

# Symptomatology of Mpox Disease and Implications for Integrated Syndromic Surveillance in Nigeria

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## Abstract

*The re-emergence of Monkeypox virus (MPXV) in Nigeria in 2017 has become a considerable public health concern with a diversity of symptoms exhibited by affected individuals, ranging from mild febrile illness to severe skin lesions, lymphadenopathy, and systemic complications. This study examined the symptomatology of Mpox disease across the six regions of Nigeria and its implications for strengthening the surveillance system. The study used cross-sectional observational design including cases reported by NCDC between January 2017 and December 2023. The study revealed most common symptoms as fever (91%), rash (85%), and lymphadenopathy (68%). About 45% of cases were classified as mild, 37% as moderate, and 18% as severe, while 28% of cases were initially misdiagnosed as other diseases. Cases with no rash or atypical symptoms were 4.3 times more likely to be delayed in diagnosis (95% CI: 2.8-6.2,  $p < 0.001$ ). The study showed that symptomatology of Mpox in Nigeria is diverse, with significant implications for disease surveillance. Strengthening healthcare worker training, enhancing syndromic surveillance, and promoting public awareness are critical steps for improving Mpox detection and control in Nigeria.*

## INTRODUCTION

Mpox, formerly known as Monkeypox, is an emerging zoonotic viral disease caused by the Monkeypox virus (MPXV), a member of the Orthopoxvirus genus within the Poxviridae family. First identified in humans in 1970 in the Democratic Republic of Congo, Mpox shares clinical similarities with smallpox, though it is generally less severe and less contagious (Mitjà et al., 2023). Despite its early detection in Central and West Africa, Mpox has gained significant attention in recent years due to its re-emergence in various parts of Africa, notably Nigeria, and the spread to non-endemic regions globally.

The 2017 re-emergence of Mpox in Nigeria has raised considerable public health concerns, with cases now reported across multiple states, particularly in the southwestern region, which includes Lagos, Rivers, Bayelsa, Abia, Imo and Ogun (Yinka et al., 2017). The outbreak of Mpox in these areas is complicated by the diversity of symptoms exhibited by affected individuals, ranging from mild febrile illness to severe skin lesions, lymphadenopathy, and systemic complications. Mpox poses a significant public health challenge due to its capacity for both zoonotic and human-to-human transmission, as well as its potential to cause severe illness, particularly in immunocompromised populations.

Accurate symptom recognition is critical for effective surveillance, early diagnosis, and containment of Mpox. Surveillance systems in Nigeria and across West Africa have historically faced significant challenges, including underreporting, misdiagnosis, and delays in case identification due to the nonspecific and often overlapping

symptomatology of Mpox with other endemic diseases such as smallpox, chickenpox, and measles and HIV (Zhou et al., 2023; Asaolu et al., 2022). Additionally, the presence of asymptomatic cases or mild presentations in some individuals further complicates surveillance efforts.

This study aims to examine the symptomatology of Mpox disease across the six regions of Nigeria and its implications for strengthening surveillance systems. By identifying the most common and distinctive symptoms associated with Mpox in this region, this research seeks to inform public health strategies that can enhance early case detection, improve outbreak response, and limit the spread of the disease in both rural and urban areas.

## Overview of Mpox Disease and Symptomatology

Mpox is an Orthopoxvirus infection that presents with a wide range of clinical symptoms. The incubation period of Mpox typically ranges from 5 to 21 days, after which patients begin to exhibit nonspecific prodromal symptoms such as fever, headache, muscle aches, fatigue, and chills (NCDC, 2022). Following this initial phase, characteristic skin rashes and lesions appear, typically starting on the face before spreading to other parts of the body. These lesions progress through stages of macules, papules, vesicles, pustules, and finally crusts, which eventually scab over and fall off (McCollum & Damon, 2014).

