

***Epidemiology, Clinical Features, Diagnosis and Management of
Monkey pox Virus: A Clinical Review Article***



Daffodil
International
University

PROJECT REPORT

[In the partial fulfillment of the requirements for the degree of Bachelor of
Pharmacy]

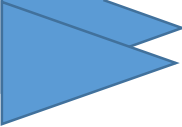
Submitted To

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APPROVAL

This project paper, “**Epidemiology, Clinical Features, Diagnosis and Management of Monkey pox Virus: A Clinical Review Article**”, submitted to the Department of Pharmacy, Faculty of Allied Health Sciences, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Pharmacy and approved as to its style and contents.

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DECLARATION

I hereby declare that this project report, “**Epidemiology, Clinical Features, Diagnosis and Management of Monkey pox Virus: A Clinical Review Article**” is done by me under the supervision of Ms. Aklima Akter Assistant Professor Department of Pharmacy Faculty of Health & Life Sciences Daffodil International University. I am declaring that this Project is my original work. I also declare that neither this project nor any part therefore has been submitted elsewhere for the award of Bachelor or any degree.

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My Parents,

***The persons who always encourage me in every sphere of my life. My
teacher,***

***The persons who guided me in this process and the faculties who kept me
on track.***

Abstract

The resurgence of monkeypox virus poses a renewed global health threat, characterized by zoonotic spillover and human-to-human transmission. This clinical review explores the epidemiology, clinical features, diagnostic methods, and management strategies for monkeypox, highlighting critical risk factors that exacerbate its spread. Zoonotic transmission primarily occurs through direct contact with infected animals, while human-to-human transmission is driven by close physical contact, respiratory droplets, and contaminated materials, with heightened risks in densely populated areas and healthcare settings. Clinically, monkeypox presents with fever, lymphadenopathy, and distinctive rashes, making accurate diagnostic differentiation essential, particularly using PCR to confirm infection. Management encompasses patient isolation, symptomatic treatment, and the use of antiviral agents like Tecovirimat for severe cases. Vaccines, including Jynneos and ACAM2000, provide effective protection but face accessibility challenges in low-resource regions. This review emphasizes the importance of robust public health interventions, including preventive education, improved healthcare infrastructure, and equitable vaccine distribution to curb the spread of monkeypox and mitigate its impact on global health.

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Chapter 1

Introduction

1. Introduction

Monkey pox is an emerging zoonotic viral disease that has recently captured global attention due to its rapid spread outside its traditionally endemic regions. The virus is part of the Orthopoxvirus genus, which includes several other significant viruses like variola (the cause of smallpox) and cowpox. Although monkey pox was first identified in laboratory monkeys in 1958, it is now known to primarily infect rodents, and humans can contract the virus through zoonotic transmission, typically through contact with infected animals or their secretions [1]. The disease manifests with symptoms similar to smallpox, although it is generally less severe. However, the recent outbreaks, particularly in nonendemic countries, underscore the need for a deeper understanding of the virus, its transmission, and how to effectively control and prevent future outbreaks [2].

1.1 Background on Monkey pox Virus

The Monkey pox virus (MPXV) belongs to the family Poxviridae, under the Chordopoxvirinae subfamily. It is an enveloped, double-stranded DNA virus that is relatively large compared to other viruses. The virus was first discovered when two outbreaks occurred in research monkeys, hence the name “monkey pox.” Despite this, further investigation revealed that the natural reservoir of the virus is not monkeys but rather small rodents, particularly squirrels and dormice, which are believed to be the primary carriers of the virus in Central and West Africa. Humans can contract the virus through direct contact with these animals or by consuming undercooked meat from infected animals [3]. The Monkey pox virus is closely related to the smallpox virus, and this connection has made it of particular interest to health experts, especially given that smallpox was eradicated in 1980. The decline in immunity to smallpox in the global population, due to the cessation of routine smallpox vaccination, is believed to be a contributing factor to the resurgence of monkey pox. Smallpox vaccination historically provided cross-protection against monkey pox, and with the majority of the global population now unvaccinated against smallpox, the risk of monkey pox outbreaks has increased [4].

1.2 Epidemiological Context

Monkey pox is primarily endemic in Central and West African countries, particularly in regions with dense rainforest ecosystems where human-animal interactions are more frequent. The virus is transmitted from animals to humans through direct contact with the blood, bodily fluids, or skin lesions of infected animals. Secondary, human-to-human transmission is also possible, primarily through close contact with respiratory droplets, bodily fluids, or materials contaminated by an infected person's lesions. The virus has two distinct genetic clades: the Central African (Congo Basin) clade and the West African clade [5]. The Central African clade is known to cause more severe illness and is associated with a higher fatality rate, while the West African clade typically results in milder illness and has a lower case-fatality rate. These regional variations in the virus's severity have important implications for public health strategies in different parts of the world. Epidemiological data from African countries show that monkey pox outbreaks are often associated with rural settings where people have close contact with wildlife. However, the recent outbreaks in urban settings, particularly in non-endemic countries, have raised concerns about the virus's potential to spread in more densely populated areas. Factors such as global travel, international trade of exotic animals, and deforestation have contributed to the increased incidence of human-monkey pox interactions [6].

