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Monkeypox (Mpox)

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Abstract

Mpox (formerly known as monkeypox) has re-emerged as a critical global public health priority following the unprecedented multi-country outbreak that began in 2022 and persisted through 2024. Historically confined to Central and West Africa with sporadic zoonotic transmission, mpox transitioned into sustained human-to-human transmission across global networks. This epidemiologic shift revealed new adult clinical phenotypes and exposed critical gaps in antiviral evidence, vaccination equity, infection prevention preparedness, and stigma-sensitive care delivery.

Although overall mortality during the 2022–2024 outbreak remained lower than historical Clade I epidemics, the morbidity burden, prolonged symptomatology, complications among immunocompromised populations, and psychosocial sequelae were substantial. Healthcare systems encountered diagnostic uncertainty, evolving infection prevention guidance, limited randomized trial data for therapeutics, and occupational risk concerns for frontline nurses. Adult care environments also faced resource allocation dilemmas and ethical challenges related to isolation and vaccine distribution.

This narrative review critically synthesizes contemporary evidence on mpox in adult care settings, examining epidemiology including incidence rates, etiopathogenesis, pathophysiology, clinical complexity, diagnostic strategies, therapeutic controversies, prognosis, prevention inequities, complications, and the expanding role of nurses in outbreak preparedness and response. Emphasis is placed on translational gaps, ethical challenges in vaccine allocation, and the need for nurse-led implementation research. Strengthening interdisciplinary collaboration and nursing scholarship is essential to enhance resilience against future mpox resurgence and other emerging zoonotic threats.

Keywords: Mpox, Monkeypox virus, adult nursing, Infection prevention, Tecovirimat, Vaccine equity, public health preparedness

1. Introduction

Mpox is caused by the monkeypox virus (MPXV), an enveloped double-stranded DNA virus of the *Orthopoxvirus* genus within the *Poxviridae* family [1]. Historically, mpox was regarded as a neglected zoonotic infection endemic to Central and West Africa, with human transmission largely limited to close contact with animal reservoirs [2]. Secondary human-to-human transmission was typically self-limited and geographically restricted.

However, starting in early 2022, mpox spread rapidly to over 100 non-endemic countries, predominantly affecting adult populations in interconnected sexual and social networks [3]. This marked a significant departure from prior epidemiologic patterns, as sustained human transmission occurred independently of direct animal exposure, challenging conventional containment paradigms [4].

By 2023–2024, incidence declined in some high-income regions following targeted vaccination and infection control strategies; however, resurgence in endemic African countries, coupled with sporadic outbreaks elsewhere, highlighted persistent global inequities in vaccine access, surveillance capacity, and healthcare preparedness [5]. Adult care settings faced multiple operational challenges, including:

- Atypical clinical presentations that mimic sexually transmitted infections
- Diagnostic ambiguity with evolving case definitions
- Limited evidence from randomized controlled trials (RCTs) for antivirals
- Occupational exposure concerns among healthcare providers, especially nurses
- Ethical and logistical dilemmas in vaccination, isolation, and resource allocation

Within this context, nurses emerged as key leaders in clinical management, infection prevention, patient education, psychosocial support, and public health advocacy. A comprehensive understanding of mpox in adult care settings is therefore critical to strengthening clinical outcomes and healthcare system responsiveness.

2. Definition

Mpox (formerly known as monkeypox) is an acute zoonotic viral disease caused by the monkeypox virus (MPXV), an enveloped double-stranded DNA virus belonging to the genus *Orthopoxvirus* within the family *Poxviridae*. The disease is clinically characterized by a febrile prodrome followed by the development of a progressive vesiculopustular rash and prominent lymphadenopathy, the latter serving as a distinguishing feature from smallpox [1].

Transmission occurs through direct contact with infected animals, exposure to human skin or mucosal lesions, bodily fluids, respiratory droplets during prolonged close interaction, or contact with contaminated fomites such as clothing and bedding [6]. Historically confined to endemic regions of Central and West Africa with predominantly zoonotic transmission, mpox has evolved into a globally significant infectious disease following the 2022–2024 multi-country outbreak, which demonstrated sustained human-to-human transmission across interconnected adult populations.

The clinical presentation ranges from mild, localized cutaneous involvement to severe disseminated systemic disease, particularly among immunocompromised individuals [7]. Lesions typically progress sequentially through macular, papular, vesicular, pustular, and crusting stages over a two-to-four-week period. However, recent outbreaks have revealed atypical phenotypes, including localized genital and perianal lesions, minimal prodromal symptoms, and asynchronous lesion evolution, thereby complicating timely diagnosis and public health containment.

In contemporary adult healthcare settings, mpox represents not only an infectious disease entity but also a complex public health challenge involving evolving epidemiological dynamics, infection prevention demands, psychosocial considerations, and ethical concerns related to vaccine access and healthcare equity.