In addition to skin lesions, patients often experience lymphadenopathy, a notable feature that distinguishes Mpox from other orthopoxvirus infections like smallpox (Reynolds et al., 2019). Other symptoms may include back pain, sore throat, and respiratory symptoms, depending on the severity of the infection. The clinical severity of Mpox can vary, with some patients developing mild, self-limiting illness, while others, especially the immunocompromised, may experience more severe manifestations, including secondary bacterial infections, pneumonia, sepsis, and encephalitis (Alakunle et al., 2020).

The diversity in symptomatology presents a major challenge for surveillance efforts, particularly in regions where healthcare infrastructure is limited, and there is overlap between Mpox symptoms and those of other endemic diseases. Effective surveillance requires a clear understanding of the full clinical spectrum of Mpox to facilitate early detection and differentiation from other diseases.

## Mpox in Nigeria: Epidemiological Trends and Symptom Diversity

Nigeria experienced a resurgence of Mpox in 2017, following nearly four decades of relative absence. The re-emergence of the disease led to widespread outbreaks across several states, with northwestern Nigeria identified as a key hotspot. Data from the Nigeria Centre for Disease Control (NCDC) indicate that the southwestern states, particularly Lagos and Rivers, have reported a high number of Mpox cases, contributing to a significant portion of the national case burden (Yinka-Ogunleye et al., 2019).

The symptomatology of Mpox in Nigeria is consistent with global observations but exhibits considerable variability. Fever, skin rash, and lymphadenopathy are the most commonly reported symptoms; however, a significant proportion of cases have been reported with atypical presentations, including fewer skin lesions or lesions localized to specific body areas (Bunge et al., 2022). This variability has implications for disease surveillance, as healthcare workers may fail to recognize milder or atypical cases, leading to underreporting and delays in diagnosis.

The presence of co-infections in Mpox patients, such as HIV and other endemic diseases, further complicates the clinical presentation. A study by Ogoina et al. (2019) found that co-infections can mask typical Mpox symptoms, making it more challenging for clinicians to diagnose the disease promptly. Additionally, asymptomatic carriers or those with mild, self-limiting illness may not seek medical care, further contributing to surveillance gaps.

## Challenges in Mpox Surveillance in Northwestern Nigeria

Surveillance systems in Nigeria face numerous challenges, particularly in remote and underserved areas. One of the primary challenges is the misidentification of Mpox due to its symptom overlap with other diseases. In northwestern Nigeria, where diseases like chickenpox, smallpox, measles, and other febrile illnesses are

endemic, the accurate differentiation of Mpox cases is difficult (NCDC, 2021). This diagnostic ambiguity is compounded by the scarcity of laboratory facilities capable of confirming Mpox via polymerase chain reaction (PCR) testing, resulting in a heavy reliance on clinical diagnosis in many areas.

Underreporting is another critical issue in Mpox surveillance, particularly in rural settings where healthcare access is limited, and many cases go unreported. Several studies have indicated that a lack of public awareness about Mpox and other disease symptoms contributes to delayed healthcare seeking behavior, which in turn delays case reporting (Mbala et al., 2017; Ojewumi et al., 2016). Furthermore, stigma associated with Mpox, particularly in communities where skin diseases are viewed negatively, may discourage individuals from reporting symptoms or seeking medical care (Ježek et al., 1987; Asaolu et al., 2022).

The lack of adequate training for healthcare workers on the identification and management of Mpox is a further hindrance to effective surveillance. In some parts of northwestern Nigeria, healthcare workers have limited knowledge of Mpox, leading to misdiagnosis, reporting and inappropriate treatment. A study by Akinoyemi et al. (2020) highlighted that improved training and resources are needed to enhance the capacity of healthcare workers to recognize and report Mpox cases effectively.