1.3 The Global Health Threat

While monkey pox was long considered a localized issue in African countries, recent global events have highlighted its potential to become a significant public health threat. The first major outbreak outside of Africa occurred in 2003 in the United States, when imported African rodents infected prairie dogs that were being sold as pets. This outbreak resulted in over 70 cases of monkey pox in humans, marking the first recorded incidence of the virus in the Western Hemisphere. Although no deaths were reported in this outbreak, it demonstrated the ability of the virus to cross borders through the global wildlife trade [7]. More recently, in 2022, there were multiple outbreaks of monkey pox in Europe, North America, and other non-endemic regions. These outbreaks were significant because many of the infected individuals had no direct travel history to endemic areas, suggesting the possibility of sustained human-to-human transmission. This marked a turning point in the

understanding of monkey pox, moving from a disease primarily associated with animal reservoirs in rural Africa to one that can spread in urban populations far from its origin. The global response to these outbreaks has been swift, with public health agencies such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) issuing advisories, guidelines, and emergency measures to control the spread of the virus. Isolation of infected individuals, contact tracing, and the use of smallpox vaccines to contain the spread of monkey pox have been key strategies in managing these outbreaks [8].

1.4 Historical Outbreaks and Recent Trends

The history of monkey pox dates back to its first discovery in humans in 1970 in the Democratic Republic of Congo (DRC), during intensified efforts to eradicate smallpox. In the decades that followed, most monkey pox cases were confined to rural parts of Central and West Africa, particularly the DRC, Nigeria, and the Republic of the Congo. These areas remain hotspots for the virus, with thousands of cases reported annually, often linked to human-wildlife interactions and inadequate healthcare infrastructure. The case-fatality rate of monkey pox varies depending on the clade and the healthcare system's capacity to manage infections [9]. For the Central African clade, the mortality rate has been estimated at 10-11%, while the West African clade tends to have a much lower case-fatality rate of about 1-3%. Mortality is generally higher in young children, pregnant women, and individuals with compromised immune systems. In 2022, a notable shift occurred in the epidemiology of monkey pox, with outbreaks reported in countries such as the United Kingdom, Spain, Portugal, and the United States. This raised concerns about the virus's potential for widespread transmission in densely populated, urban settings. These outbreaks were not linked to animal exposure but were believed to have been transmitted between humans, marking a change in the pattern of monkey pox transmission. The exact mechanisms of this shift remain under investigation, but the potential for monkey pox to spread in non-endemic regions has heightened global awareness and urgency in addressing the virus [10].

1.5 Significance of the Review

Understanding the epidemiology, clinical features, diagnosis, and management of monkey pox is essential for controlling and preventing future outbreaks. This review aims to provide a detailed analysis of the virus and its impact on both endemic and non-endemic regions. As the world becomes increasingly interconnected, the threat posed by zoonotic diseases like monkey pox cannot be underestimated. This review will delve into the factors contributing to the virus's resurgence, including the role of deforestation, global travel, and the decline in immunity due to the cessation of the smallpox vaccination program. It will also explore how the international community can collaborate to strengthen surveillance, improve diagnostic capacity, and develop more effective vaccines and treatments [11].

1.6 Scope of the Paper

The scope of this review encompasses an examination of the epidemiological trends of monkey pox, with a particular focus on recent outbreaks in non-endemic regions. It will analyze the clinical manifestations of the disease, ranging from mild skin lesions to severe complications such as encephalitis. The review will also cover the current diagnostic tools used to confirm cases of monkey pox, as well as the challenges in distinguishing it from other pox-like illnesses. Furthermore, the paper will address the management of monkey pox, including supportive care for affected individuals, the use of antiviral drugs in severe cases, and the role of vaccines in controlling outbreaks. Special attention will be given to the lessons learned from the recent global outbreaks and how these can inform future public health strategies [12].

1.7 Pathophysiology of monkey pox

Following the entry of the monkey pox virus through any route (such as the oropharynx, nasopharynx, or intradermal exposure), the virus initially circulates at the site of infection before spreading to nearby lymph nodes. An early viremia triggers the transmission of viruses and organ transplantation. This phase is known as the incubation period, typically lasting between seven and fourteen days, although it can extend up to 21 days. Prior to the emergence of lesions, patients may experience 1-2 days of prodromal symptoms, including lymphadenopathy and fever due to secondary viremia. Individuals who are currently symptomatic may be contagious. Oropharyngeal lesions can lead to the development of

skin lesions, and serum antibodies usually become detectable once these lesions appear. Additional details regarding the rash are available in the History and Physical section [13]. The monkey pox virus is believed to have multiple transmission routes, as illustrated in Figure 2, all related to direct exposure to infected individuals or animals. While human infections have been associated with animal contact, identifying the specific animal interactions that result in cases can be challenging in regions where bushmeat from various species is frequently hunted or consumed [14]. The transmission modes illustrated in Figure 2 are included in the list of risk factors for monkey pox infection outlined by Bunge et al., despite the precise mechanisms of transmission remaining unclear. Notably, during the ongoing monkey pox pandemic, it has been observed that men who have sex with other men are at a higher risk of contracting the disease. The World Health Organization (WHO) has indicated that while it is not confirmed if monkey pox is contagious, shared living spaces or the use of dishes that have been in contact with an infected person are thought to increase the risk of viral transmission among household members [15].