3. Epidemiology And Incidence Rates

❖ Global Incidence and Trends

In the 2022–2024 outbreak, the global burden of mpox expanded dramatically beyond traditional endemic regions. By mid-2023, the World Health Organization (WHO) reported over 85,000 laboratory-confirmed cases and more than 110 deaths across >100 countries [5]. Although case counts declined in some regions in late 2023 and 2024 due to effective public health measures, the incidence remained elevated compared to historical patterns.

Incidence rates varied substantially by region and population subgroup. In some urban centers early in the outbreak, incidence exceeded 20 cases per 100,000 adults in specific high-risk networks, particularly among men who have sex with men (MSM) [3]. In contrast, regions with delayed surveillance capacity reported sporadic cluster outbreaks with an incidence <1 per 100,000 population.

❖ Demographic Patterns

Adults aged 25–45 years represented the majority of cases, reflecting social and sexual network dynamics underlying transmission in non-endemic regions [3]. Male sex predominated in reported cohorts, though under ascertainment in women and nonbinary individuals has been noted, partly due to case definition biases and surveillance gaps.

❖ Endemicity and Resurgence in Africa

Despite global focus on non-endemic outbreaks, several African countries reported significant resurgence in 2023–2024, suggesting incomplete control and persistent zoonotic reservoirs. Surveillance data indicated increased incidence rates in parts of Central and West Africa, with regional estimates ranging from 5 to 15 cases per 100,000 population annually, substantially higher than pre-2022 baselines [5]. These patterns underscore health inequities in infectious disease surveillance and response infrastructure.

4. Etiopathogenic Factors

❖ Viral Structure and Clade Evolution

MPXV possesses a relatively large (~197 kbp) double-stranded DNA genome encoding proteins that modulate host immunity and facilitate viral replication [1]. Two major genetic clades are recognized:

- Clade I (Central African): Historically associated with higher case fatality and more severe disease.
- Clade II (West African, including IIb): Responsible for the 2022–2024 outbreak, associated with lower mortality but greater transmissibility.

Phylogenomic studies revealed that Clade IIb isolates accumulated mutations during sustained human transmission, possibly enhancing fitness and transmission efficiency [4,7].

❖ Transmission Dynamics

Transmission in the 2022–2024 outbreak occurred predominantly through:

- Close physical and sexual contact
- Exchange of bodily fluids
- Shared bedding or clothing
- Respiratory droplets in prolonged exposure

Although respiratory and fomite transmission are biologically plausible, epidemiologic evidence strongly emphasizes intimate contact as the primary driver in adult networks [3]. Urban proximity and social clustering amplified spread, particularly in settings with dense interpersonal interactions.

❖ Host Susceptibility

Adults with the highest risk for severe disease include:

- People with advanced or untreated HIV infection
- Individuals receiving immunosuppressive therapy
- Pregnant individuals
- Persons with chronic comorbidities (e.g., diabetes, cardiovascular disease)
- Patients undergoing oncologic treatment [7]

Population immunity against orthopoxviruses has declined since the cessation of routine smallpox vaccination in the 1980s, contributing to increased susceptibility among younger adults [2].

5. Pathophysiology

The pathophysiological sequence of mpox infection includes:

Exposure to Monkeypox Virus
↓
Viral Entry (Skin / Respiratory Mucosa)
↓
Replication in Monocytes & Lymph Nodes
↓
Primary Viremia
↓
Systemic Spread to Liver, Spleen & Skin
↓
Secondary Viremia
↓
Infection of Epidermal Cells
↓
Inflammatory Response + Cytokine Release
↓
Fever & Systemic Symptoms
↓
Skin Lesion Formation
(Macule → Papule → Vesicle → Pustule → Crust)
↓
Immune Response → Recovery
OR
Complications in Severe Cases

MPXV evades host immunity by encoding proteins that inhibit interferon pathways, complement activation, and apoptosis induction [(1)]. Lymphadenopathy is a hallmark feature reflecting host immune activation and distinguishes mpox from smallpox.

In immunocompromised adults, impaired viral clearance can result in prolonged viremia, extensive necrotic lesions, severe mucosal inflammation (e.g., proctitis), and systemic immune dysregulation [(7)].

6. Clinical Features

➢ Classical Presentation

Classical mpox manifests with:

- Fever, chills, headache, myalgia
- Marked lymphadenopathy (cervical, axillary, inguinal)
- Centrifugal vesiculopustular rash involving face and extremities

- Synchronous lesion evolution over 2–4 weeks [2]

➢ **Atypical Adult Presentation (2022–2024)**

Recent outbreaks revealed atypical clinical patterns, especially among adults:

- Localized genital or perianal lesions
- Severe anorectal pain and proctitis
- Asynchronous lesion development
- Minimal or absent prodromal symptoms
- Limited total lesion count [3]

These presentations frequently mimicked common sexually transmitted infections, particularly herpes simplex and syphilis, leading to delayed diagnosis and underreporting.

➢ **Severe Disease and Complications**

In severe cases, complications can include:

- Extensive necrotic skin lesions
- Secondary bacterial infection
- Pneumonia
- Encephalitis
- Sepsis

Individuals with advanced HIV infection or other immunocompromising conditions are at increased risk for severe complications and mortality [7].