### **The Role of Symptomatology in Strengthening Surveillance**

Symptom recognition plays a crucial role in the early detection and containment of Mpox outbreaks. Public health surveillance systems rely heavily on syndromic surveillance, which involves identifying clusters of symptoms indicative of Mpox, such as fever, rash, and lymphadenopathy, to trigger further investigation and laboratory confirmation. In this context, the diversity of Mpox symptomatology necessitates a syndrome-based approach that can capture both classic and atypical presentations of the disease (Jezeck et al., 1988; Asaolu et al., 2023).

Efforts to strengthen Mpox surveillance in Nigeria must prioritize the inclusion of syndromic data from primary healthcare centers, particularly in rural areas where access to diagnostic testing is limited. Enhanced surveillance protocols should emphasize the identification of key symptoms such as rash and lymphadenopathy while remaining vigilant for atypical or mild cases that may otherwise go undetected. Community health education is equally important to raise awareness about the symptoms of Mpox and encourage individuals to seek medical attention when experiencing suspected symptoms.

### **Implications for Public Health Surveillance in Nigeria**

The implications of improved symptomatology-based surveillance for Mpox are significant, particularly in northwestern Nigeria. Given the high burden of disease and the challenges associated with laboratory confirmation in this region, improving symptom recognition and integrating community-based surveillance approaches could facilitate earlier detection of cases, leading to quicker containment of outbreaks (Adeniran et al. 2024). In addition, training healthcare workers to recognize the diverse clinical manifestations of Mpox would enhance their ability to diagnose the disease accurately, even in the absence of advanced diagnostic tools.

Expanding public awareness and integrating Mpox surveillance into existing disease control programs could further enhance Nigeria's capacity to manage future outbreaks. Given the recurrent nature of Mpox in West Africa and the potential for continued outbreaks, especially in vulnerable populations, adopting a comprehensive approach to Mpox symptomatology and surveillance is critical to reducing the disease's impact on public health.

The symptomatology of Mpox in Nigeria, particularly in northwestern states, presents significant challenges for disease surveillance due to its variability and overlap with other endemic illnesses. While fever, rash, and lymphadenopathy remain the hallmark symptoms of Mpox, the presence of atypical cases, co-infections, and asymptomatic carriers complicates efforts to diagnose and report the disease effectively. Strengthening symptom-based surveillance systems, improving healthcare worker training, and increasing public awareness are essential strategies for enhancing Mpox detection and control in this region. As Mpox continues to pose a

public health threat, understanding the full spectrum of its clinical presentations is vital for timely diagnosis and effective outbreak response.

## Study Design

This study used a cross-sectional observational design to analyze the symptomatology of Mpox and its implications for surveillance across the six geopolitical zones in Nigeria. The study included cases reported between January 2017 and December 2023. Two states with the highest burden of Mpox confirmed cases were selected from each of the geopolitical zones: South West (Lagos & Ogun); South South (Rivers and Bayelsa); South East (Abia & Imo); North Central (Plateau & Kwara) North East (Adamawa & Borno); North West (Kaduna Katsina). Data collection focused on confirmed Mpox cases from both clinical and public health surveillance records, with an emphasis on identifying symptoms and risk factors relevant to improving disease detection.

## Study Population and Setting

The study population consisted of patients diagnosed with Mpox within the study period, including those who sought care in healthcare facilities and those identified through public health surveillance systems. The population also included healthcare workers involved in diagnosing and managing Mpox cases. The study setting encompassed both urban and rural areas in the selected states of Nigeria, where Mpox cases have been reported with varying prevalence.

## Data Collection Methods

The study utilized secondary data from the Nigeria Centre for Disease Control (NCDC), hospital records, and reports from public health officials. Data were extracted from confirmed Mpox cases, which had been verified by laboratory testing (PCR for Mpox virus). A subset of cases with detailed clinical histories was selected for further analysis, including the most commonly reported symptoms and disease severity. The clinical history data covered self-reported symptoms by the patients, time period between symptom manifestation and healthcare seeking, diagnosed symptoms, and laboratory confirmed cases. The clinical history data provided information on self-reported symptoms, healthcare-seeking behavior, and potential delays in diagnosis.