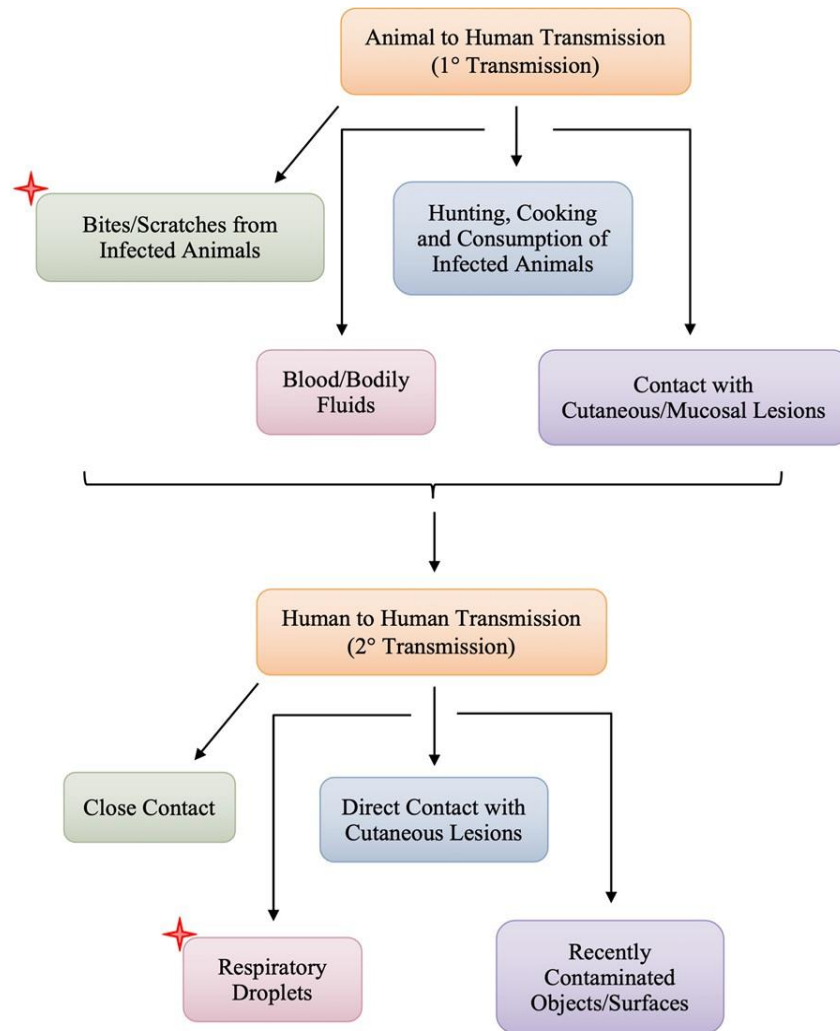


Figure 1: Pathophysiology of monkey pox

Chapter 2

Purpose of the study

2. Purpose of the study

The purpose of this clinical review is to provide a comprehensive analysis of the current knowledge on the epidemiology, clinical features, diagnosis, and management of the

Monkey pox virus (MPXV). With the increasing global concerns surrounding zoonotic diseases, including recent outbreaks of Monkey pox, this review aims to consolidate key information to better understand the virus, its transmission patterns, clinical presentation, and diagnostic methods. Additionally, this review will explore the available therapeutic and preventive measures to manage Monkey pox infections effectively, highlighting gaps in knowledge and areas for further research. By offering a well-rounded perspective, this article aims to support healthcare professionals, researchers, and policymakers in developing strategies to control the spread of the virus and improve patient outcomes.

Chapter 3

Literature Review

3.1 Literature Review Analysis

1:

Monkeypox, a re-emerging zoonotic disease caused by the Monkeypox virus (MPXV), has drawn global attention due to its recent outbreaks and potential for human-to-human transmission. This review article provides a comprehensive overview of the virus's epidemiology, clinical manifestations, diagnostic techniques, and management strategies. We discuss the global distribution of Monkeypox, focusing on the factors influencing its transmission, including close contact and reservoir hosts. The clinical presentation of the disease, ranging from mild rash to severe systemic involvement, is analyzed in detail. Additionally, this review highlights diagnostic advancements, from polymerase chain reaction (PCR) to serological tests, and outlines treatment and preventive measures, including antiviral therapies and vaccination strategies. By consolidating current knowledge, this review aims to guide future research and improve clinical outcomes in managing Monkeypox outbreaks [16].

Analysis 2:

Monkeypox, an emerging viral zoonosis, poses significant public health concerns, particularly in light of its increasing geographical spread beyond endemic regions. This clinical review synthesizes the latest research on the epidemiology, clinical presentation, diagnosis, and management of Monkeypox virus (MPXV). It examines the virus's natural reservoirs, transmission dynamics, and risk factors contributing to outbreaks. The clinical spectrum of Monkeypox, characterized by febrile rash illnesses, is discussed, alongside the challenges of differential diagnosis. Emphasis is placed on current diagnostic tools, including molecular and immunological assays, and management strategies, ranging from supportive care to experimental antiviral therapies. Preventive measures, such as vaccination, are also evaluated, with recommendations for controlling future outbreaks. This review serves as a resource for healthcare professionals in addressing Monkeypox in both endemic and non-endemic settings [17].

Analysis 3:

With the increasing incidence of Monkeypox outbreaks across various regions, understanding its epidemiological and clinical profile is critical. This review provides an in-depth analysis of the epidemiology, clinical features, diagnosis, and management of the Monkeypox virus (MPXV). It explores the virus's transmission patterns, environmental factors contributing to its spread, and the evolving epidemiological landscape. Clinical manifestations, ranging from mild skin lesions to severe complications, are discussed alongside diagnostic challenges and advancements in molecular testing. The review also covers management strategies, focusing on antiviral treatments and supportive care, while discussing the role of vaccination in preventing future outbreaks. This article aims to consolidate current knowledge to better equip healthcare providers in managing and controlling Monkeypox effectively [18].

Analysis 4:

Monkeypox, an orthopoxvirus infection, has recently garnered significant attention due to its potential for widespread transmission. This review article aims to present a comprehensive summary of the epidemiology, clinical features, diagnostic techniques, and management options for the Monkeypox virus (MPXV). The article details the virus's zoonotic origins, transmission routes, and epidemiological trends, with a focus on outbreaks outside endemic regions. Clinical manifestations are examined, highlighting common symptoms such as fever, rash, and lymphadenopathy, as well as severe complications. The review evaluates the diagnostic accuracy of current testing methodologies, including PCR and serological assays. Management approaches, including antiviral therapies, symptomatic treatment, and preventive vaccination, are discussed with an emphasis on improving patient outcomes and controlling the spread of the virus. This review contributes to a better understanding of MPXV and its public health implications [19].

