Mpox Case Investigation in Chitambo District, Zambia: Lessons from the First Reported Case in 2024

Daliso Ngulube[1,2,3], Benjamin Mubemba[1], Emmanuel Tembo[1,2], Lwito Mutale[1,2,4], Shadreck Mufwaya[4], Innocent Mwape[1], Doreen Shempela[1], Dabwitso Banda[1,2], Nyambe Sinyange[1,2]

[1]Zambia Field Epidemiology Training Program, Zambia National Public Health Institute, Lusaka, Zambia [2]Department of Public Health, University of Zambia, Lusaka, Zambia [3]Central Province Health Office, Ministry of Health, Kabwe, Zambia.

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Abstract

Mpox is a viral zoonotic disease with growing public health relevance in Africa. In October 2024, Zambia confirmed its first Mpox case in Chitambo District, involving a foreign truck driver with suspected cross-border and occupational exposure. Given Chitambo's strategic location along major transport routes, an investigation was conducted to assess potential community transmission and the district's outbreak preparedness.

A case report approach was used from October 14–19, 2024. Data were collected on the index case and 24 identified contacts using WHO and Zambia's IDSR protocols. Contact follow-up lasted 21 days. Genomic sequencing was performed to determine the virus strain, and a retrospective review of dermatological cases at two health facilities assessed undetected Mpox transmission. Timeliness of detection, notification, and response was evaluated using the 7-1-7 framework.

The index case, a 32-year-old male truck driver, exhibited rash symptoms consistent with Mpox. Among 24 contacts, 91.7% remained asymptomatic. Most contacts were young females (median age: 18.5 years). Genomic analysis confirmed Mpox Clade 1b. Dermatological case reviews found chickenpox and dermatitis as the most common diagnoses. The 7-1-7 evaluation showed case detection in 2 days, notification in 1 day, and full response within 6 days. However, challenges were noted in specimen handling (23.1% errors), delayed health-seeking behavior, and low risk perception.

While no community transmission was confirmed, this case highlights the role of mobile populations in Mpox spread. Strengthening surveillance, improving public awareness, and enhancing specimen handling and response capacity are critical for effective Mpox control in Zambia.

Keywords: Mpox, cross-border transmission, 7-1-7 framework,

Introduction

Mpox is a severe viral illness that affects humans, posing a risk of serious complications and even death (1). It is caused by the Mpox virus, belonging to the Orthopoxvirus family, which also includes the variola virus responsible for smallpox (2). The incubation period for mpox varies widely, with estimates ranging from 5 to 21 days. Recent studies have suggested a median incubation period of less than 10 days, with many cases presenting symptoms around 8 to 9 days post-exposure (3-5). In rare circumstances, the average incubation period can extend up to 21 days (5,6).

Historically, Mpox has been found in rural areas of Central and West Africa, especially near tropical rainforests were zoonotic transmission is suspected (7). The global epidemiological landscape has undergone a significant shift, with widespread outbreaks reported across over 94 countries, driven by international travel and human-to-human transmission (8). As of September 13, 2024, the Africa CDC reported 26,544 cases and 724 deaths across 15 African Union member states, with a 2.73% case fatality rate (9). The World Health Organization (WHO) initially declared Mpox a Public Health Emergency of International Concern (PHEIC) on July

23, 2022, in response to a surge in outbreaks (10,11). However, despite this initial declaration, the outbreak continued to escalate, prompting the Africa Centres for Disease Control and Prevention (Africa CDC) to declare Mpox a Public Health Emergency on August 13, 2024, followed by the WHO on August 14, 2024 (1,12). The declarations signaled a coordinated global response to address the growing crisis.

On the 9th of October 2024, Zambia reported its first confirmed Mpox case in Chitambo District, Cen- tral Province. The index case, a 32-year-old Tanzani- an truck driver, developed symptoms after traveling through multiple transit hubs before reaching Chitambo district (Fig1). The detection of Mpox case in Zambia underscored the urgent need to investigate transmission dynamics and assess the risk of further spread. Given Chitambo District's role as a major transit hub, the index case also raised concerns about cross-border transmission and localized exposure. Further, limited epidemiological data on Mpox in Zambia necessitated a targeted investigation to understand disease patterns, strengthen surveillance, and improve outbreak preparedness (13). Thus, this investigation aimed to characterize the index case, assess secondary transmission risks, evaluate outbreak response effectiveness and provide recommendations for strengthening Mpox surveillance and control strategies. Understanding the public health response, diagnostic challenges, and risk factors associated with this case will inform future Mpox prevention efforts in similar high-mobility regions, ultimately contributing to more effective disease control measures.

