

## ORIGINAL RESEARCH

# Risk factors associated with HIV and Syphilis co-infection: A Cross sectional study from ICTC and PPTCT center of tertiary care hospital

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### Abstract

This prospective cross-sectional study conducted at the ICTC and PPTCT centers of a tertiary care hospital of Madhya Pradesh aimed to identify risk factors associated with HIV and syphilis co-infection among individuals seeking HIV testing. Over a year, 445 HIV-positive individuals were evaluated. Results showed a 9.21% (41/445) HIV-syphilis co-infection rate, with 56.10% having an active syphilis infection. Co-infection was more prevalent in heterosexual males (5.4%) compared to females (0%). Notably, 95.45% of co-infected individuals were below 55 years, with 59% aged 25-34 years.

**Keywords:** HIV, syphilis, co-infection, risk factors, ICTC, PPTCT, heterosexual males, RPR testing, prevalence, and serological assays

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### Introduction

There are approximately 5 million new HIV infections, and approximately 3 million deaths from AIDS every year. Thus, it has become the fourth largest cause of mortality in the world<sup>[1]</sup>.

Syphilis can also present with some atypical features in the HIV-positive patients. The rate of symptomless primary syphilis is higher and proportionately more HIV-positive patients present with secondary disease. Secondary infection can become more aggressive. Also, there is an increased rate of early neurological and ophthalmic involvement<sup>[2]</sup>.

Studies have indicated that syphilis infection can put an individual at three to five-fold higher risk for HIV infection and HIV infection can also greatly increase the risk for primary or secondary syphilis infection.

In the MSM group, syphilis surveillance showed an increasing HIV and syphilis co-infection rate, ranging from 30% to 60% depending on the geographic location<sup>[3-5]</sup>.

HIV has the potential to clinically alter the normal course of syphilis, increases the chance of relapse, and

confound the diagnosis of neurosyphilis<sup>[6]</sup>. HIV infection may alter primary manifestations of Syphilis, leading to an atypical presentation and/or multiple ulcers that may be mistaken for genital herpes<sup>[7]</sup>. The rate of symptomless primary syphilis is higher and proportionately more HIV positive patients present with secondary disease. Secondary infection can become more aggressive<sup>[2]</sup>. Among HIV-infected patients, Syphilis is reported to be associated with greater organ involvement<sup>[8]</sup>.

**Aim:** Aim of our study is to detect various risk factors associated with HIV and syphilis co-infection among all individuals attending ICTC and PPTCT centers of our Institute.

### Methodology

This study was carried out in the ICTC and PPTCT centers of the Department of Microbiology of a tertiary care hospital over a period of 1 year from August 2021 to July 2022.

This study was prospective cross sectional study. All participants who have visited our ICTC and PPTCT centre for HIV testing and have given written consent after Pre-test counseling were recruited for the study. A complete clinical detail and various associated Risk factors were recorded in a predesigned proforma. For testing of HIV we have followed NACO Strategy III for HIV testing.

Individuals who have found positive for HIV-1 antibody after testing with 03 different kits as per the NACO strategy were further tested for syphilis infection using Rapid plasma Reagin antibody (RPR) test. Individuals with history of current or past treatment for Syphilis were excluded from the study. The study was started after getting approval from the Institutional ethics committee. A total of 445 HIV positive individuals were included and evaluated for risk factors associated with HIV or HIV-syphilis infection.

**Collection of specimen:** 4-5 ml of blood sample was collected aseptically by venipuncture from all recruited individuals in study. The collected blood was allowed to clot for 30 to 40 min then the serum was separated by centrifugation at room temperature and used for HIV and syphilis testing.

**Laboratory diagnosis:** Diagnosis of HIV infection was performed using NACO III strategy for HIV testing using 03 kit based on different antigens and test principles. Syphilis diagnosis was made by testing of serum samples by the RPR test. All serum samples were tested in serial dilution, and samples found reactive in titre of >1:8 were considered to be having an active syphilis infection.