Analysis 5:

Monkeypox virus (MPXV), a zoonotic pathogen, has emerged as a growing public health concern with its potential to cause significant outbreaks beyond endemic areas. This clinical review aims to explore the epidemiology, clinical manifestations, diagnostic tools,

and management strategies related to MPXV. The review outlines the virus's transmission mechanisms, risk factors, and epidemiological trends, particularly in non-endemic regions. Clinical features, from mild cutaneous lesions to severe systemic illness, are discussed in detail, with attention to differential diagnosis and complications. Current diagnostic methods, including molecular and serological approaches, are evaluated for their effectiveness in early detection. Furthermore, the review addresses management strategies, including antiviral treatment options, supportive care, and preventive measures such as vaccination. By providing a comprehensive overview, this review seeks to enhance understanding of MPXV and inform future research and clinical practice in managing Monkeypox outbreaks [20].

Chapter 4

Methods and Materials

4.1 Data collection procedure

The review process was initiated in **June 2024** with a comprehensive search for relevant literature related to the epidemiology, clinical features, diagnosis, and management of the Monkeypox virus (MPXV). The following steps were followed:

- **Literature Search:** Relevant books, conference proceedings, peer-reviewed journal articles, and official guidelines were identified and sourced. Databases utilized include: ○ PubMed ○ Scopus ○ Google Scholar ○ Research Gate ○ Medline
 - **Search Keywords:** To ensure comprehensive coverage, various search terms were used, including:
 - "Monkeypox virus epidemiology" ○ "Clinical features of Monkeypox" ○ "Diagnosis of Monkeypox" ○ "Management of Monkeypox"
 - "Treatment options for Monkeypox" These search terms were applied across educational bibliographic databases and web-based search engines, aiming to gather recent and historical data on MPXV.
 - **Inclusion Criteria:** The search focused on studies published between **2000 to 2024** to ensure the inclusion of the most recent and relevant information. Both clinical case reports and research studies were included, as well as guidelines issued by health authorities such as WHO and CDC.
 - **Document Review:** Approximately **30 publications** were identified and evaluated for this review. Each publication was assessed for its scientific rigor, relevance, and contribution to the understanding of Monkeypox. Special attention was given to studies that provided clinical and epidemiological data, as well as research on diagnostic tools and treatment methodologies.
 - **Compilation of Data:** The collected data were systematically compiled using Microsoft Word for ease of organization and editing.
-

4.2 Data Analysis Strategy

To synthesize and analyze the gathered information, the following approach was taken:

- **Data Summarization:** The collected data were organized into thematic categories based on the study's objectives: epidemiology, clinical features, diagnostic tools, and management strategies.
- **Qualitative Analysis:** Qualitative assessment was conducted to summarize and compare findings across multiple studies. Key trends in epidemiological data, common clinical manifestations, and diagnostic methods were identified and documented.
- **Data Presentation:** All statistical data regarding case numbers, mortality rates, and diagnostic test sensitivity/specificity were processed and presented using **Microsoft Excel** to facilitate visual representation (e.g., graphs, tables).
- **Review and Refinement:** The collected and synthesized data were reviewed iteratively to ensure clarity and precision. This final review included the refinement of the manuscript to ensure scholarly quality.

Chapter 5

Results & Discussion

5.1 Risk factor of Monkeypox

The resurgence of Monkeypox in recent years has highlighted several key risk factors that contribute to the spread of the virus. Understanding these factors is critical for

implementing effective control measures. Some of the primary risk factors associated with Monkeypox include:

1. Human-to-Human Transmission

Human-to-human transmission occurs primarily through close physical contact with infectious lesions, body fluids, respiratory droplets, or contaminated materials such as bedding or clothing. The following factors increase the risk of transmission [[21]:

- **Close Contact:** Physical contact with an infected person, especially during caregiving, sexual contact, or living in the same household, increases the likelihood of spread.
- **Healthcare Settings:** Healthcare workers are at heightened risk due to potential exposure during the treatment of infected patients without adequate protective measures.
- **Dense Urban Areas:** High population density facilitates transmission in urban settings, particularly when individuals live in close quarters [22].

2. Zoonotic Transmission

Monkeypox is primarily a zoonotic disease, meaning it is transmitted from animals to humans. Key risk factors include:

- **Exposure to Infected Animals:** Handling, hunting, or eating bushmeat, particularly in endemic regions, exposes individuals to the virus carried by rodents or primates.
- **Deforestation and Habitat Loss:** As humans encroach on wildlife habitats, the frequency of human-animal interactions increases, raising the risk of zoonotic transmission.
- **Wet Markets and Animal Trade:** The sale and trade of exotic animals, particularly in wet markets, have been identified as points of exposure to infected wildlife [23].

3. Immunocompromised Individuals

People with weakened immune systems, such as those with HIV/AIDS, undergoing chemotherapy, or on immunosuppressive drugs, are more vulnerable to severe illness from Monkeypox. The risk of complications is higher in this group due to their reduced ability to mount an effective immune response [24].

4. Lack of Vaccination (Post-Smallpox Era)

The cessation of smallpox vaccination programs has led to reduced population immunity to orthopoxviruses, including Monkeypox. Individuals born after the global eradication of smallpox in 1980 are particularly at risk, as they have not received the smallpox vaccine, which offers cross-protection against Monkeypox.

5. International Travel and Globalization

With increased international travel, there is a greater risk of Monkeypox spreading to nonendemic regions. Travelers returning from areas with active outbreaks may unknowingly carry the virus, leading to potential outbreaks in previously unaffected countries.

