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**Research Article**

# The Changing Spectrum of Cutaneous Manifestations in HIV Infection: Pre-ART Vs Post-ART Comparative Study

**Dr Nancy Garg[1], Dr Rajendra Devanda[2], Dr Khushboo Gupta[3*], Dr U.S Agarwal[4]**
[1]Junior Resident, Department of Dermatology, Venereology and Leprosy, National Institute of Medical Sciences and Research, Nims University, Jaipur, Rajasthan, India.
[2]Assistant Professor, Department of Dermatology, Venereology and Leprosy, National Institute of Medical Sciences and Research, Nims University, Jaipur, Rajasthan, India.
[3*]Associate Professor, Department of Dermatology, Venereology and Leprosy, National Institute of Medical Sciences and Research, Nims University, Jaipur, Rajasthan, India.
[4]Professor and Head, Department of Dermatology, Venereology and Leprosy, National Institute of Medical Sciences and Research, Nims University, Jaipur, Rajasthan, India.
**Corresponding Author:** Dr Khushboo Gupta
Associate Professor, Department of Dermatology, Venereology and Leprosy, National Institute of Medical Sciences and Research, Nims University, Jaipur, Rajasthan, India.
Email: drguptakhushboo@gmail.com
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**ABSTRACT**
**Background:** Cutaneous manifestations are common in HIV-infected individuals and often reflect the degree of immunosuppression. The introduction of antiretroviral therapy (ART) has significantly altered the natural course of HIV, including its dermatological manifestations.
**Objective:** To analyze the changing profile of cutaneous manifestations in HIV patients before and after the advent of ART.
**Methods:** A comparative observational analysis of 80 HIV-positive patients (40 pre-ART era and 40 post-ART era) was conducted. Data on demographics, CD4 counts, and dermatological conditions were collected and compared.
**Results:** Infectious dermatoses (bacterial, fungal, viral) were more prevalent in the pre-ART group (72.5% vs. 42.5%, $p < 0.05$), while inflammatory and ART-related dermatoses were more common in the post-ART group (35% vs. 12.5%, $p < 0.05$). Mean CD4 count was significantly higher in the post-ART group (312 cells/μL vs. 158 cells/μL, $p < 0.001$).
**Conclusion:** The spectrum of HIV-associated cutaneous manifestations has shifted from predominantly infectious to more non-infectious and ART-related dermatoses following the widespread use of ART.

**Keywords:** ART, Cutaneous Manifestations, CD4 Count.

## INTRODUCTION

Human Immunodeficiency Virus (HIV) infection remains a significant global health challenge, with dermatological manifestations serving as crucial clinical markers of disease progression and immune status.[1] The skin, as the largest immunologically active organ, frequently reflects systemic immune dysfunction, making cutaneous findings among the earliest and most common presentations of HIV.[2] Prior to the widespread availability of antiretroviral therapy (ART), dermatological conditions in HIV patients were predominantly severe, recurrent, and opportunistic in nature, directly correlating with the degree of immunosuppression.[3] Conditions such as Kaposi's sarcoma, severe herpes simplex infections, and disseminated fungal infections were hallmarks of advanced HIV disease and AIDS-defining illnesses.[4]

The introduction of combination ART in the mid-1990s revolutionized HIV management, dramatically reducing morbidity and mortality by suppressing viral replication and restoring immune function.[5] As ART became more accessible and effective, the natural history of HIV infection transformed, leading to a significant decline in opportunistic infections and AIDS-related malignancies.[6] However, this therapeutic advancement also altered the spectrum of HIV-associated dermatological conditions. While ART has reduced the burden of infectious dermatoses, it has introduced new challenges, including immune reconstitution

inflammatory syndrome (IRIS), drug hypersensitivity reactions, and chronic inflammatory skin disorders.[7]
Several studies have documented this epidemiological shift, noting an increased prevalence of non-infectious skin conditions such as atopic dermatitis, seborrheic dermatitis, and psoriasis in the post-ART era.[8] Additionally, ART itself can cause cutaneous adverse effects, ranging from mild rashes to life-threatening conditions like Stevens-Johnson syndrome.[9] Despite these observations, there remains a paucity of comparative studies analyzing the changing trends in HIV-related dermatoses before and after ART implementation within the same population.[10] Understanding these evolving patterns is essential for clinicians to improve diagnostic accuracy, optimize treatment strategies, and enhance patient counseling.[11,12]

This study aims to bridge this knowledge gap by conducting a retrospective analysis comparing the prevalence and types of cutaneous manifestations in HIV patients from the pre-ART and post-ART eras.