7. Diagnostic Criteria

Accurate diagnosis of mpox requires:

- Clinical suspicion based on symptoms and exposure history
- Laboratory confirmation via PCR of lesion swabs, which remains the gold standard [6]
- Differential diagnosis to exclude varicella, herpes simplex virus, syphilis, molluscum contagiosum, and drug eruptions

Challenges include delayed presentation due to stigma, limited laboratory access in resource-constrained settings, and clinician unfamiliarity with atypical presentations.

8. Management

➢ Supportive Care

Supportive management is the cornerstone for most patients:

- Adequate hydration
- Antipyretics and analgesics
- Local wound care
- Treatment of secondary bacterial infections

Nurses are instrumental in pain assessment, particularly for debilitating anorectal symptoms, and in monitoring lesion evolution and hydration status.

➢ Antiviral Therapy: Tecovirimat

Tecovirimat targets the orthopoxvirus VP37 envelope protein, preventing viral egress [8]. While observational data suggest clinical benefit in reducing viral load and symptom duration, randomized controlled trial (RCT) evidence remains limited. These data gaps highlight the need for rigorous antiviral trials during emerging infectious disease outbreaks. Current clinical guidance prioritizes tecovirimat for patients with severe disease, immunocompromised status, or extensive mucosal involvement.

➢ Hospitalization Criteria

Hospitalization may be indicated for:

- Severe pain requiring intravenous analgesia
- Airway compromise or pneumonia
- Neurological symptoms (e.g., encephalitis)
- Advanced immunosuppression requiring close monitoring

➢ Infection Prevention and Control

Infection prevention and control (IPC) measures include:

- Contact and droplet precautions until complete lesion crusting and healing
- Environmental cleaning and disinfection
- Proper donning and doffing of PPE
- Nurse-led audits to ensure compliance and minimize nosocomial transmission [6]

9. Prognosis

Mortality during the 2022–2024 outbreak was substantially lower than historical Clade I epidemics [5]. However:

- Symptom duration often exceeds 3 weeks
- Residual scarring and pigmentation changes can be permanent
- Psychological distress, anxiety, or depression is common
- Immunocompromised individuals exhibit higher mortality and prolonged recovery [7]

Long-term sequelae, including impacts on sexual health and mental well-being, require further longitudinal investigation.

10. Prevention

➢ Vaccination

The Modified Vaccinia Ankara–Bavarian Nordic (MVA-BN) vaccine has been used for post-exposure prophylaxis (PEP) and targeted pre-exposure prophylaxis (PrEP) in high-risk populations [9]. Evidence indicates a significant reduction in infection risk and disease severity, though the durability of protection continues to be evaluated.

Global inequities in vaccine access remain a profound ethical and public health concern, particularly in low-income and endemic regions.

➢ Public Health Measures

- Case isolation until complete lesion healing
- Contact tracing and monitoring
- Community engagement and risk communication
- Genomic surveillance for early detection of viral mutations and transmission clusters [4]

11. Complications

Mpox complications may include:

- ✓ Severe proctitis and mucosal ulceration
- ✓ Keratitis leading to vision impairment
- ✓ Pneumonia or respiratory compromise
- ✓ Encephalitis and CNS involvement
- ✓ Sepsis and systemic inflammatory response
- ✓ Secondary bacterial infections

- ✓ Psychological trauma and stigma-related social harm

12. Health Education and Nursing Role

Nurses are pivotal in the mpox outbreak response and adult care:

Clinical Leadership

- Early case identification
- Triage and risk stratification
- Isolation implementation and monitoring
- Daily symptom assessment and lesion care

Infection Prevention Advocacy

- PPE adherence audits
- Environmental hygiene supervision
- Occupational exposure mitigation protocols

Psychosocial Support

- Confidential, stigma-sensitive counselling
- Mental health referral and coordination
- Family and community support facilitation

Patient and Community Education

- Safe lesion care and hygiene practices
- Transmission prevention guidance
- Recognition of warning signs requiring urgent care

Research Priorities in Nursing

- Nurse-led outbreak implementation trials
- Evaluation of vaccine counselling effectiveness
- Occupational exposure risk assessments
- Integration of digital surveillance tools
- Community-based prevention and education models

13. Conclusion

Mpox has evolved into a globally significant infectious disease with sustained human transmission, diverse clinical phenotypes, and substantial psychosocial impact. Although mortality during recent outbreaks was comparatively low, the burden of morbidity, healthcare disparities, and long-term sequelae remains significant.

Critical evidence gaps persist in antiviral effectiveness, vaccine durability, and long-term outcomes. Nursing leadership is essential for infection prevention, patient education, stigma reduction, outbreak surveillance, and community engagement.

Future preparedness should integrate genomic monitoring, equitable vaccine distribution, rapid clinical-trial infrastructure, and nurse-led implementation science. Strengthening nursing scholarship in emerging infectious diseases will enhance global resilience against mpox resurgence and future zoonotic threats.

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