6. Poor Sanitation and Healthcare Infrastructure

In regions with poor sanitation and inadequate healthcare infrastructure, controlling the spread of infectious diseases becomes more challenging. Limited access to personal protective equipment (PPE), clean water, and hygiene practices increases the risk of transmission [25].

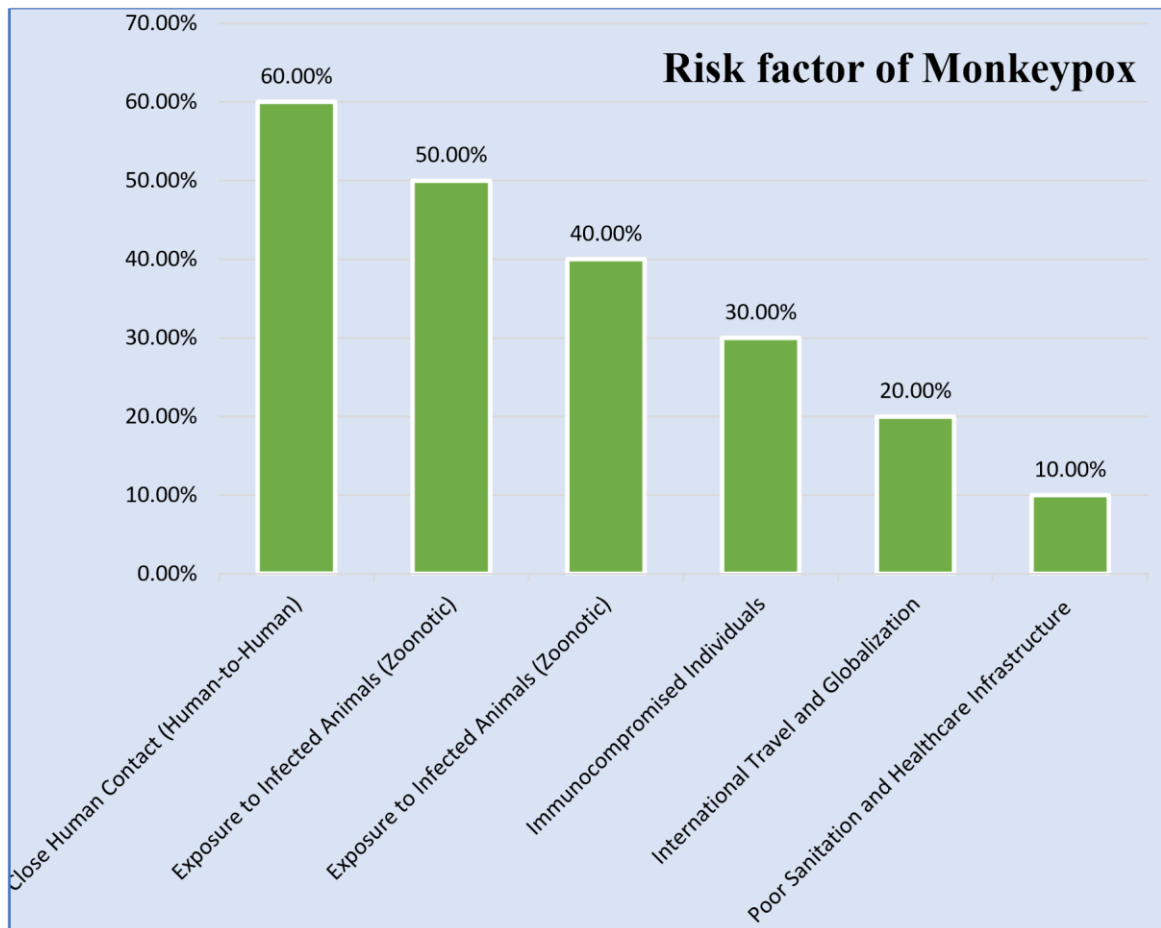


Figure 2: Graphical representation of Risk factor of Monkeypox

5.2 Transmission of Monkeypox

The transmission of the Monkeypox virus (MPXV) occurs through both zoonotic and human-to-human pathways, making it a versatile and challenging pathogen to control. The results of various studies highlight the mechanisms and contributing factors that facilitate the spread of the virus.

1. Zoonotic Transmission

Monkeypox is primarily a zoonotic disease, originating from animals and transmitted to humans. The natural hosts of the virus are believed to be small mammals, particularly rodents, with evidence suggesting that certain species, such as African squirrels, dormice, and Gambian pouched rats, are reservoirs for the virus. Human infection occurs through:

- **Direct Contact with Infected Animals:** Handling or consuming bushmeat from infected animals is a significant mode of transmission, especially in endemic areas of Central and West Africa. Animal bites, scratches, or the handling of bodily fluids from infected animals can introduce the virus to humans.
- **Indirect Contact:** Contaminated surfaces, materials, or fomites such as bedding or cages used for infected animals can also serve as sources of infection. People involved in the wildlife trade or those living near forests with wildlife reservoirs are at increased risk [26].

2. Human-to-Human Transmission

Once the virus enters the human population, human-to-human transmission becomes a primary driver of outbreaks. The most common methods of transmission include:

- **Close Physical Contact:** Transmission occurs through direct contact with skin lesions, body fluids, or respiratory secretions from an infected person. This is particularly relevant during caregiving, within households, and in healthcare settings where contact with infected individuals is frequent.
- **Respiratory Droplets:** Although less common, Monkeypox can spread via large respiratory droplets. This type of transmission typically requires prolonged face-to-face contact, which is why household members and healthcare workers are at high risk.
- **Fomites:** Contaminated objects, such as clothing, bedding, and personal items of an infected individual, can harbor the virus and spread it to others who come into contact with these materials. This form of transmission emphasizes the need for strict hygiene and disinfection practices in outbreak areas [27].

