

# The Current Monkeypox Outbreak: Highlighting Gaps in Approach to Disease in Endemic vs. Non-Endemic Countries

Hira Anas Khan<sup>1</sup>, Parvathy Mohanan<sup>2</sup>, Zainab Syyeda Rahmat<sup>1</sup>, Una Kanor<sup>3</sup> and Sameer Saleem Tebha<sup>4\*</sup>

<sup>1</sup>Faculty of Medicine, Dow University of Health Sciences, Karachi, Pakistan

<sup>2</sup>Faculty of Medicine, Medical University, Sofia, Bulgaria

<sup>3</sup>Department of Internal Medicine, Bogomolets National Medical University, Kyiv, Ukraine

<sup>4</sup>Department of Neurosurgery and Neurology, Jinnah Medical and Dental College, Karachi, Pakistan

## Abstract

The appearance of monkeypox cases in non-endemic regions of the world has sparked concern in the global community, raising questions about prior undetected spread as well as suspicion of changing epidemiology. However, Africa has contained this burden for decades without much attention on global forums. Contributing factors in Africa include socioeconomic and political turmoil which have led to disturbance of habitats of various host species, with larger populations at risk of transmission, whereas the current outbreak in other countries has shown human-to-human transmission, mostly *via* sexual contact with infected individuals. While it is important to deal effectively with the situation at hand, prompt and equitable efforts are needed to control the spread of disease in endemic areas in the long term. Only then is it possible to prevent such multi-country outbreaks in the future.

**Keywords:** Monkeypox, endemic disease, infectious diseases, endemic, human to human transmission, public health crisis.

## INTRODUCTION

Monkeypox is a zoonotic viral infection transmitted through contact with the blood, bodily fluids, or injuries of infected animals; human contaminations have been recorded through exposure to monkeys, Gambian giant rats, and squirrels with rodents being the most likely reservoir of infection. The clinical presentation includes fever, headache, swelling of the lymph nodes, back pain, muscle aches, and fatigue. There may be skin rashes at the beginning of the infection on the face spread to other parts of the body and gradually evolve into pustules and crusts. Rarely and more recently, have neurological manifestations such as panencephalitis been noted in severe cases. There are currently no specific medicines or vaccines for monkeypox virus disease, but prior vaccinia inoculation may decrease the impact of the disease [1, 2].

Monkeypox was first detailed in 1958 when two outbreaks of a pox-like infection happened in colonies of monkeys kept for investigation, thus the title 'monkeypox.' The primary human case of monkeypox was recorded in 1970 within the Law-based Republic of the Congo (DRC) amid a period of intensified effort to eliminate smallpox [3, 4]. Since that point, monkeypox has been detailed in individuals in a few other central and western African countries: Benin, Cameroon, Central African Republic, Cote d'Ivoire, the Democratic Republic of the Congo, Gabon, Liberia, Nigeria, Republic of the Congo, South Sudan, and Sierra Leone, with the average case fatality ratio (CFR) ranging from 0-11% [4]. The larger

part of these infections is in the Democratic Republic of the Congo with 760 confirmed cases reported between November 2005 to 2007 and since 2016, more than 1000 cases of monkeypox per year have been confirmed in DRC [5, 6]. Some of the recent outbreaks in Africa are in Cameroon, from 30 April to 30 May 2018 and this outbreak was declared to be ceased with one confirmed and 15 suspected cases and no deaths. Nigeria had an outbreak from 4<sup>th</sup> September lasting till 9<sup>th</sup> December 2017. This outbreak was declared over with 172 suspected and 61 confirmed cases and no deaths were reported. In the Central Africa Republic, the outbreak began on 4<sup>th</sup> September and lasted till 7 October 2016. There were 26 suspected and three confirmed cases with one death reported [1].

Monkeypox had been neglected in Africa for years until cases began to rise in non-endemic countries. Transmission of monkeypox virus happens through large respiratory droplets, close or direct contact with skin injuries, and possibly through contaminated fomites. Young children and immunocompromised people, including people with human immunodeficiency virus (HIV) disease, have been reported to be at increased risk for severe outcomes. The solid probability of sexual transmission was supported by the discoveries of primary genital, anal, and oral mucosal lesions, which may represent the inoculation location [7]. Investigations of the epidemiology of the disease are progressing and most reported cases so far have been transmitted through sexual health or other health services in primary or secondary healthcare facilities and have included primarily, but not solely men who have sex with men (MSM) [8, 9]. Monkeypox virus DNA was detectable by PCR in seminal liquid in 29 of the 32

\*Corresponding author: Sameer Saleem Tebha, Department of Neurosurgery and Neurology, Jinnah Medical and Dental College, Karachi, Pakistan; Email: samtebha@gmail.com

