

Exploring the interactions between HSV-2 and HIV: model predictions for a Southern Indian setting

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Background: Herpes simplex virus type 2 (HSV-2) may play an important role in the HIV epidemic, increasing both HIV acquisition and infectivity; and perhaps conversely, with HIV potentially increasing HSV-2 infectivity and acquisition.

Methods: A dynamic model describing the interactions between HSV-2 and HIV was developed to estimate how much HSV-2 contributes to HIV transmission, and vice versa, when considering one-way transmission from clients to female sex workers (FSWs) in a southern Indian setting. This was parameterised using the literature and data from Mysore, Karnataka, India. The model was run for each of 10,000 parameter sets to identify simulations producing prevalences fitting the data. The model estimated the population attributable fraction (PAF) of HIV infections that were due to HSV-2 and vice versa. Multivariate sensitivity analysis and multilinear regression analysis were used to explore the robustness of the findings and sensitivity to the interaction inputs.

Results: 401 parameter sets produced model fits. These suggest about 33% (95% CI 22-62%) of HIV infections among FSWs were due to HSV-2, mostly through increased HIV susceptibility among HSV-2+/HIV- FSWs, but also from increased HIV infectivity among coinfecting clients. HIV may have increased HSV-2 incidence among FSWs by about 42%, mostly due to the increased rate of asymptomatic HSV-2 shedding and heightened HSV-2 infectivity among coinfecting clients. The PAFs change by less than 10% for a 20% change in any of the best-fit interaction inputs, and are most sensitive to the direct cofactors increasing the probability of HIV transmission in the presence of HSV-2 and vice versa, and the cofactors for increased HSV-2 shedding rates among those coinfecting with HIV.

Conclusions: The analysis stresses the significance of HSV-2 to the HIV epidemic in an Indian context, suggesting that about a third of HIV infections among FSWs may be attributable to HSV-2, mostly due to asymptomatic HSV-2 shedding.

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