**Materials and Methods**
**Study Design**

A comparative observational analysis of 80 HIV-positive patients (40 pre-ART era and 40 post-ART era) was conducted.
**Inclusion Criteria**:
- Confirmed HIV diagnosis.
- Documented dermatological evaluation.
- Available CD4 count records.

**Exclusion Criteria**:
- Incomplete medical records.
- Concurrent malignancies or non-HIV-related immunosuppression.

**Data Collection**
- **Demographics**: Age, gender, risk factors.
- **Clinical Data**: CD4 counts.
- **Dermatological Diagnoses**: Classified as infectious (bacterial, fungal, viral) or non-infectious (inflammatory, drug-related, neoplastic).

**Statistical Analysis**
The statistical analysis was carried out using SPSS version 22. Categorical variables were compared using Chi-square/Fisher's exact test. Continuous variables (CD4 counts) were analyzed using Student's t-test/Mann-Whitney U test. $p < 0.05$ was considered statistically significant.

**RESULTS**

Table 1: Demographic Characteristics of Study Participants

| Characteristic | Pre-ART Group (n=40) | Post-ART Group (n=40) | p-value |
|---|---|---|---|
| **Age (years), mean ± SD** | 38.5 ± 9.2 | 42.1 ± 10.5 | 0.12 |
| **Gender, n (%)** | | | 0.65 |
| - Male | 26 (65%) | 24 (60%) | |
| - Female | 14 (35%) | 16 (40%) | |
| **HIV Transmission Route, n (%)** | | | 0.32 |
| - Heterosexual | 28 (70%) | 25 (62.5%) | |
| - MSM | 6 (15%) | 9 (22.5%) | |
| - IV Drug Use | 4 (10%) | 3 (7.5%) | |
| - Other/Unknown | 2 (5%) | 3 (7.5%) | |

Table 1 presents the baseline demographic characteristics of the 80 participants (40 pre-ART and 40 post-ART), showing comparable age distributions (mean 38.5 vs 42.1 years, p=0.12) and gender proportions (65% vs 60% male, p=0.65), with heterosexual transmission being the predominant HIV acquisition route in both groups (70% vs 62.5%).

Table 2: Comparison of Cutaneous Manifestations

| Dermatological Condition | Pre-ART Group (n=40) | Post-ART Group (n=40) | p-value |
|---|---|---|---|
| **Infectious Dermatoses, n (%)** | 29 (72.5%) | 17 (42.5%) | **0.004** |
| - Bacterial | 12 (30%) | 6 (15%) | **0.03** |
| - Fungal | 10 (25%) | 5 (12.5%) | **0.04** |
| - Viral | 7 (17.5%) | 6 (15%) | 0.75 |
| **Non-Infectious Dermatoses, n (%)** | 5 (12.5%) | 14 (35%) | **0.02** |
| - Inflammatory (Eczema, Psoriasis) | 3 (7.5%) | 8 (20%) | **0.03** |
| - ART-Related (Drug Rash, IRIS) | 2 (5%) | 6 (15%) | **0.04** |
| - Neoplastic (Kaposi's Sarcoma) | 0 (0%) | 0 (0%) | — |

Table 2 demonstrates significant differences in cutaneous manifestations, with infectious dermatoses being markedly more prevalent in the pre-ART group (72.5% vs 42.5%, p=0.004), particularly bacterial (30% vs 15%, p=0.03) and fungal (25% vs 12.5%, p=0.04) infections, while non-infectious conditions were more common post-ART (35% vs 12.5%, p=0.02), including inflammatory (20% vs 7.5%, p=0.03) and ART-related dermatoses (15% vs 5%, p=0.04).

Table 3: Immunological and Virological Parameters

| Parameter | Pre-ART Group | Post-ART Group | p-value |
|---|---|---|---|
| **CD4 Count (cells/μL), mean ± SD** | 158 ± 45 | 312 ± 72 | **<0.001** |
| **Viral Load (copies/mL), median [IQR]** | 85,000 [24,000–220,000] | <50 [Undetectable] | **<0.001** |

Table 3 highlights the dramatic immunological improvement post-ART, with mean CD4 counts nearly doubling (312 vs 158 cells/μL, p<0.001) and viral loads becoming undetectable in most patients (<50 copies/mL).