Methods

Study Design

A case report study design was employed to investigate Zambia's first confirmed Mpox case in Chitambo District. The study followed standardized World Health Organization (WHO) Mpox case investigation protocols and Zambia's Integrated Disease Surveillance and Response (IDSR) framework, ensuring consistency in case detection, contact tracing, and outbreak response measures. A multidisciplinary approach was applied, incorporating epidemiological assessments, contact monitoring, laboratory diagnostics, and dermatological review of facility records to evaluate Mpox transmission risks.

Study Period and Setting

The investigation was conducted from 14-19th October 2024, in Chitambo District, Central Province, Zambia, located 470 km north-east of Lusaka and 357 km north-east of Kabwe along the Great North Road. The district spans 11,884.5 square kilometers, with a population of 113,465 residents.

Study Population

The study population consisted of the index Mpox case and identified contacts. Inclusion criteria covered individuals with a known direct or indirect exposure to the confirmed case within 21 days before symptom onset. Healthcare workers, household members, occupational colleagues, and social contacts were enlisted for monitoring. Individuals without any potential exposure or those outside the infectious period were excluded.

Data Collection

Data were systematically collected using WHO-approved Mpox case investigation forms, contact enlisting forms, and contact follow-up forms. Structured epidemiological interviews were conducted to assess clinical presentations, exposure history, and risk factors. Data were recorded digitally using Kobo Collect, enabling real-time data entry and streamlined management. Facility records were reviewed at Mukando Health Post (diagnosis site) and Katikulula Rural Health Facility (isolation site) to extract relevant clinical and epidemiological data on dermatological conditions. Collected data were exported to Microsoft Excel 2019 and analyzed in RStudio version 4.4.1. We presented descriptive statistics and charts and tables for our analysis.

Contact Tracing Approach and Assessment of Community Transmission

Contact tracing followed WHO guidelines, categorizing individuals based on primary (direct exposure) and secondary (indirect exposure) classifications. The confirmed case identified initial contacts, expanding the list. Traced individuals underwent 21-day symptom monitoring, assessed through house visits and telephone surveillance. Exposure pathways included skin-to-skin interaction, respiratory exposure, shared materials, and healthcare exposure with inadequate PPE were assessed alongside dermatological conditions using outpatient department registers at Mukando and Katikulula health facilities to identify potential undiagnosed Mpox infections.

7-1-7 Matrix Assessment

The investigation assessed outbreak response efficiency using the 7-1-7 framework, measuring the district's ability to detect cases within seven days, notify authorities within one day, and initiate response measures within seven days. Challenges and system constraints affecting Mpox detection, reporting, and response effectiveness were documented.

Laboratory Investigations

Specimen collection for diagnostic confirmation followed WHO laboratory protocols and included whole blood, lesion swabs, scabs, lesion fluid, and urine. Real-time polymerase chain reaction (PCR) testing was conducted using the FlexStar® Monkeypox Virus PCR Detection Kit (altona Diagnostics GmbH, Hamburg, Germany) on the QuantStudio™ 5 Real-Time PCR System (Applied Biosystems) at the Zambia National Public Health Institute (ZNPHI) laboratory. This assay allows for the qualitative detection of specific Mpox virus genes. Genomic sequencing was subsequently performed to identify the Mpox virus strain.