To complement this data, structured interviews were conducted with healthcare workers and public health officials to gather insights into the challenges of recognizing Mpox symptoms and reporting cases to the surveillance system.

## Symptom Classification

For the purpose of analysis, symptoms were categorized into:

- Common symptoms: fever, rash (vesicular or pustular), and lymphadenopathy.
- Atypical symptoms: localized rash, respiratory symptoms, gastrointestinal disturbances, or absence of rash.
- Severity: mild, moderate, or severe illness based on the extent of rash, systemic symptoms, and any associated complications (such as bacterial infections or encephalitis).

## Sampling and Sample Size

Out of the total 741 confirmed cases reported as at December 2023, a total of 512 confirmed Mpox cases were included in the study. This sample size was deemed sufficient based on previous Mpox prevalence estimates in each of the selected states and accounted for stratification across the six states. In each state, 10 to 80 records were representatively randomly selected based on the confirmed number of reported cases and available clinical history records to provide a balanced dataset across the regions.

## Data Analysis

Descriptive statistics were used to summarize the distribution of symptoms among Mpox cases. The frequency of common and atypical symptoms was calculated for each state and overall. Chi-square tests were used to evaluate associations between demographic characteristics (age, gender, rural/urban location) and symptom presentation. The presence of atypical symptoms was analyzed using logistic regression to identify significant predictors, with odds ratios (ORs) and 95% confidence intervals (CIs) reported.

The implications of symptom variability for surveillance were assessed by analyzing the proportion of misdiagnosed or delayed cases in relation to symptom presentation. Data from interviews and questionnaires were used to evaluate healthcare worker knowledge of Mpox symptomatology and the challenges of reporting to the surveillance system.

## Results

### 1. Demographic Characteristics

Of the 512 confirmed Mpox cases, 60% were male and 40% were female, with a mean age of  $34.7 \pm 12.4$  years. The majority of cases (67%) occurred in rural areas, with the highest number of cases reported in Lagos (33%), followed by Rivers (13%) and Bayelsa (12%).

**Table 3: Nigeria confirmed Mpox cases by State, September 2017 – 31st December 2023**

State	2017	2018	2019	2020	2021	2022	2023	Total	% of Total Confirmed Cases
Lagos	4	1	15	4	6	188	27	245	33%
Rivers	25	14	7	1	5	37	4	93	13%
Bayelsa	19	11	7	0	6	45	2	90	12%
Abia	1	2	0	0	0	58	6	67	9%
Imo	5	2	1	0	0	45	5	58	8%
Ogun	0	0	0	0	1	40	17	58	8%
FCT	5	0	0	0	1	25	4	35	5%
Kwara	0	0	0	0	0	21	0	21	3%
Plateau	0	2	0	1	0	16	0	19	3%
Adamawa	0	0	0	0	0	16	0	16	2%
Kaduna	0	0	0	0	0	15	2	17	2%
Borno	0	0	0	0	0	11	2	13	2%
Katsina	0	0	0	0	0	8	1	9	1%
<b>Total</b>	<b>59</b>	<b>32</b>	<b>30</b>	<b>6</b>	<b>19</b>	<b>525</b>	<b>70</b>	<b>741</b>	<b>100%</b>

Source: NCDC.GOV.NG <https://ncdc.gov.ng/diseases/sitreps/?cat=8&name=An%20Update%20of%20Mon>

### 2. Symptomatology of Mpox

Table 1. The most frequently reported symptoms among confirmed Mpox cases

Symptom	Frequency (%)
Fever	91%
Rash (vesicular/pustular)	85%
Lymphadenopathy	68%
Fatigue	56%
Headache	54%
Respiratory symptoms	14%
Gastrointestinal symptoms	8%
Localized rash only	6%
No rash (fever only)	4%

- The most common symptoms were fever (91%), rash (85%), and lymphadenopathy (68%).
- Atypical presentations included localized rash (6%), respiratory symptoms (14%), and cases with no rash (4%).
- Patients in rural areas were more likely to present with atypical symptoms (17%) compared to those in urban settings (8%) ( $p < 0.05$ ).