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cases in which seminal liquid was tested further supports this hypothesis. However, whether semen is capable of transmitting disease remains to be investigated, since it is obscure whether the viral DNA recognized in these specimens was replication-competent [7]. Although the virus cannot be regarded as a sexually transmitted disease, a higher number of detected cases have been linked to sexual activities especially among the MSM population through mucosal contact. This phenomenon can be attributed to both behavioral and biological factors. Additionally, this puts HIV- gay-related immunodeficiency higher up on the list of risk factors given its association with the group in question. A lack of proper research in this regard resulting in insubstantial proof means the effectiveness of preventive measures and overall motivation in people to implement them may be insufficient [10]. Additionally, seasonal and environmental variations, epigenetics, and the ability to evade host T-cell attacks have also been shown to play a role in viral replication and spread [11, 12].

From 13 May 2022 to 8 June 2022, 1285 laboratories confirmed cases of monkeypox have been reported to or identified by WHO from 28 non-endemic Member States over four WHO regions including Portugal, Spain, and the United Kingdom having the highest burden of monkeypox cases. Since the beginning of the year, there have been 1536 suspected cases of monkeypox with 72 deaths reported across 8 African countries [13]. The sudden and unforeseen emergence of monkeypox simultaneously in several non-endemic countries suggests that there might have been undetected transmission for an unknown duration of time leading to recently amplified events making the exact epidemiology of such outbreaks unclear. As a result a lack of information on why and how transmission occurred could hinder the development and implementation of preventive measures, detection of possible mutations in the virus, and subsequent complications in disease [7].

On August 4<sup>th</sup>, 2022, the United States declared monkeypox to be a public health emergency, and the U.S. Department of Health and Human Services has allocated over 1.1 million vaccines throughout the country to combat the spread of the infection [14]. More recently, the International Health Regulations Committee met in February of 2023, and concluded that monkeypox was still a public health emergency of “International Concern” [15].

## CHALLENGES

### Non-Endemic Regions

The recent surge of monkeypox cases was the first large-scale multi-country outbreak in non-endemic

regions across the globe, such as Canada, France, and the United Kingdom [16]. The expanding monkeypox episode is posing colossal communication challenges for public well-being specialists keen to keep this virus from becoming entrenched as a human pathogen. Transmission between sexual partners, due to intimate contact amid sex with infectious skin lesions appears as the mode of transmission among men who have sex with men (MSM) [9]. Given the unusually tall recurrence of human-to-human transmission watched on this occasion and the likely community transmission without a history of traveling to endemic regions, the probability of further spread of the infection through near contact, for cases amid sexual activities, is high. The link between sexual transmission and disease prevalence in non-endemic areas could potentially help in prevention by encouraging at-risk groups, especially MSM, to implement precautionary measures such as the use of condoms [7].

Stress and misinformation can be a concern if healthcare workers do not communicate with exceptional clarity to the public on the characteristics of the disease and the poignance of vaccination campaigns. As this outbreak of monkeypox expands, the infection has an exceptional opportunity to set up itself in non-African species, which might infect people and give a more prominent opportunity for more perilous variations to evolve [17]. Monkeypox causes a rash that is similar to those in other diseases, like herpes, syphilis, and chickenpox. It will be crucial to distinguish monkeypox from these diseases which can all cause rashes similar in appearance to monkeypox, bearing in mind the possibility of variation in symptoms between individuals, to avoid misdiagnosis [18]. The most common methods of testing include PCR and ELISA on collected samples. However, the effectiveness of serological testing may be limited in suspected individuals with low immune responses. The process also requires highly specific primers for accurate detection which may be unavailable in non-endemic countries. The situation also calls into question the availability of highly skilled lab technicians due to their time-consuming and labor-intensive nature. Recently, biosensors have emerged as better options due to their high sensitivity, specificity, automation, and portable nature as seen by their use in the detection of various viruses. However, it would require training and monetary capital [19].

Unpreparedness among the healthcare community in non-endemic countries owing to a lack of exposure to this disease, as well as the public poses a risk for such situations.

## Endemic Regions

In comparison, monkeypox has had a regular incidence in various African countries for decades, especially in locations with or near large semi-deciduous forest cover, which makes optimum breeding and housing conditions for rope squirrels, a notable reservoir for the monkeypox virus [20]. In African countries endemic to monkeypox, recent spikes in reported cases may be due to deforestation, which enables closer contact of humans with infected animal species.<sup>5</sup> In addition, the migration of people due to political instability may have led to increased contact with infected wild animals [21]. The resultant poverty from the mass displacement of people and reduced outlets of nutritional intake, also further exacerbated during COVID-19, may have also resulted in more people coming into contact with wild infected animals, to use as an alternate protein source [22].