Results

Case Presentation

A 32-year-old male Tanzanian truck driver presented to Mukando Health Post on 4 October 2024 with a three-day history of an itchy body rash, joint pain, malaise, and sore throat. He had no known comorbidities and reported being HIV-negative. On presentation, the patient was clinically stable, a febrile (36.7°C), normotensive (145/87 mmHg), with a pulse rate of 97/min and no signs of respiratory distress. Initial examination revealed a papular rash predominantly affecting the face, trunk, upper limbs including the palms and lower limbs, sparing the soles; no genital or oral lesions were noted. Symptomatic treatment was initiated, including piriton (4 mg orally, twice daily for three days), penicillin V (500 mg, four times daily for five days), Brustan (400 mg, three times daily for three days), and benzyl benzoate lotion. At the two-week follow-up, cervical lymphadenopathy and lesion scabbing were observed, consistent with healing (Fig1). Laboratory screening was negative for syphilis (RPR) and for viral hepatitis B and C.

Timeline of Events

The index case entered Zambia on September 2, 2024, via Nakonde Border Post, transiting through Matumbo, Mkushi, Sabina, and Mokambo, where he arrived on September 6, 2024 (Fig 2).

During his stay in Mokambo, the patient reported contact with a female sex worker and interaction with another Tanzanian truck driver presenting with similar itchy skin lesions. The patient described face-to-face contact, skin contact through greetings, sharing beer from the same cup, and sharing cigarettes with the symptomatic truck driver. The fellow truck driver reportedly sought traditional medicine in the Democratic Republic of Congo (DRC) and recovered within 10 days.

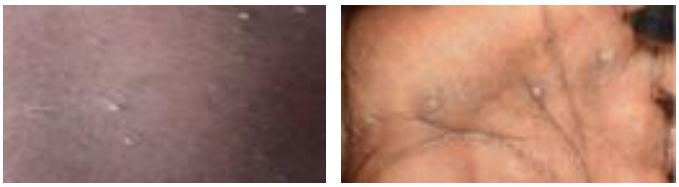

Figure 1: Different stages of Mpox lesions affecting parts of the body at two weeks follow up

Figure 2: Movements by date of the Mpox case, Chitambo, 2024

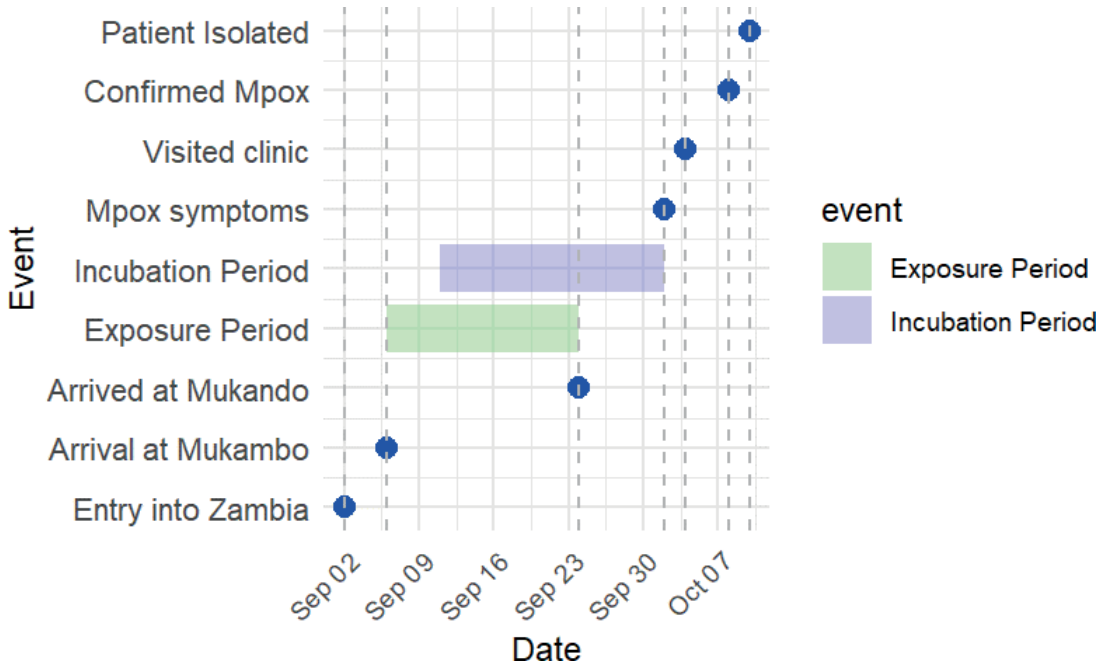

Figure 3: Timeline of the onset, diagnosis, and clinical outcomes of the mpox Case