### Result and Discussion

In present study, 9.21% (41/445) HIV positive individuals were RPR reactive (Table-1/2) which was higher than the study by Gilbert L *et al.* who estimated 5.3% RPR reactive among 2818 HIV positive individuals & 56.10% (23/41) were found to have Titre greater than 1:8 in this study, indicating active Syphilis infection as compared to only 12.6% (11/87) in the above mentioned study [9]. The prevalence of HIV/syphilis co-infection was 10.6% (49/459) in the study by Luana Andrade Simões *et al.* [10].

HIV-Syphilis co-infection (Table-3) was found in 8.21% (134/1,620) of tested subjects by Hui-Zi Gong *et al.*, [11]. HIV and Syphilis co-infection was observed in 3 (1.5%) patients out of 200 patients in a study by Sonali Bhattar *et al.* which was lower as compared to

this study 24). Lina Fan *et al.* estimated HIV-Syphilis coinfection to be 40.2% in their study [13].

In our study, 23 (5.17%) out of 445 HIV positive patients had HIV- Syphilis co-infection among which 22 were males and 1 was transgender (Image-1). There was no female patient with HIV – Syphilis co-infection. In a study by Djomand *et al.* [14], HIV-Syphilis co-infection was higher in men than in women (2.4% vs 0.6%) similar to the present study where it was 5.4% in men and 0% in women, According to one study by Cyprien Kengne- Nde *et al.* (2017), unmarried pregnant women were 3 times more likely to be infected by HIV/Syphilis Co-infection than married, cohabiting, widow or divorced pregnant women [15]. In this study, all the pregnant females (100%) were married, so, no such comparison could be made. According to Chao Zhang *et al.* among the HIV-positive individuals with the antibodies against *Treponema pallidum*, the rate of homosexual transmission was higher than heterosexual transmission in their study but in this study, we found greater heterosexual transmission as compared to homosexual transmission [16]. In a study by Lina Fan *et al.*, Syphilis infection among HIV-infected MSM accounted for 65.3% of the total individuals who were HIV infected [13]. In this study, 2.19% MSM were found among total HIV infected individuals but none of them were co-infected with Syphilis (Table-5). In a study by Mwumvaneza Mutagoma *et al.* among FSWs aged between 20 and 29 years old, the overall prevalence was 27.4% for syphilis/HIV co-infection. It was also found that the 27.4% of HIV-Syphilis coinfection was increasing age-wise. This prevalence agrees with our study among all irrespective of any particular risk group. Hui-Zi Gong *et al.*, [11] mention male sex, age less than 55 years, especially 25-34-years-old, and with a RPR titre >1:32 as the age group 2 risk factors for HIV-Syphilis co-infection which agrees with the present study where 95.45% (21/22) HIV-Syphilis co-infected individuals belonged to age group less than 55 years, 59% (13/22) belonged to age group between 25-34 years but in this study, only 22.73% (5/22) had RPR Titre > 1:32.

### Conclusion

HIV-syphilis co-infection is most commonly found in heterosexual males which is also a commonest route of transmission for HIV infection. To prevent this awareness regarding use of contraception, health education, distribution of IEC material, RPR testing for all samples coming for HIV testing is to be done.

**Table 1: Distribution of RPR Reactivity among HIV Positive individual**

RPR	Proportion of HIV Positive Individuals (n=445)	Percentage (%)
RPR Reactive	41	9.21
RPR Non-Reactive	404	90.79

**Table2: Distribution of RPR Titre among all HIV positive individuals**

RPR Titre	Total no of sample tested(n=41)	Percentage	
1:02	12	29.3	Titre<1:8=18(43.9%)
1:04	2	4.9	
1:08	4	9.7	
1:16	7	17.1	Titre ≥1:8 =23 (56.1%)
1:32	6	14.6	
1:64	5	12.2	
1:128	4	9.7	
1:256	1	2.4	