3. Transmission in Healthcare Settings

Healthcare-associated infections (HAIs) are a significant concern during Monkeypox outbreaks. Inadequate use of personal protective equipment (PPE) or improper infection control protocols can lead to the spread of the virus among healthcare workers. Studies indicate that several cases of Monkeypox transmission to healthcare workers have been

documented during outbreaks, particularly in facilities where the necessary preventive measures were not implemented effectively [28].

4. Sexual Transmission

While Monkeypox is not traditionally classified as a sexually transmitted infection (STI), recent evidence from outbreaks outside endemic regions has shown cases where the virus was potentially transmitted through sexual contact. Lesions found in the genital and perianal regions of some patients, along with reports of transmission in sexual networks, have raised the possibility that intimate physical contact, especially during sexual activities, may contribute to the spread of the virus [29].

5. Environmental Factors and Transmission

Environmental factors such as deforestation, wildlife habitat loss, and climate change have increased human-wildlife interactions, thereby facilitating zoonotic spillovers of the Monkeypox virus. Additionally, globalization, urbanization, and increased international travel have allowed the virus to spread beyond its endemic regions, introducing it to populations with no prior exposure or immunity [30].

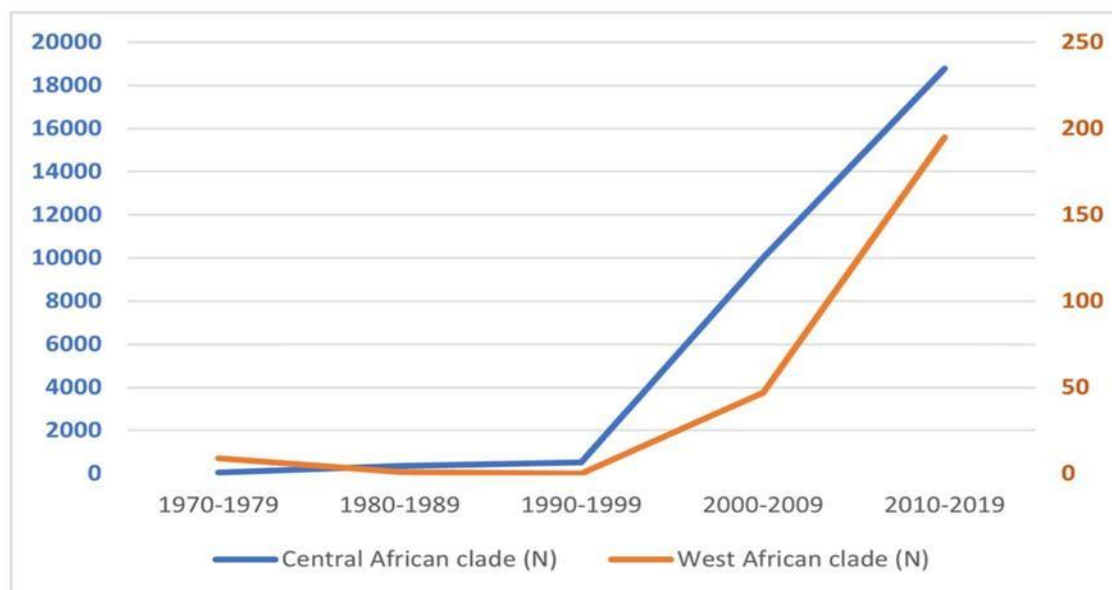


Fig 7. Evolution of number of cases per clade. For 2000–2019, the numbers for the Central African clade are based largely on suspected cases, per the reporting system by the Democratic Republic of the Congo.