Table 1 Detection of Mpox virus (MPXV) by real-time polymerase chain reaction (PCR), Chitambo district 2024

Case	Specimen collection date	Specimen type	Results
Patient 1	07/10/2024	Whole blood	**Positive**
	11/10/2024	Whole blood	Negative
		Dry swab of lesion	**Positive**
		Scab over lesion	**Positive**
		Fluid from lesion	Negative
	15/10/2024	Oral swab in VTM	Negative
		Whole blood	Negative
		Urine	Negative
		Dry swab over lesion	**Positive**
	19/10/2024	Skin scrapping	**Positive**
		Whole blood	Negative
		Urine	Negative
	25/10/2025	Scabs over lesions	Clade 1b

Table 2: Contacts descriptive information

Contact category		Number	Percentage (%)
Total contacts		24	-
Lost to follow-up		2	8.3
Monitored contacts		22	91.7
Monitored contacts breakdown:		N= (22)	-
Primary contacts		6	27.3
Secondary contacts		16	72.7
Gender	-	-	-
	Female	15	68.2
Median age		18.5	-
IQR		12-28	-

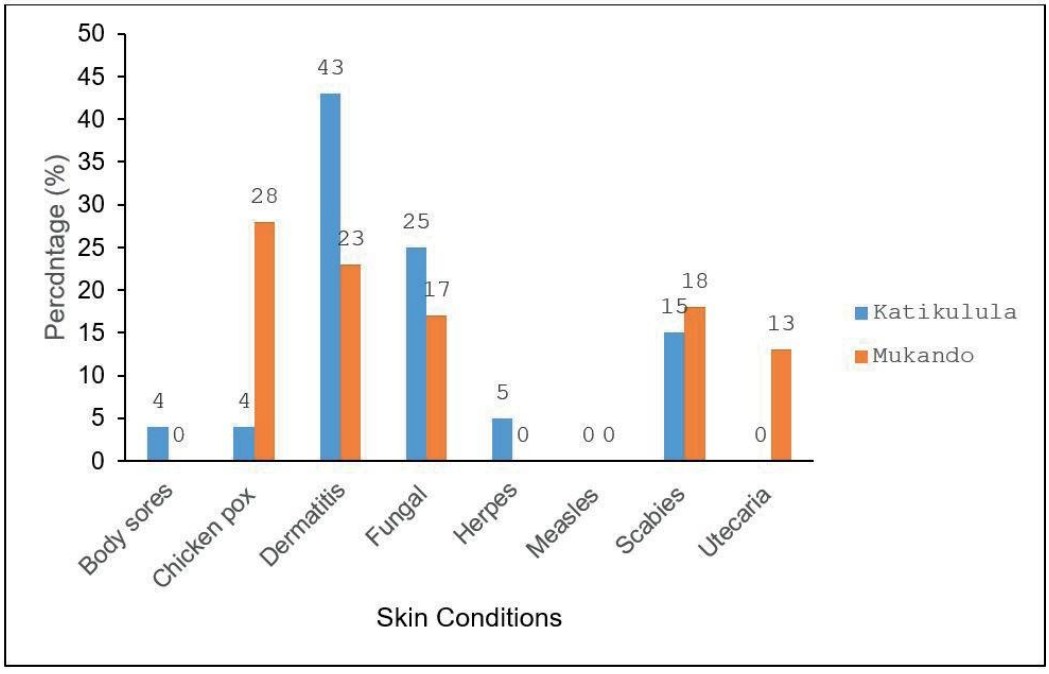

Figure 4: Analysis of Dermatological skin conditions at Katikulula and Mukando health post in Chitambo district, March to September 2024.