In addition to the impact of abundant host species of the virus, a lack of effective surveillance particularly in areas afflicted by war and rural areas has resulted in an understatement of case counts [23]. The COVID-19 pandemic also greatly affected surveillance, coupling this factor with the socioeconomic and health-related implications of COVID-19 [24].

The burden of prevalent diseases such as HIV, tuberculosis, and other infectious diseases on the poor healthcare system in most countries of Africa which are endemic for monkeypox makes the situation more complicated due to inadequate medical resources to deal with the impacts of such co-morbidities on overall health, [25] especially in individuals suffering from monkeypox.

### MONKEYPOX: AFRICA VS. THE WORLD

The current outbreak of monkeypox in non-endemic countries has highlighted an important aspect of disease management: the disparity in approach between endemic and non-endemic countries. While the surge in cases raised eyes, and rightly so, it is important to note that countries such as the Democratic Republic of Congo, Nigeria, and many others were suffering for years with high case counts and subsequent deaths without active eradication plans or external aid from other, more stable parts of the world. Shockingly, it was only until the recent multi-country outbreak that many first became aware of the threat of monkeypox [26, 27].

Ever since the first case was reported in the UK on May 7, 2022, WHO has taken an active part in helping countries effectively manage the spread. On May 20<sup>th</sup>, 2022, a meeting of the Strategic & Technical Advisory Group on Infectious Hazards with Pandemic and Epidemic Potential [STAG-IH]) was held to discuss strategies to tackle the outbreak [28]. While it was

stated that mass vaccination is not a requirement now, countries are looking into using stockpiled smallpox vaccines for exposed populations, as well as ordering new stock for future use, owing to its 85% effectiveness against monkeypox as well [3]. Ever since the outbreak, Britain has successfully vaccinated more than 1,000 at-risk individuals and ordered 20,000 more doses, while the US has released 700 doses in affected states.<sup>26</sup> However, the 31 million doses pledged by WHO members for African countries were never used [29]. Another advantage in first-world countries facing the monkeypox epidemic is effective surveillance which is important in containing the spread, as well as research facilities that can help identify specific strains and their vulnerabilities to certain drugs.

A contrasting picture is seen in third-world African countries. After the eradication of smallpox in 1977 and the consequent discontinuation of smallpox vaccination, large populations were left at risk of infection due to waning cross-protection [4]. Given the poor economic conditions, vaccine availability was scarce, unlike the situation in first-world countries facing the monkeypox threat today. Subsequently, in 2016, only 10.1% of the population was vaccinated against smallpox [30]. Additionally, the US and UK are employing an FDA-approved vaccine produced by Bavarian Nordic which is unavailable in endemic countries today [27].

Inequity is also heavily reflected through the lack of effective drugs for monkeypox management in Africa [20] whereas the Strategic National Stockpile in the US currently has antiviral drugs such as Tecovirimat (TPOXX), Brincidofovir (CMX001), and cidofovir (Vistide) which may be useful in managing cases [31]. To bridge this gap, SIGA in collaboration with Oxford University had pledged to provide 500 tecovirimat doses free of cost for the treatment of monkeypox in the Central African Republic in 2021 [32].

Without significant intervention by the global community during situations of humanitarian crises that sped up the transmission, frequent outbreaks in endemic countries were inevitable. WHO has been working in various affected countries to improve surveillance, diagnosis, treatment methods, community-level awareness, and professional training to curtail monkeypox spread and associated mortality [33]. However, endemic countries are still showing case counts significantly higher than other parts of the world, highlighting the need for more rigorous efforts.

### RECOMMENDATIONS

Considering the socioeconomic, political, and geographical differences between endemic African countries and non-endemic countries such as the US



and various European nations, appropriate infection control to mitigate this outbreak will require separate and equitable strategies. A key factor in prevention is case surveillance and contact tracing. International health authorities recommend the use of vaccinations in close contact with infected individuals and those with occupational exposure [34]. Adequate use of vaccinations can curb outbreaks in endemic and non-endemic countries and provide vast immunity. Since vaccinations against smallpox have proven to also provide immunity against monkeypox, the continuation of mass smallpox vaccinations could prove as an important infectious control measure [35]. Equipping dermatologists and general physicians through robust training to correctly diagnose monkeypox from other poxvirus infections and to provide adequate referral can reduce transmission and complications [36]. Exposed individuals can then be provided with the smallpox vaccine for cross-protection against monkeypox, prioritizing high-risk individuals such as exposed individuals, children under the age of 10, and those with co-morbidities such as immunodeficiency or other systemic disorders [37]. In addition, the WHO mentions the use of a new vaccine that has been approved against monkeypox and an antiviral agent that was initially licensed for smallpox but can now be used for treating monkeypox [35].