**Table3:Distribution of HIV-Syphilis Co-Infection**

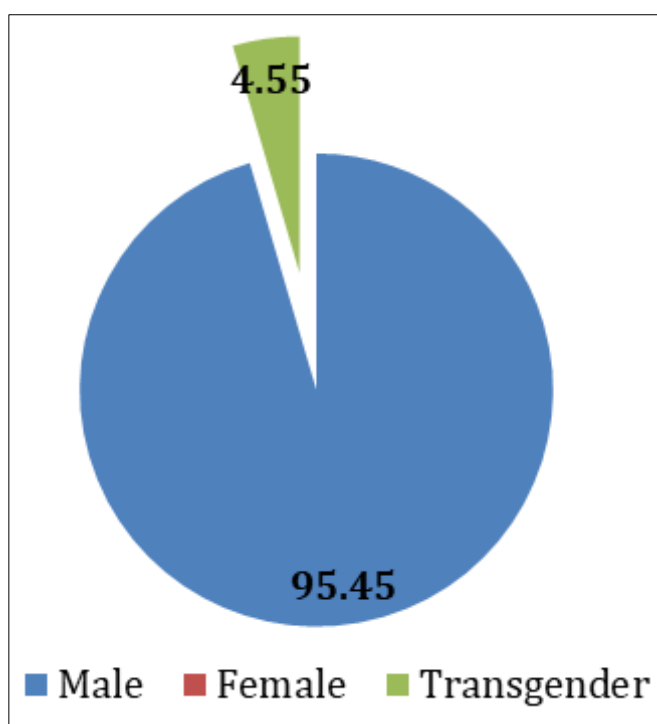
HIV Associated Co-infection	Number ofPositive Individuals (n=445)	Percent Positivity (%)
HIV-Syphilis Coinfection	23	5.16
Only HIV Infection	422	94.83

**Table4: Distribution of Risk factor among HIV Infected individuals**

Risk Factor Identification	No of HIV Positive Individuals (n=445)	Percentage (%)
Risk Factor Identified	228	51.24
Risk Factor Not Identified	217	48.76

**Table5: Distribution of risk factors associated with HIV+ syphilis**

Risk factors	Number of HIV positive Individuals with syphilis (N=23)	Percentage
Multiple blood transfusion	0	0
Transgender	1	4.34%
Truck driver	1	4.34%
Homosexual/ Bisexual	1	4.34%
Parent to child transmission	0	0
MSM	0	0
Prisoner	0	0
Sex with commercial worker	0	0
Spouse HIV positive	3	13.04%
History of sexually transmitted disease	23	100%