Table 3: Summary of 7-1-7 matrix assessment of Mpox outbreak, Chitambo 2024

Metric	Target timeline	Actual timeline	Status	Key bottlenecks	Key enablers
Outbreak detection	≤ 7 days	2 days	Achieved	Poor patient health seeking behavior	Effective surveillance: trained staff
Notification to authorities	≤ 1 day	1 day	Achieved	Nill	Efficient communication system
Response initiation	≤ 7 days	6 days	Achieved	Inadequate fuel, no IMS	Strong inter agency collaboration,

Laboratory Results

Diagnostic confirmation was conducted using PCR testing and genomic sequencing. Mpox virus was first detected in whole blood on October 7, 2024, with subsequent positive results in lesion swabs and scabs, while fluid samples tested negative, as summarized in Table 1. Genomic sequencing performed on October 25, 2024, confirmed the presence of the Clade 1b strain, which is associated with high transmissibility.

Contact Tracing and Assessment of Community Transmission

A total of 24 contacts were identified for monitoring and symptom surveillance; however, two contacts (8.3%) a female sex worker and a fellow truck driver were lost during follow-ups, leaving 22 contacts (91.7%) under full monitoring for the 21-days. Of these, six (27.3%) were classified as primary contacts, including one female sexual partner, three healthcare workers, and two close social associates, while the remaining 16 (72.7%) were secondary contacts identified through active case search. The demographic breakdown showed that 15 contacts (68.2%) were female, with a median age of 18.5 years (IQR: 12–28). None of the monitored contacts developed symptoms suggestive of Mpox during the follow-up period (Table 2).

A retrospective review of dermatological conditions recorded at Mukando and Katikulula health facilities between March and September 2024 revealed no cases aligned to Mpox but instead, revealed chickenpox as the most prevalent condition at Mukando (28%), while dermatitis was more common at Katikulula, accounting for 43% of the cases (Fig 4).

7-1-7 Matrix Assessment of Mpox Outbreak Response

The 7-1-7 framework was applied to assess outbreak detection, notification, and response efficiency (Table 3). The evaluation demonstrated that all response targets were met within the recommended timelines. Outbreak detection was achieved within 2 days, supported by trained personnel and active surveillance, although poor patient health-seeking behavior posed a challenge. Notification to public health authorities was completed within 1 day, facilitated by efficient communication systems. Response initiation occurred within 6 days, successfully meeting the 7-day target, despite challenges such as fuel shortages and the absence of an Incident Management System (IMS). Strong inter-agency collaboration played a critical role in resource mobilization, ensuring a timely outbreak response. Specifically, coordination among health authorities, local government, and partner organizations enabled resource mobilization, including emergency fuel supplies and deployment of personnel. Pre-existing partnerships and communication frameworks further streamlined decision-making, ensuring a timely response.

Discussion

We investigated Zambia's first confirmed Mpox case in Chitambo district, assessing the case characteristics, transmission dynamics and outbreak response efficiency. The index case, a Tanzanian truck driver, presented with characteristic Mpox symptoms and was confirmed to have Clade 1b through laboratory testing. Despite extensive contact tracing and retrospective facility record reviews, no secondary cases were identified, suggesting no evidence of local transmission among the people investigated. The outbreak response adhered to the 7-1-7 framework, indicating timely detection, notification, and intervention. These findings highlight the role of mobile populations in disease spread and underscore the need for strengthened surveillance and diagnostic capacity.

The investigation found that the patient, during transit in Mokambo, reported contact with a symptomatic individual and a female sex worker. These exposures included face-to-face interaction, skin contact, sharing of items, and sexual contact all of which align with established Mpox transmission routes (14-16). While no secondary cases were identified, this is consistent with evidence that transmission risk depends on contact type and intensity, with intimate or prolonged contact posing higher risk (16). These findings highlight the importance of thorough exposure assessment during contact tracing, particularly among mobile populations.

Our findings confirm the presence of Mpox virus Clade 1b in Chitambo, Zambia. This clade has been associated with high transmissibility, particularly in African context (17–19). In Burundi, secondary attack rates of up to 14% have been reported among household and sexual contacts (18). However, the absence of secondary transmission in Zambia, despite involvement of Clade 1b, suggests the influence of specific contextual factors. This observation is consistent with a study indicating that Mpox transmission is highly dependent on the nature of exposure (18). For example, a study conducted in Bujumbura, Burundi, identified sexual contact and intra-household exposure as primary transmission routes, with no infections reported following casual or transit-related interactions paralleling the exposure scenario of our index case (18). In contrast, Clade 1b outbreaks in the Democratic Republic of Congo have demonstrated sustained transmission within familial caregiving and sexual networks (18). These findings underscore the role of exposure context in determining transmission outcomes, even with highly transmissible viral strains. Strengthening targeted surveillance and risk communication among mobile populations, such as truck drivers, is essential. Additionally, border health interventions and awareness campaigns focusing on high-risk exposures may aid in preventing future transmission.