Although COVID-19 and monkeypox are different in terms of pathogenesis and manifestation, the various protocols advised during the COVID-19 pandemic such as reduced gatherings, regular handwashing as well as the blueprint of effective testing and subsequent hot-spot identification can prove extremely useful [38].

### Non-Endemic Regions

Multiple reports of recent monkeypox infections in non-endemic countries reveal that infected individuals had a history of sexually transmitted infections and had recent unprotected sexual encounters [39]. Therefore, a simple recommendation to reduce transmission of monkeypox in the short term is for individuals to reduce the amount of high-risk, unprotected sexual encounters, especially in non-endemic countries. Almost all individuals affected by monkeypox in non-endemic countries were MSMs, and the WHO has published a detailed pamphlet to provide accurate information for gay, bisexual, and other MSMs about their public health regarding monkeypox [40, 41].

The WHO reveals that the most significant risk factor in the transmission of monkeypox during human outbreaks is close contact with body fluids, contaminated materials, and lesions [41]. Therefore, proper isolation of infected individuals is key to preventing transmission

to close contacts and healthcare workers [40]. Since most monkeypox cases do not require hospitalization, the public must be adequately enlightened about proper self-isolation techniques. For example, the public should be aware that individuals with monkeypox are infectious until all lesions have crusted and new skin has appeared to replace fallen scabs [40]. Monkeypox can also be transmitted through respiratory droplets, with transmission requiring prolonged face-to-face contact, putting family members and healthcare workers at risk [42]. Therefore, HCWs managing a patient infected with monkeypox must exercise proper infection control measures including the use of PPEs, FFP2 or N95 respirators, and hand hygiene. Hospitalized patients should be isolated in a single room with a separate bathroom, and adequate ventilation, and HCWs using protective measures to reduce transmission [40].

### Endemic Regions

Vaccine availability will not be an issue for first-world countries, that are already ordering stocks or making stockpiled doses available to the public. However, African countries will require collaborations to effectively acquire, distribute, and administer vaccines within their populations, which has been a struggle in previous monkeypox surges in these countries.

Control of host species breeding and containment can prove to be useful in endemic countries with high populations of such animals through the re-establishment of lost habitats whilst limiting contact with humans. Education of the public in these areas to limit hunting and subsequent use of contaminated meats is also equally important, [5, 43] alongside the extension of foreign aid to boost nutrition in poor countries to prevent the need to turn towards these alternative protein sources. Facilitating the development of the agriculture sector and food animal breeding to meet food requirements can also prove to be beneficial in this regard [43].

It is also essential to direct attention towards at-home prevention strategies such as isolation and avoidance of shared utensils and clothing in case of suspected but undiagnosed infections, since this may help curb transmission at the grassroots level [38]. Lab confirmation of the virus can be made possible *via* improved research and testing facilities. With collaborative efforts, additional research focusing on the Congo Basin strain, responsible for most monkeypox-related deaths in DRC owing to its increased transmission and mortality rates compared to West African clade, [44]. can be useful in formulating better strategies. Introduction and maintenance of such facilities in countries lacking them can help track cases effectively as shown by joint efforts by the Ministry of

Health, INRB, and the US centers of CDC in DRC since 2010 [45].

Endemic countries also require attention towards disease management given the fact that monkeypox has led to many deaths, unlike the current epidemic. The provision of antiviral drugs such as brincidofovir and a prophylactic regimen can help improve the prognosis of monkeypox infection. Improved surveillance of prevalent immunocompromising diseases such as HIV and tuberculosis can also help assess risk levels for monkeypox-affected areas considering the impact of these comorbidities on prognosis.

### CONCLUSION

The monkeypox situation in Africa has deteriorated over the years due to a lack of surveillance, treatment options, and various socioeconomic reasons. Efforts must be made by the global superpowers in collaboration with WHO and other organizations to bring African countries at par with the rest of the world regarding research, medical facilities, and infrastructure to enable them to tackle diseases such as monkeypox effectively.

### CONSENT FOR PUBLICATION

Written informed consent was taken from the participants.

### CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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Declared none.

### AUTHORS CONTRIBUTION

Conceptualization: Sameer Saleem Tebha, Writing original draft: Hira Anas Khan, Parvathy Mohanan, Zainab Syyeda Rahmat, Una Kanor, Review and editing: Una Kanor and Sameer Saleem Tebha.

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