**Fig 1: Gender wise distribution of Individual with HIV Syphilis Co-infection**

## References

- National Strategic Plan for HIV/AIDS and STI 2017 – 2024 —Paving Way for an AIDS Free India - National AIDS Control Organisation & Indian Council of Medical Research – National Institute of Medical Statistics (ICMR-NIMS), Ministry of Health & Family Welfare, Government of India
- Lynn WA, Lightman S. Syphilis and HIV: a dangerous combination. *Lancet Infect Dis.* 2004 Jul;4(7):456-66. doi: 10.1016/S1473-3099(04)01061-8. PMID: 15219556.
- Watson-Jones D, Changalucha J, Gumodoka B, Weiss H, Rusizoka M, Ndeki L, *et al.* Syphilis in pregnancy in Tanzania. I. Impact of maternal syphilis on outcome of pregnancy. *J Infect Dis.* 2002;186(7):940–947. doi: 10.1086/342952.
- Kassutto S, Sax PE. HIV and syphilis coinfection: trends and interactions. *AIDS Clin Care.* 2003;15(2):9–15
- World Health Organization. Report on global sexually transmitted infection surveillance 2018. Geneva: WHO, 2018.
- Wu MY, Gong HZ, Hu KR, Zheng HY, Wan X, Li J. Effect of syphilis infection on HIV acquisition: a systematic review and metaanalysis. *Sex Transm Infect.* 2021 Nov;97(7):525-533. doi: 10.1136/sextrans-2020-054706. Epub 2020 Nov 20. PMID: 33219164; PMCID: PMC8543214.
- DiCarlo RP, Martin DH. The clinical diagnosis of genital ulcer disease in men. *Clin Infect Dis.* 1997;25:292–8.
- Greenstone CL, Saint S, Moseley RH. A Hand-Carried Diagnosis. *N Engl J Med.* 2007;356:2407–2411. doi: 10.1056/NEJMcps062271
- Gilbert, L., Dear, N., Esber, A. *et al.* Prevalence and risk factors associated with HIV and syphilis co-infection in the African Cohort Study: a cross-sectional study. *BMC Infect Dis* 21, 1123 (2021). <https://doi.org/10.1186/s12879-021-06668-6>
- Simões LA, Ceccato MGB, Silveira MR, Mendes JC, Lula MD, Costa AMG. Factors associated with HIV/syphilis co-infection initiating of antiretroviral therapy. *Rev Saude Publica.* 2022;56:59. <https://doi.org/10.11606/s1518-8787.2022056003904>
- Gong, H.-Z., Hu, K.-R., Lyu, W., Zheng, H.-Y., Guo Zhu, W., Wan, X., & Li, J. (2020). Risk Factors for the Co-infection with HIV, Hepatitis B and C Virus in Syphilis Patients. *Acta DermatoVenereologica*, 100(17), 1–6. <https://doi.org/10.2340/00015555-3657>.
- Bhattar S, Aggarwal P, Sahani SK, Bhalla P. Co-Infections and Sero-Prevalence of HIV, Syphilis, Hepatitis B and C Infections in Sexually Transmitted Infections Clinic Attendees of Tertiary Care Hospital in North India. *J Res Health Sci.* 2016 Summer;16(3):162- 165. PMID: 27840345; PMCID: PMC7191022.
- Fan L, Yu A, Zhang D, Wang Z, Ma P. Consequences of HIV/Syphilis Co-Infection on HIV Viral Load and Immune Response to Antiretroviral Therapy. *Infect Drug Resist.* 2021 Jul 24;14:2851-2862. doi: 10.2147/IDR.S320648. PMID: 34335031; PMCID: PMC8318222.
- Djomand *et al.* Prevalence and Correlates of Genital Infections Among Newly Diagnosed Human Immunodeficiency Virus–Infected Adults Entering Human Immunodeficiency Virus Care in Windhoek, Namibia. *Sexually Transmitted Diseases: November 2016 - Volume 43 - Issue 11 - p 698-705*doi: 10.1097/OLQ.0000000000000513
- Kengne-Nde C *et al.*, Highlighting a population-based re-emergence of Syphilis infection and assessing associated risk factors among pregnant women in Cameroon: Evidence from the 2009, 2012 and 2017 national sentinel surveillance surveys of HIV and syphilis. *PLoS One.* 2020 Nov 13;15(11):e0241999. doi: 10.1371/journal.pone.0241999. PMID: 33186360; PMCID: PMC7665812.
- Zhang C, Ren Q, Chang W. Epidemiological Features and Risk Factors for Acquiring Hepatitis B, Hepatitis C, and Syphilis in HIV-Infected Patients in Shaanxi Province, Northwest China. *Int J Environ Res Public Health.* 2020 Mar 18;17(6):1990. doi: 10.3390/ijerph17061990. PMID: 32197326; PMCID: PMC7143838.
- Mutagoma M, Nyirazinyoye L, Sebuho D, Riedel DJ, Ntaganira J. Syphilis and HIV prevalence and associated factors to their coinfection, Hepatitis B and Hepatitis C viruses prevalence among female sex workers in Rwanda. *BMC Infect Dis.* 2017 Jul 28;17(1):525. doi: 10.1186/s12879-017-2625-0. PMID: 28754104; PMCID: PMC553406