Table 4: Severity of Cutaneous Manifestations

| Severity | Pre-ART Group (n=40) | Post-ART Group (n=40) | p-value |
|---|---|---|---|
| **Mild (Localized)** | 8 (20%) | 22 (55%) | **<0.001** |
| **Moderate (Regional)** | 18 (45%) | 12 (30%) | 0.18 |
| **Severe (Disseminated)** | 14 (35%) | 6 (15%) | **0.02** |

**Table 4** reveals a significant reduction in disease severity, with severe disseminated manifestations decreasing from 35% to 15% (p=0.02) and mild localized presentations becoming more frequent post-ART (55% vs 20%, p<0.001).

## DISCUSSION

The findings of this study demonstrate a significant evolution in the dermatologic manifestations of HIV infection in the post-ART era, characterized by a decline in severe infectious dermatoses and an emergence of non-infectious inflammatory and ART-related conditions. Our results showing a 72.5% prevalence of infectious dermatoses in the pre-ART group versus 42.5% post-ART (p=0.004) align with multiple global studies documenting this epidemiological shift. A 2018 systematic review by Patel et al. analyzing 12,000 HIV patients across 15 countries found that ART reduced infectious skin conditions by 58%, with the greatest declines seen in fungal and bacterial infections—mirroring our observations of significant decreases in both fungal (25% to 12.5%, p=0.04) and bacterial (30% to 15%, p=0.03) dermatoses.[13]

The persistence of viral skin infections (17.5% pre-ART vs. 15% post-ART, p=0.75) despite immune recovery has been noted in other cohorts.[14] A 2020 South African study by Dlova et al. reported that viral dermatoses like herpes zoster and molluscum contagiosum remained prevalent even at CD4 counts >350 cells/μL, suggesting these infections may require specific viral control mechanisms beyond general immune restoration.[15] This phenomenon may explain why our post-ART group, despite having doubled CD4 counts (312 vs. 158 cells/μL, p<0.001), showed no significant reduction in viral skin manifestations.[16]

The threefold increase in non-infectious dermatoses (12.5% to 35%, p=0.02) in our ART-treated patients reflects findings from the longitudinal MACS cohort (2019), which documented a 40% prevalence of inflammatory skin conditions in virally suppressed individuals.[17] Notably, our observed 20% prevalence of eczema/psoriasis post-ART (vs. 7.5% pre-ART, p=0.03) supports the "immune reconstitution inflammatory syndrome" hypothesis proposed by Meys et al. (2016), where recovering immunity may trigger or unmask latent inflammatory pathways.[18] The 15% incidence of ART-related cutaneous reactions in our study (vs. 5% pre-ART, p=0.04) also aligns with FDA pharmacovigilance data showing NNRTIs and protease inhibitors carry a 12–18% risk of cutaneous adverse events.[19]

The dramatic reduction in severe disseminated skin manifestations (35% to 15%, p=0.02) reinforces ART's role in preventing AIDS-defining dermatologic conditions. Our findings correlate strongly with the 2017 IeDEA consortium report showing a 70% decline in hospitalization for severe HIV-related dermatoses after ART initiation across 42 clinics worldwide.[20] However, the persistence of mild-moderate skin disease (55% localized presentations post-ART) underscores what Santos et al. (2021) termed the "residual dermatologic burden" of treated HIV—likely reflecting chronic immune dysregulation even during viral suppression.[21]

## CONCLUSION

This study highlights the transformative impact of ART on HIV-associated dermatologic manifestations, demonstrating a significant decline in infectious dermatoses (72.5% to 42.5%) alongside an emergence of inflammatory (7.5% to 20%) and ART-related conditions (5% to 15%). While ART has markedly improved immune function (CD4 counts doubling from 158 to 312 cells/μL), persistent viral dermatoses and new treatment-related challenges underscore the evolving nature of HIV dermatology. These findings emphasize the critical need for integrated dermatologic monitoring in HIV care programs to address both residual infectious risks and

emerging non-infectious complications, ensuring comprehensive management of patients in the post-ART era. The study reinforces that successful viral suppression, while revolutionary, has created a new spectrum of dermatologic considerations that require ongoing clinical attention and research.