In this investigation, we did not establish evidence of community transmission of Mpox. However, a review of health facility records during the period revealed that chickenpox and dermatitis were the most reported skin conditions. Both conditions can present with vesicular or pustular rashes that closely resemble early-stage Mpox, posing challenges for clinical differentiation (20-22). Similar diagnostic overlap has been reported in other settings, where Mpox cases were initially misclassified as varicella, particularly in the absence of laboratory confirmation (21,22) . While these findings do not indicate undetected community spread, they underscore the importance of strengthening syndromic surveillance systems for rash illnesses. Enhancing frontline clinician capacity to distinguish between Mpox and similar conditions, alongside expanded access to PCR testing for both Mpox and varicella viruses, could reduce misclassification and improve the sensitivity of outbreak detection efforts.

Response to the Mpox case in Chitambo met the 7-1-7 benchmark, with detection, notification, and response all occurring within recommended timeframes. Similar performance has been associated with improved outbreak control in other African countries. For instance, Nigeria and Kenya have reported that timely detection and response, supported by dedicated outbreak funds and rapid response teams, contributed to shorter outbreaks and limited transmission (23-25). However, maintaining such capacity will require investment in laboratory infrastructure, digital reporting systems, and workforce training (24).

This investigation faced several limitations. Incomplete contact tracing and reliance on self-reported information often conveyed through interpreters may have introduced recall and reporting biases. Logistical challenges, including fuel shortages and lack of pre-positioned response supplies, impeded timely field operations. Diagnostic variability across specimen types, suboptimal sample quality, and potential underreporting of skin conditions in outpatient records limited the accuracy of case ascertainment and retrospective exposure assessment. Additionally, the absence of phylogenetic analysis constrained the ability to infer regional transmission pathways. Future investigations should incorporate genomic sequencing and strengthen sample quality assurance to improve diagnostic yield and inform epidemiologic linkages.

Conclusion

This case underscores the importance of border surveillance, targeted health communication, and preparedness for infectious disease threats in transit corridors like Chitambo. Health systems in such areas need support in improving diagnostic capacity, managing high-risk mobile populations, and sustaining trained surveillance teams. Future responses would benefit from integrating Mpox into broader outbreak preparedness plans, strengthening border surveillance, and ensuring that rural facilities are equipped to recognize and respond to suspected cases promptly.

References

1. Bapolisi WA, Krasemann S, Wayengera M,Kirenga B, Bahizire E, Malembaka EB, et al.Mpox outbreak tecovirimat resistance, management approaches, and challenges in HIV-endemic regions. LancetInfect Dis. 2024;3099(24):1-2.

2. Satapathy P, Khatib MN, Gaidhane S, Zahiruddin QS, Alrasheed HA, Al-Subaie MF,et al. Multi-organ clinical manifestations of Mpox: an umbrella review of systematic reviews. BMC Infect Dis. 2024;24(1).

3. Miura F, van Ewijk CE, Backer JA, Xiridou M,Franz E, Op de Coul E, et al. Estimated incubation period for monkeypox cases confirmed in the Netherlands, May 2022.Euro Surveill Bull Eur sur les Mal Transm =Eur Commun Dis Bull. 2022 Jun;27(24).

4. McFarland SE, Marcus U, Hemmers L, MiuraF, Iñigo Martínez J, Martínez FM, et al. Estimated incubation period distributions of mpox using cases from two international European festivals and outbreaks in a club in Berlin, May to June 2022. Euro Surveill Bull Eur sur les Mal Transm = Eur Commun Dis Bull. 2023 Jul;28(27).

