research should also evaluate behavioural risk factors, barriers to partner notification and testing, treatment adherence, loss to follow-up, and the healthcare needs of transgender and other vulnerable populations. Longitudinal studies may help assess treatment outcomes, recurrence or reinfection, and long-term retention in care. Strengthening community-based counselling, partner services, risk-reduction interventions, and accessible linkage-to-care mechanisms should also be explored as components of integrated HIV and STI prevention strategies.

### CONCLUSION

The coexistence of HIV and syphilis poses a greater health risk, as each infection can increase the risk of acquiring the other. Syphilis may also increase HIV viral load, while treatment response to syphilis may be less favourable in people living with HIV.[17] These concerns call for integrated behavioural change and communication, integrated testing and integrated case management. The accelerated integrated response for combating HIV and syphilis, can pave the path of achieving concerned Sustainable Development Goals by 2030.

### Declarations

#### Ethical Approval

Clinical and epidemiological information was obtained retrospectively from institutional healthcare records.

Patient confidentiality and privacy were maintained throughout the preparation of the case series, and identifying information was not disclosed.

### Informed Consent

Written informed consent for publication should be obtained from the patients wherever required by the institutional ethics committee and journal policy. All potentially identifying information should be removed or anonymized before publication.

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### Conflict of Interest

The authors declare that they have no conflict of interest.

### Use of Artificial Intelligence Tools

No artificial intelligence (AI) tools were used in the preparation of this manuscript.

### Permissions

No additional permissions were required for the use of institutional clinical records. All patient-related information presented in the manuscript has been anonymized.

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