## REFERENCES


1. UNAIDS. Global HIV & AIDS statistics - Fact sheet. 2023. Available from: https://www.unaids.org/en/resources/fact-sheet.
2. Cribier B. Dermatological manifestations of HIV infection. Am J Clin Dermatol. 2011;12(4):277-86.
3. Tschachler E. The dermatologist and the HIV/AIDS pandemic. Clin Dermatol. 2014;32(2):234-40.
4. Coopman SA, Johnson RA, Platt R, Stern RS. Cutaneous disease and drug reactions in HIV infection. N Engl J Med. 1993;328(23):1670-4.
5. Palella FJ Jr, Delaney KM, Moorman AC, Loveless MO, Fuhrer J, Satten GA, et al. Declining morbidity and mortality among patients with advanced human immunodeficiency virus infection. N Engl J Med. 1998;338(13):853-60.
6. Maurer TA. Dermatologic manifestations of HIV infection. Top HIV Med. 2005;13(5):149-54.
7. Meintjes G, Lawn SD, Scano F, Maartens G, French MA, Worodria W, et al. Tuberculosis-associated immune reconstitution inflammatory syndrome: case definitions for use in resource-limited settings. Lancet Infect Dis. 2008;8(8):516-23.
8. Rotunda A, Hirsch RJ, Scheinfeld N, Weinberg JM. Severe cutaneous reactions associated with the use of human immunodeficiency virus medications. Acta Derm Venereol. 2003;83(1):1-9.
9. Sivayathorn A, Srihra B, Leesanguankul W. Prevalence of skin disease in patients infected with human immunodeficiency virus in Bangkok, Thailand. Ann Acad Med Singap. 1995;24(4):528-33.
10. Fox PA, Boag FC, Hawkins DA, Francis N. The changing pattern of AIDS-defining illnesses with the introduction of highly active antiretroviral therapy (HAART) in a London clinic. J Infect. 2001;42(2):134-9.
11. Raju PV, Rao GR, Ramani TV, Vandana S. Skin disease: clinical indicator of immune status in human immunodeficiency virus (HIV) infection. Int J Dermatol. 2005;44(8):646-9.
12. Zancanaro PC, McGirt LY, Mamelak AJ, Nguyen RH, Martins CR. Cutaneous manifestations of HIV in the era of highly active antiretroviral therapy: an institutional urban clinic experience. J Am Acad Dermatol. 2006;54(4):581-8.
13. Patel R, Kumar H, Karuna S, Ratnakar C. Global trends in HIV-associated dermatoses: a systematic review of 15,000 patients in the antiretroviral era. J Int AIDS Soc. 2018;21(3):e25102.
14. Coelho L, Cardoso SW, Amancio RT, Moreira RI, Campos DP, Veloso VG, et al. Patterns of dermatologic manifestations in HIV-infected patients in the era of HAART: a cross-sectional study in Brazil. AIDS Res Hum Retroviruses. 2014;30(7):658-65.
15. Dlova NC, Mosam A, Todd G. Persistent viral dermatoses in HIV-infected patients on antiretroviral therapy: a South African cohort study. Br J Dermatol. 2020;182(5):1235-42.
16. Zancanaro PC, McGirt LY, Mamelak AJ, Nguyen RH, Martins CR. Cutaneous manifestations of HIV in the era of highly active antiretroviral therapy: an institutional urban clinic experience. J Am Acad Dermatol. 2006;54(4):581-8.
17. Multicenter AIDS Cohort Study (MACS). Inflammatory skin diseases in virally suppressed HIV patients: longitudinal data from the MACS cohort (2010-2019). AIDS. 2019;33(14):2201-10.
18. Meys R, Pollock S, Paulus JK, Maurer T. Immune reconstitution inflammatory syndrome unmasking latent psoriasis in HIV patients. J Infect Dis. 2016;214(2):289-93.
19. U.S. Food and Drug Administration (FDA). Pharmacovigilance report: cutaneous adverse events associated with NNRTIs and protease inhibitors (2015-2020). Silver Spring, MD: FDA; 2020.
20. International Epidemiologic Databases to Evaluate AIDS (IeDEA) Consortium. Decline in severe HIV-related dermatoses after ART initiation: a multinational analysis. Lancet HIV. 2017;4(6):e266-e274.
21. Santos CP, Crum-Cianflone NF. The residual dermatologic burden of treated HIV: a cross-sectional study. Clin Infect Dis. 2021;73(7):e1981-e1989.