Figure 3: Outbreak of Monkeypox

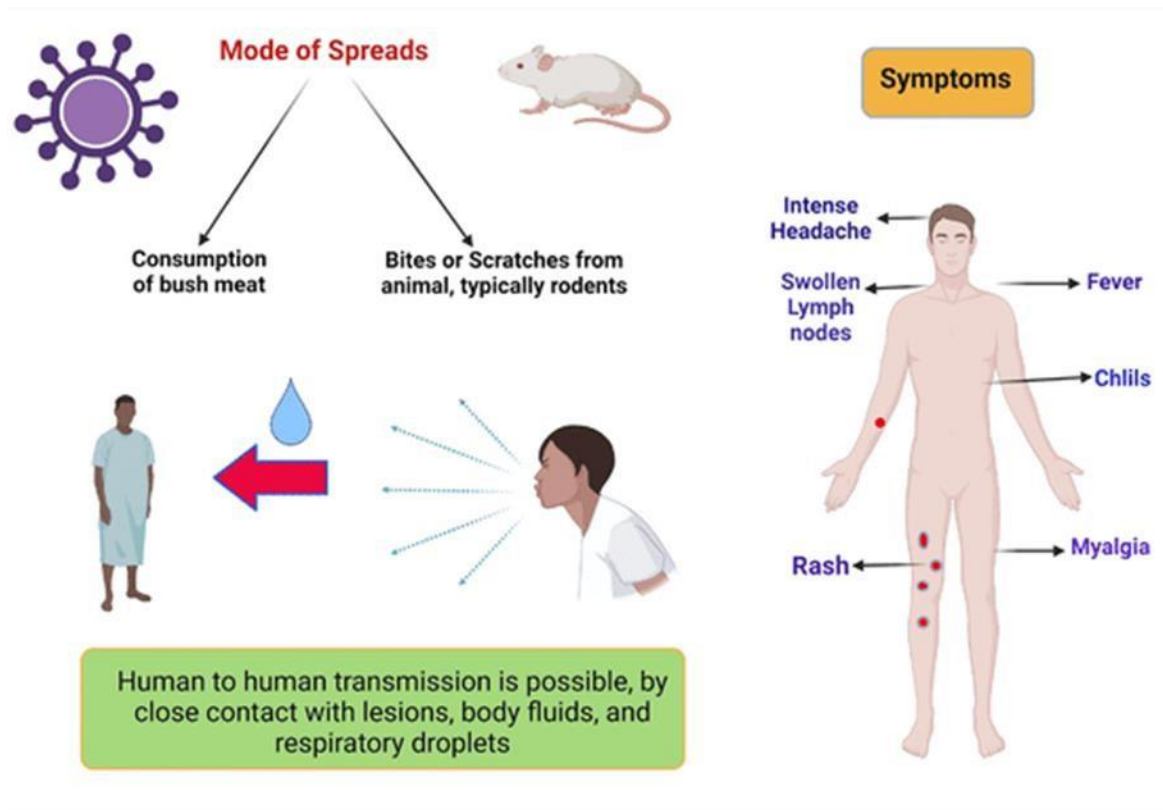


Figure 4: The mode of transmission and symptoms of Monkeypox

5.3 Privilege of Monkey pox

The concept of "privilege" related to monkeypox might refer to certain advantages or protections that some individuals or groups may have in the context of a monkeypox outbreak. This could involve factors such as access to healthcare, vaccines, or public health interventions. Here are some areas where "privilege" may play a role:

1. Access to Healthcare:

People in wealthier countries or those with better healthcare systems may have quicker access to diagnosis, treatment, and management of monkeypox. Those without insurance or in regions with limited healthcare infrastructure may face delays or difficulties in getting proper care [31].

2. Vaccination Availability:

Some populations may have greater access to vaccines due to geographic, economic, or political factors. In previous outbreaks, vaccines were often prioritized for high-risk groups in developed countries, leaving other populations with less protection.

3. Public Awareness and Education:

Communities with access to timely and accurate health information may be better equipped to take preventive measures against monkeypox. Privileged groups often have more resources to access public health messaging through reliable channels, while marginalized communities might struggle with misinformation [32].

4. Social and Economic Impact:

Wealthier individuals can often afford to take time off work or isolate if needed during a monkeypox outbreak, whereas people with lower incomes may lack the financial cushion to stop working or afford necessary medical supplies. Privilege here can influence the ability to follow public health guidelines.

5. Discrimination and Stigma:

Certain groups may face less stigma if they contract the virus. For example, in some cases, outbreaks of diseases like monkeypox have been disproportionately associated with specific communities, such as LGBTQ+ populations. Privilege can shield individuals from such discrimination, while others may experience heightened marginalization [33].

Aspect of Privilege	Description	Who Benefits	Who May Be Disadvantaged
Access to Monkeypox Testing	Easier access to testing facilities, timely diagnosis, and follow-up care.	Individuals in developed countries or urban areas with robust healthcare infrastructure	People in rural or underserved regions with limited healthcare access
Availability of Monkeypox Vaccines	Prioritization of certain populations or regions for vaccine distribution based on risk, resources, or government policies.	Residents of wealthier nations, high-risk groups (healthcare workers, certain communities)	People in lower-income countries or regions with limited vaccine supplies

Access to Treatment & Medication	Ability to afford antiviral treatments, supportive care, or hospitalization when needed.	Individuals with health insurance or financial resources to afford treatment	Uninsured or underinsured individuals, or those in countries with limited treatment options
Public Health Messaging & Education	Access to reliable and upto-date information on how to prevent and manage monkeypox infections.	Populations with access to public health campaigns, internet, and healthcare	People without internet access or in areas with less public health outreach
Workplace and Economic Impact	Ability to take time off from work for isolation or treatment without financial penalty or job insecurity.	Higher-income individuals with flexible jobs, salaried employees with paid sick leave	Low-income individuals, those in informal work or without access to sick leave
Social Support & Community Resources	Access to community and social support systems (e.g., mental health, social services) during quarantine or illness.	Individuals in strong, resourceful communities with support networks	Those living in isolation, marginalized groups with limited community resources
Reduced Stigma and Discrimination	Lower likelihood of facing stigma, particularly if they are outside communities disproportionately affected (e.g., LGBTQ+ populations).	Non-targeted groups or those with greater social acceptance	LGBTQ+ communities, individuals facing social marginalization or blame for disease spread

Table 1: Privilege of Monkey pox

5.4 Management of Monkeypox

The management of monkeypox involves various approaches aimed at controlling the spread of the virus, treating symptoms, and preventing severe complications. Here's a breakdown of the key aspects of managing monkeypox:

1. Isolation and Infection Control

- **Isolation of Infected Individuals:** Patients diagnosed with monkeypox should be isolated to prevent the spread of the virus. This involves staying in a separate room, minimizing contact with others, and using personal protective equipment (PPE) for caregivers [34].

- **Hospital Precautions:** For hospitalized patients, healthcare workers must use protective measures such as gloves, masks, and gowns. Standard, contact, and droplet precautions should be followed.

2. Symptomatic Treatment

- **Fever and Pain Management:** Common symptoms like fever, muscle aches, and headaches can be managed with over-the-counter medications such as paracetamol (acetaminophen) or ibuprofen.
- **Skin Lesion Care:** Itching or discomfort from monkeypox rashes and lesions can be alleviated using antiseptic ointments, calamine lotion, or other skin-soothing treatments. Keeping lesions clean and dry helps prevent secondary infections.
- **Hydration and Nutrition:** Maintaining good hydration and nutrition is essential for recovery, especially in cases where eating or drinking might be difficult due to lesions in the mouth or throat [35].