5. WHO. Multi-country outbreak of mpox.WHO Extern Situat Rep [Internet]. 2024;(28).Available from: https://www.who.int/publications/m/item/multi-country-outbreak-of-mpox--external-situation-report-28--19-september-2023

6. Massmed. Incubation Period, Symptoms and Contagiousness. 2024; Available from: https://www.massmed.org/Mpox/Incubation-Period,-Symptoms-and-Contagiousness/

7. Islam MM, Dutta P, Rashid R, Jaffery SS, Islam A, Farag E, et al. Pathogenicity and virulence of monkeypox at the human-animal-ecology interface. 2023 Dec;14(1):2186357.

8. Meo SA, Al-Khlaiwi T, Al Jassir FF, Meo AS.Impact of traveling on transmission trends of human monkeypox disease: worldwide data based observational analysis. Front Public Heal. 2023;11(June).

9. CDC A. Mpox Situation in Africa [Internet]. 2024. Available from: https://africacdc.org/download/outbreak-report-13-september-2024-mpox-situation-in-africa/

10. WHO. WHO Director-General declares the ongoing monkeypox outbreak a Public Health Emergency of International Concern [Internet]. 2022. Available from: https://www.who.int/europe/news/item/23-07-2022-who-director-general-declares-the-ongoing-monkeypox-outbreak-a-public health-event-of-international-concern

11. Parums D V. Editorial: Current Status of Non-Endemic Global Infections with the Monkeypox Virus. Vol. 28, Medical science monitor : international medical journal of experimental and clinical research. United States; 2022. p. e938203.

12. Rivers C, Watson C, Phelan AL. The Resurgence of Mpox in Africa. JAMA. 2024;332(13):1045–6.

13. ECDC. Risk assessment for the EU/EEA of the mpox epidemic caused by monkeypox virus clade I in affected African countries. 2024.

14. CDC. How Mpox Spreads | Mpox | CDC.2025.

15. Beeson A, Styczynski A, Hutson CL, Whitehill F, Angelo KM, Minhaj FS, et al. Mpox respiratory transmission: the state of the evidence. The Lancet Microbe. 2025 Apr 1;4(4):e277–83.

16. Kuehn R, Fox T, Guyatt G, Lutje V, Gould S.Infection prevention and control measures to reduce the transmission of mpox: A systematic review. PLOS Glob Public Heal. 2024 Jan 1;4(1):e0002731.

17. Srivastava S, Laxmi, Sharma K, Sridhar SB, Talath S, Shareef J, et al. Clade Ib: a new emerging threat in the Mpox outbreak. Front Pharmacol. 2024;15(December):1-16.

18. Otshudiema JO, Nkengurutse L, Kamwenubusa G, Diallo I, Sibomana A, Nsavyimana O, et al. Epidemiological Characteristics and Transmission Dynamics of Mpox in Bujumbura, Burundi: A Prospective Cohort Study. 2025;

19. Gueye AS. The surge of mpox in African countries. PAMJ 2025; 501. 2025 Mar 2;50(1).

20. WHO. Mpox. 2024.

21. Hughes CM, Liu L, Davidson WB, Radford KW, Wilkins K, Monroe B, et al. A Tale of Two Viruses: Coinfections of Monkeypox and Varicella Zoster Virus in the Democratic Republic of Congo. Am J Trop Med Hyg.2020 Feb 1;104(2):604.

22. Coppens J, Liesenborghs L, Vercauteren K, Esbroeck M Van, Van Dijck C. No Varicella Zoster Virus Infection among Mpox Cases in Antwerp, Belgium. Am J Trop Med Hyg. 2023;109(6):1282–3.

23. Bochner AF, Makumbi I, Aderinola O, Abayneh A, Jetoh R, Yemanaberhan RL, et al. Implementation of the 7-1-7 target for detection, notification, and response to public health threats in five countries: a retrospective, observational study. Lancet Glob Heal. 2023 Jun 1;11(6):e871–9.

24. Frieden TR, Lee CT, Bochner AF, Buissonnière M, McClelland A. 7-1-7: an organising principle, target, and accountability metric to make the world safer from pandemics. Lancet [Internet]. 2024 Aug 14 [cited 2025 May 13];398(10300):638–40. Available from: https://www.cdc.gov/global-health/impact/7-1-7-disease-detection.html

25. CDC. 7-1-7 Framework in Kenya | Global Health | CDC. 2024.