### 3. Symptom Severity and Healthcare Access

- 45% of cases were classified as mild, 37% as moderate, and 18% as severe.
- Severe cases were more frequently reported among patients with comorbidities (e.g., HIV) or delayed access to healthcare.
- Rural residents experienced an average delay of 7 days before seeking care, significantly longer than urban residents (3 days), which led to more severe cases upon diagnosis.

### 4. Surveillance Implications

- 28% of cases were initially misdiagnosed as other diseases, including chickenpox and measles, due to atypical or incomplete symptom presentations.
- Healthcare workers in rural areas reported significant difficulties in differentiating Mpox from other febrile rash illnesses, with 32% indicating a lack of training on Mpox diagnosis.
- Cases with no rash or atypical symptoms were 4.3 times more likely to be delayed in diagnosis (95% CI: 2.8–6.2,  $p < 0.001$ ).
- 48% of healthcare workers reported challenges in reporting Mpox cases due to the absence of clear diagnostic guidelines for atypical symptoms.

## Discussion

### Symptomatology and Its Variability

The findings of this study highlight the high variability in the clinical presentation of Mpox in Nigeria, particularly the presence of atypical symptoms such as localized rash, respiratory symptoms, and cases with no rash. This variability complicates early detection and diagnosis, particularly in rural settings, where healthcare access is limited and Mpox may be misidentified as other endemic diseases. The presence of non-classical symptoms such as respiratory or gastrointestinal signs further complicates the diagnostic process, underscoring the need for a more comprehensive approach to Mpox surveillance.

The high proportion of fever, rash, and lymphadenopathy remains consistent with global literature on Mpox symptomatology (Reynolds et al., 2019), but the identification of milder cases and atypical presentations suggests that many cases may be missed in routine clinical practice. Additionally, the significant delays in healthcare access observed in rural areas contribute to disease progression and complications, indicating that improved public awareness and healthcare infrastructure are needed.

### Implications for Surveillance

The results of this study underscore the challenges that symptom variability poses for Mpox surveillance systems. In particular, the misdiagnosis of atypical cases and the underreporting of mild or asymptomatic cases present significant barriers to accurate disease monitoring. Surveillance systems must be equipped to recognize the full spectrum of Mpox symptoms, including non-classical presentations.

Training healthcare workers to recognize these atypical signs is critical for improving Mpox detection, especially in rural healthcare facilities, where resources and diagnostic tools are limited. Furthermore, incorporating syndromic surveillance systems that track clusters of febrile and rash illnesses, even those not conforming to classical Mpox presentations, may enhance early detection efforts.

### Public Health Recommendations

Based on these findings, several public health measures should be prioritized:

- Training programs for healthcare workers, particularly in rural areas, to improve recognition of atypical Mpox symptoms and differential diagnosis from other febrile rash illnesses.
- Strengthening community awareness campaigns to promote earlier healthcare-seeking behavior, particularly in remote areas where delays in diagnosis exacerbate disease severity.
- Integration of Mpox surveillance with existing public health programs, such as those for measles and chickenpox, to capture a broader range of symptom presentations and improve reporting.

## Conclusion

The symptomatology of Mpox in Nigeria is diverse, with significant implications for disease surveillance. Atypical symptoms and delays in healthcare access contribute to diagnostic challenges and hinder accurate reporting. Strengthening healthcare worker training, enhancing syndromic surveillance, and promoting public awareness are critical steps for improving Mpox detection and control in Nigeria.

## Ethical considerations

Ethical clearance was obtained from the NHREC to cover all the selected states across the six geopolitical zones. No conflict of interest is reported. All data used are available and accessible through the Epidemiology Unit of the Ministry of Health.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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