3. Antiviral Treatments

- **Tecovirimat (TPOXX):** Tecovirimat, an antiviral drug, is approved for treating monkeypox and other orthopoxvirus infections. It has shown effectiveness in reducing symptoms and the duration of illness, especially in severe cases.
- **Cidofovir and Brincidofovir:** These antiviral medications have been used experimentally to treat severe monkeypox cases. They inhibit viral DNA replication and are generally reserved for high-risk or complicated cases [36]

4. Vaccination

- **Post-exposure Prophylaxis (PEP):** Vaccines can be administered to high-risk individuals who have been exposed to the virus to prevent the onset of monkeypox. The smallpox vaccine (Jynneos/Imvamune/Imvanex) is commonly used as it provides cross-protection against monkeypox.
- **Pre-exposure Prophylaxis (PrEP):** Vaccination may also be provided to individuals at high risk of contracting the virus, such as healthcare workers, laboratory personnel, or close contacts of confirmed cases [37].

5. Monitoring and Follow-Up

- **Ongoing Monitoring:** Patients with monkeypox should be monitored for complications such as secondary bacterial infections, dehydration, or respiratory issues. This is especially important in vulnerable populations, including children, pregnant women, and immunocompromised individuals.
- **Psychosocial Support:** Given the stigma and isolation that can accompany monkeypox, patients may need mental health support to manage anxiety, stress, and depression [38].

6. Prevention Measures

- **Hygiene and Disinfection:** Regular handwashing with soap and water, disinfecting contaminated surfaces, and avoiding contact with infected individuals or animals are key to preventing transmission.
- **Use of PPE:** Caregivers and healthcare workers should use gloves, masks, and other protective equipment when in contact with infected individuals.
- **Avoiding Animal Transmission:** In endemic regions, avoiding contact with animals that may carry the virus (such as rodents or primates) and consuming only properly cooked animal products are important preventive measures [39].

7. Public Health Interventions

- **Contact Tracing:** Identifying and monitoring people who have had close contact with a monkeypox patient helps in early diagnosis and reduces the risk of further transmission.
- **Quarantine and Isolation Protocols:** Enforcing proper quarantine for exposed individuals and isolation for confirmed cases is crucial to limiting outbreaks.

8. Education and Awareness

- **Public Information Campaigns:** Governments and health organizations play a role in educating the public on symptoms, transmission routes, and prevention methods to minimize fear and stigma while promoting safe practices [40].

- **Community Support:** Ensuring that communities have access to accurate, sciencebased information and that support systems are in place for those affected is important in managing the overall impact of the disease.

Table 2: Treatments of Monkeypox virus

Symptom/Complication	Supportive Treatment
Respiratory distress/Bronchopneumonia	Oral/intravenous antibiotics for prophylaxis, nebulizer treatments, non-invasive ventilation (ex. CPAP)
Sepsis	Oral/intravenous antibiotics, supplemental oxygen, corticosteroids, insulin
Gastrointestinal/mouth and throat ulcers	Oral/intravenous antiemetic and antidiarrheal medications, oral/intravenous rehydration
Fever	Antipyretic medications, external cooling
Super infection skin	Oral/intravenous antibiotics, incision, and drainage, advanced wound management (ex. negative pressure wound therapy)
Inflammation/Lymphadenopathy	Oral/intravenous anti-inflammatory/analgesic medications
Corneal infection	Ophthalmic antibiotics/antivirals and corticosteroids

Table 3: Available vaccine for monkey pox

Vaccine Name	Type of Vaccine	Indication	Administ ration	Effectiveness
Jynneos (Imvamune/ Imvanex)	Live, nonreplicating viral vaccine (Modified Vaccinia Ankara - MVA-BN)	Pre-exposure and postexposure prophylaxis for monkeypox and smallpox. Recommended for high-risk groups (e.g., healthcare workers, close	Twodose series (subcutaneous, 28 days apart)	Provides strong protection against monkeypox. Similar to smallpox vaccination but with

		contacts of monkeypox cases).		
				fewer side effects.
ACAM2000	Live, replicating vaccinia virus vaccine	Pre-exposure and postexposure protection against smallpox and monkeypox. Primarily used in emergency settings.	Single dose (percutaneous using a bifurcated needle)	Provides effective protection against monkeypox.
LC16m8	Live, attenuated vaccinia virus vaccine	Originally developed for smallpox, it may provide protection against monkeypox in some settings.	Single dose	Likely provides protection against monkeypox but lacks widespread testing for this purpose.
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Chapter 6

Conclusion

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The resurgence of monkeypox, fueled by zoonotic and human-to-human transmission, presents significant global health challenges due to several contributing factors. Key epidemiological risks include close physical contact, healthcare exposure, zoonotic transmission from infected animals, and environmental changes such as deforestation and urbanization that bring humans into closer contact with wildlife. Human-to-human spread is heightened in densely populated and healthcare settings, underscoring the importance of strict infection control protocols, especially in high-risk environments. Clinical features of monkeypox, including characteristic rashes, fever, and lymphadenopathy, make it essential to distinguish monkeypox from other similar illnesses like smallpox and chickenpox. Accurate diagnosis relies on molecular tests such as PCR, which identify viral DNA in patient samples. Proper and prompt diagnosis is critical in preventing further transmission and ensuring timely management. Effective management of monkeypox includes isolating infected individuals, providing symptomatic care, and employing antivirals like Tecovirimat in severe cases. Vaccination efforts, especially with Jynneos and ACAM2000, offer protective measures for high-risk populations, both as post-exposure prophylaxis and pre-exposure prevention in certain groups. However, vaccination access and availability remain challenges, particularly in low-resource settings. In addressing monkeypox, a multifaceted public health response is essential, involving not only healthcare interventions but also public education, access to care, and equitable vaccine distribution. Increased awareness and resource allocation can support containment efforts, while research and monitoring will be essential for addressing evolving transmission dynamics and improving preventative strategies. Continued investment in healthcare infrastructure and public health readiness will help manage future outbreaks and reduce the risk of widespread transmission.

Chapter 7

Reference

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