

# Mucocutaneous Features in Ebola: Diagnostic Insights and Safety Strategies

**Thamir A Kubaisi**

Department of Internal Medicine/ Dermatology, College of Medicine, University of Anbar; Head of Ramadi Center of Iraqi Board of Dermatology and Venereology, Ramadi Teaching Hospital; Ramadi, Anbar, Iraq.

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Dear Editor,

Ebola disease is caused by viruses belong to the genus *Orthoebolavirus*, which is a member of the *filoviridae* family. Over recent decades, this illness has led to intermittent outbreaks of the most aggressive human viral infections. Its notoriety stems not only from elevated mortality rates but also from the intricate clinical features that involve the skin, mucosal surfaces, the gastrointestinal tract, and multiple other organ systems.<sup>1,2</sup> Ebola first emerged in Africa in 1976, where it has since triggered as many as 24 widespread outbreaks. However, the first confirmed case documented outside the continent occurred in the United States during the 2014 epidemic.<sup>3</sup> Outbreaks persist because the virus remains dormant in natural reservoirs, crosses over from animals into human populations, and transmits rapidly in regions with fragile healthcare infrastructures.<sup>4</sup> Epigenetic mechanisms may contribute to the recurrence of Ebola outbreaks. This concept has helped account for the evolution and adaptive changes observed in numerous infectious diseases throughout outbreaks and epidemics.<sup>5</sup>

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#### Address for correspondence

Dr. Thamir A Kubaisi, MD, FICMS (Dermatology)  
Department of Internal Medicine/Dermatology, College of Medicine, University of Anbar; Head of Ramadi Center of Iraqi Board of Dermatology and Venereology, Ramadi Teaching Hospital; Ramadi, Anbar, Iraq.  
Ph: +9647901431836  
Email: med.thamer.alkubaisi@uoanbar.edu.iq

The Ebola virus spreads via direct contact with the skin or bodily secretions of an infected individual, including blood, sweat, and saliva. Research has also confirmed that the Ebola virus resides on the skin's surface during the later phases of illness, suggesting that skin contact may serve as a significant route of human-to-human transmission. However, the underlying biological mechanism remains incompletely understood.<sup>2,6</sup>

Ebola disease exhibits no sexual predilection; however, the age of affected individuals ranged between 15-44 year old. The severe virulence of the virus stems from its capacity to invade a broad range of body tissues, evade the host's immune defenses, including active innate immune cells, and instead of eliciting a protective immune response, reprogram infected macrophages and dendritic cells, this reprogramming subsequently triggers a destructive cytokine storm (an excessively overactive immune response); additionally, its ability to severely compromises the integrity of endothelial cells; activates the disseminated intravascular clotting cascade, and induces widespread systemic inflammation. These pathological events frequently culminate in multiorgan failure.<sup>7</sup>

In most cases, the illness initially presents with nonspecific flu-like symptoms, including high fever, headache, exhaustion, and myalgia. It subsequently advances to involve severe systemic manifestations. Among the clinical features that draw the attention

of clinicians and investigators, and carry substantial diagnostic value during outbreaks, are the cutaneous signs and symptoms observed in infected patients. These skin findings mirror the intense inflammatory response and reflect the worsening course of the viral disease.<sup>8</sup> Cutaneous findings represent significant clinical markers that can emerge across all three sequential phases of Ebola disease. The most frequently observed cutaneous signs include:<sup>4,8,9</sup>

1. **Non-pruritic maculopapular eruption:** This rash emerges between days four and six following the onset of fever. It begins as tiny, dark-red macules and papules that develop around hair follicles on the trunk, subsequently spreading to the extremities and the face.
2. **Generalized body erythema:** Appearing around day eight, this condition arises from inflammatory processes affecting the small blood vessels (microvasculature).
3. **Petechiae:** These tiny hemorrhagic spots result from a disorder affecting the blood clotting disorder.
4. **Easy bruising of the skin:** This finding occurs because of increased fragility of the blood vessel walls.
5. **Dry, scaly skin with exfoliation:** This finding becomes detectable around five days after symptom onset. It indicates either disease progression or the recovery phase, particularly affecting the palms and soles.
6. **Mucosal involvement:** This includes bilateral conjunctivitis, herpetiform erosions (cold sore-like erosion), gingivitis, glossitis, pharyngeal erythema and dysphagia.
7. **Mucosal surface bleeding:** Examples include bleeding gums or epistaxis. This finding represents a severe and late-stage clinical indicator.
8. **Hair loss (telogen effluvium):** This condition is observed during the post-recovery period.

Beyond skin rashes and hemorrhagic manifestations,

individuals infected with Ebola may experience a range of additional symptoms. These include skin pallor, cyanotic discoloration affecting the extremities, edema of the skin and underlying tissues, pruritus, skin ulcerations, heightened cutaneous tenderness, hyperhidrosis, and the development of hyperpigmented macules or dark spots. The intensity of these clinical manifestations is determined by three key factors: the robustness of the patient's immune system, the phase of the illness at presentation, and the timeliness of medical intervention.<sup>10</sup>

Within Ebola endemic zones, clinicians base their diagnosis on standardized case definitions. The following conditions are considered key early differential diagnoses: malaria, typhoid fever, shigellosis, other enteric bacterial infections, viral hepatitis, leptospirosis, and additional viral hemorrhagic fevers.<sup>8</sup> Various diagnostic methods, including skin biopsy, immunohistochemistry, polymerase chain reaction assays, antibody-capture enzyme-linked immunosorbent assays, serum neutralization tests, electron microscopy, and virus isolation via cell culture, can facilitate early diagnosis and may help limit disease transmission.<sup>2,4</sup>

Investigating and comprehending the cutaneous manifestations of Ebola offers value across multiple critical medical and preventive dimensions. These skin findings are not simply superficial alterations; rather, they hold diagnostic and therapeutic significance that can help safeguard patients' lives and curb the further spread of the disease. Furthermore, cutaneous manifestations support early diagnosis of the disease, particularly in regions where advanced laboratory facilities are unavailable. When a healthcare worker identifies a rash or hemorrhagic spots in a patient presenting with fever and fatigue, Ebola virus infection becomes a strong clinical suspicion, prompting immediate isolation protocols. This rapid response is essential to prevent onward transmission to family members or healthcare personnel. Moreover, these clinical signs mirror both the intensity and the advancing course of the illness. Ebola profoundly impacts multiple

physiological systems. Consequently, clinicians gain valuable insight by tracking cutaneous alterations, enabling them to evaluate the patient's status and establish the appropriate intensity of medical support. On the other hand, cutaneous manifestations also help monitor the effects of therapy. Resolution of the rash or reduction in bleeding may signal clinical improvement, whereas persistence or exacerbation of symptoms often suggests disease progression or deterioration.<sup>1</sup> Thus, the skin serves as a visibly accessible indicator of disease progression, often without the need for sophisticated diagnostic tools. Recognizing these symptoms also holds value for health education and community-level prevention. When individuals understand that a rash or unusual bleeding may signal a serious illness, they are more likely to seek medical care promptly and limit social interactions, thereby helping to control disease transmission.

In conclusion, cutaneous manifestations in Ebola constitute a critical component of the clinical profile of this devastating disease. They help scientists understand how the Ebola virus affects blood vessels and the immune system. These skin findings are not merely superficial markers; rather, they serve as essential indicators of the virus's profound impact within the body. By recognizing and appropriately responding to these manifestations, healthcare workers can improve the likelihood of early diagnosis, enhance patient care, and reduce the human toll inflicted by this dangerous epidemic.

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