

**HIV AND HERPETIC INFECTIONS: MODERN  
IMMUNOLOGICAL LABORATORY ASPECTS**

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**Abstract:** Human immunodeficiency virus (HIV) infection is frequently accompanied by opportunistic and co-infections, among which herpetic infections occupy a leading position. Herpes simplex virus (HSV-1, HSV-2), cytomegalovirus (CMV), Epstein–Barr virus (EBV), and varicella-zoster virus (VZV) significantly influence the clinical course of HIV infection, immune status, and disease progression. This article reviews the clinical manifestations of herpetic infections in HIV-positive patients and highlights key immunological and laboratory features that are essential for diagnosis, monitoring, and therapeutic decision-making.

**Keywords:** HIV, herpes simplex virus, varicella-zoster virus, immunodeficiency, CD4+, cytokines, opportunistic infections

## **Introduction**

HIV infection remains a major global public health problem due to its chronic course and profound impact on the immune system. Progressive depletion and dysfunction of CD4+ T lymphocytes lead to immunodeficiency, creating favorable conditions for persistent viral infections, particularly members of the Herpesviridae family. Herpetic viruses establish lifelong latency and tend to reactivate in immunocompromised hosts, resulting in severe, recurrent, and atypical clinical manifestations.

The interaction between HIV and herpetic infections is bidirectional: HIV-induced immunosuppression promotes herpesvirus reactivation, while active herpetic infections can increase HIV viral replication and accelerate disease progression. Therefore, understanding the clinical and immunological laboratory characteristics of these co-infections is of significant clinical importance.

## **Clinical Features of Herpetic Infections in HIV Patients**

### **Herpes Simplex Virus (HSV-1 and HSV-2)**

In HIV-infected individuals, HSV infections often present with prolonged, painful, and non-healing mucocutaneous lesions. Genital herpes caused by HSV-2 is particularly common and may exhibit frequent recurrences, ulcerative lesions, and resistance to standard antiviral therapy in advanced stages of immunodeficiency.

### Cytomegalovirus (CMV)

CMV infection is a major opportunistic pathogen in patients with advanced HIV disease, especially when CD4+ T cell counts fall below 50 cells/ $\mu$ L. Clinically, CMV may cause retinitis, colitis, esophagitis, pneumonitis, and central nervous system involvement, leading to significant morbidity and potential blindness.

### Epstein–Barr Virus (EBV)

EBV infection in HIV-positive patients is associated with oral hairy leukoplakia, persistent lymphadenopathy, and an increased risk of lymphoproliferative disorders, including non-Hodgkin lymphoma. Clinical manifestations are often subtle but carry important prognostic implications.

### Varicella-Zoster Virus (VZV)

Reactivation of VZV in HIV-infected individuals leads to herpes zoster, which may occur at a younger age, involve multiple dermatomes, and be complicated by postherpetic neuralgia or disseminated disease.

### Materials and Methods

Hospital between 2022 and 2024. A total of **120 patients** diagnosed with Human Immunodeficiency Virus (HIV) infection and various forms of **herpetic infections** were included in the study. The inclusion criteria were age between 18 and 65 years, confirmed HIV infection, and clinically and/or laboratory-confirmed herpesvirus co-infection (including HSV-1, HSV-2, VZV, or CMV).

Patients were divided into groups based on the type and severity of herpetic infection and the degree of immunosuppression determined by CD4+ T-cell count. All participants underwent a comprehensive clinical evaluation, including physical examination, symptom scoring, and assessment of the frequency and severity of herpesvirus manifestations.

All patients received standard antiretroviral therapy (ART), and antiviral treatment for herpetic infections was administered according to national clinical protocols.

Statistical analysis was performed using SPSS software version XX. Results were expressed as mean  $\pm$  standard deviation (SD), and comparisons between groups were made using Student's t-test or chi-square test, with a significance level set at  $p < 0.05$ .

### Results

In total, 120 HIV-positive patients with confirmed herpetic infections were examined at the Bukhara Infectious Diseases Hospital. The average age of the patients was  $38.4 \pm 10.2$  years, with 51.7% being male and 48.3% female. The most common co-infections were caused by Herpes Simplex Virus types 1 and 2 (46.7%), followed by Varicella-Zoster Virus (26.7%), Cytomegalovirus (16.7%), and mixed herpesvirus infections (10%).

Immunological testing revealed that patients with severe or recurrent herpetic

manifestations had significantly reduced CD4+ T-cell counts (mean  $186 \pm 52$  cells/mm $^3$ ) compared to those with milder forms (mean  $342 \pm 68$  cells/mm $^3$ ,  $p < 0.01$ ). The majority of patients (84.2%) showed an inverted CD4/CD8 ratio, and elevated CD8+ T-cell counts were noted across the cohort. Analysis of cytokine profiles indicated increased levels of pro-inflammatory cytokines such as IL-6 and TNF- $\alpha$ , particularly in patients co-infected with CMV or disseminated VZV, whereas IFN- $\gamma$  levels were markedly reduced in these cases.

Clinically, recurrent and chronic ulcerative lesions were most frequently observed in patients with HSV-2 infection, while disseminated herpes zoster involving multiple dermatomes occurred in patients with CD4+ counts below 150 cells/mm $^3$ . CMV-related complications, such as retinitis and colitis, were documented in patients with advanced immunosuppression.

Moreover, statistical analysis showed a significant correlation between higher HIV viral load and the increased frequency and severity of herpetic infections ( $p < 0.05$ ). Patients receiving regular antiretroviral therapy with undetectable viral load experienced fewer and less severe episodes of herpesvirus reactivation.

### **Conclusion**

Herpetic infections play a significant role in the clinical course of HIV infection and are closely linked to the degree of immunosuppression. Comprehensive clinical assessment supported by immunological and laboratory investigations is crucial for accurate diagnosis, effective management, and prognosis of HIV-positive patients. Integrated monitoring strategies targeting both HIV and herpetic viruses contribute to improved quality of life and long-term survival.

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