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Epidemiology of Mpox Outbreaks and Implications for Surveillance in Imo State, Nigeria

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Abstract

Mpox disease is caused by a double-stranded DNA virus, genus Orthopoxvirus of the family Poxviridae. The incubation period is usually 6 to 13 days but can range from 5 to 21 days while symptoms and signs may persist for 2 to 5 weeks. Although, the clinical features are usually less severe when compared to the deadly smallpox, the disease can be fatal with case fatality rate between 1% and 10%. In Imo State, Nigeria, there has been a changing epidemiology of the disease in the last 6 years and the frequency and geographic distribution of cases have progressively increased. This study aims to conduct a review of the disease epidemiology between 2017 and 2023 and implications for surveillance in Imo State. Surveillance data from the Surveillance Outbreak Response and Management System (SORMAS) was extracted between Janu-

ary 2017 and December 2023 across the 27 Local Government Areas (LGAs) of Imo State. A line list of 231 suspected cases was downloaded into an excel template and analyzed using SPSS® version 20 software. Analysis was done using descriptive statistics and associations were tested using Fischer's exact at 0.05 level of significance. Of the 231 suspected cases, 57.1% (132) were males, 42.9% (99) were females and the modal age group was between the ages of 0 - 4 (32.5%). Eight (8) LGAs (districts) accounted for 71% (n = 164) of all the suspected cases. 21.2% (49) were confirmed positive, 27 males (55.1%) and 22 females (44.9%) ($p > 0.05$). Modal age group was 20 - 24 (22.4%, n = 11), 18% (9) were children under 14 years, $p > 0.05$. Case fatality rate was 8% (n = 4). There was no significant association between mortality and age group. Five (5) LGAs accounted for about 60% (29) of all confirmed cases. These LGAs contribute only 20% to the total population in the State. Only 5.6% and 4% of suspected and confirmed cases, respectively, had knowledge of contact with an infectious source. The study described the epidemiology of Mpox outbreaks between 2017 and 2023 and the findings have significant implications on detection and outbreak response activities.

Keywords

Mpox, Epidemiology, Outbreak, Surveillance

1. Background

Mpox disease is caused by a double-stranded DNA virus, genus Orthopoxvirus of the family Poxviridae. Four of the orthopoxvirus species are responsible for causing diseases in man [1]. The virus was first detected in1958 among monkeys being used for research purposes, hence, the nomenclature. The first case in human was however identified in 1970 in a 9-year-old child with smallpox-like vesicular rash in the Equatorial region of Zaire, now, Democratic Republic of Congo [2] [3]. In 2022, when there was an increase in Mpox outbreak, racist and stigmatizing languages were reported to WHO and both individuals and countries raised concerns which led to the changing of nomenclature from Monkeypox virus to Mpox virus. The re-naming was also important because rodents, and not monkeys, have been found as the largest animal reservoir of the virus [4] [5]. The incubation period is usually 6 to 13 days but can range from 5 to 21 days while symptoms and signs may persist for 2 to 5 weeks [4].

Although the clinical features are usually less severe when compared to the deadly smallpox, the disease can be fatal with a case fatality rate between 1% and 10% [6]. The illness begins with non-specific symptoms and signs that include fever, chills, headaches, lethargy, asthenia, lymph nodes swellings, back pain, and myalgia. Person-to-person transmission of Mpox can occur through direct contact with infectious skin or other lesions such as in the mouth or on genitals; this includes contact which is face-to-face (talking or breathing), skin-to-skin including touching, vaginal or anal sex, mouth-to-mouth through kissing, mouth-

to-skin contact, respiratory droplets or short-range aerosols from prolonged close contact. The virus then enters the body through broken skin, mucosal surfaces (e g oral, pharyngeal, ocular, genital, anorectal), or via the respiratory tract. Mpox can spread to other members of the household and to sex partners. People with multiple sexual partners are at higher risk [4].

Animal to human transmission of Mpox occurs from infected animals to humans from bites or scratches, or during activities such as hunting, skinning, trapping, cooking, playing with carcasses, or eating animals. The extent of viral circulation in animal populations is not entirely known and further studies are underway [4] [7] [8] [9].

To clinically distinguish between Mpox and Chicken-pox during outbreaks has also been challenging [6]. Studies have also established similar genetic and antigenic properties between various orthopox virus species hence, the possibility of one infection conferring significant protection against infection by the other species [10].

The WHO discontinued smallpox vaccinations in 1978. This has since led to a drop in the cross-protection to other orthopox viruses, more pronounced among the younger and the unvaccinated population. A mathematical model has however suggested that following the cessation of smallpox vaccination, human to human transmission would not be able to sustain the Mpox infection in humans without repeated re-introduction of the virus from the animal reservoirs, hence, a justification for the discontinuation of smallpox vaccination [11].

There was a global re-awakening and media attention to Mpox following the diagnosis of 3 cases in the United Kingdom in 2018. Two of the three patients had a recent travel history to Nigeria while the third was a health worker who was involved in the care of one of the other two patients. These cases of human Mpox were the first ever reported from the European Union [12].

Prior to the recent and ongoing outbreak, Nigeria had her last confirmed case of Mpox in 1978 [13]. On the 22nd of September, 2017, an 11-year old child was identified with suspected Mpox in Nigeria [14]. Genomic studies of Mpox virus isolates from infected humans in Nigeria suggest that the index case was not imported into Nigeria and outbreaks in Nigeria are considered to be a spillover from multiple sources of introduction into the human population. It is also interesting to note that the clustering observed within the various States thus far have not shown any epidemiologic linkages between them [15].

In Imo State, there has been a changing epidemiology of the disease in the last 6 years and the frequency and geographic distribution of Mpox cases have progressively increased. The State, with a 2023 projected population of 6,721,844, occupies a total area of 5,530 square kilometer sharing boundaries with Abia State to the East, Delta State and River Niger to the West, Anambra State to the North and Rivers State to the South. Imo state is made up of 27 Local Government Areas (LGAs) and 418 political wards. In the State, poverty, civil crises, displacement, farming, climate change like flooding and population movement are likely risk factors to Mpox infection by increasing exposure to wild rodents

which may carry Mpox virus [16]. This study aims to conduct a review of the disease epidemiology during outbreaks in Imo State between 2017 and 2023 and the implications for surveillance.

2. Methods

Surveillance data from the Surveillance Outbreak Response Management and Analysis System (SORMAS) was extracted between January 2017 and December 2023 across the 27 Local Government Areas (LGAs) of Imo State. SORMAS is an open source mobile eHealth system adopted by the Nigeria Centre for Disease control (NCDC) for real-time digital surveillance covering peripheral health care facilities and laboratories. SORMAS facilitates the implementation of disease control and outbreak management procedures including surveillance and early detection of outbreaks. The line list of 231 suspected cases was downloaded from SORMAS and exported into an excel template. Data was visualized and exported for analysis into SPSS® version 20 software. Analysis was done using descriptive statistics and associations were tested using Fisher's exact method at 0.05 level of significance.

3. Results

Of the 231 suspected cases within the 6 year period, 57.1% (132) were males while 42.9% (99) were females and the modal age group was children between the ages of 0 - 4 (32.5%). About a half of all suspected cases were children under the age of 14 years (47.3%). Eight (8) LGAs (districts): Orlu, Aboh-Mbaise, Ehime-Mbano, Ideato South, Owerri North, Owerri West, Owerri Municipal and Mbatoli LGAs account for 71% (n = 164) of all the suspected cases and 4.3% (n = 10) of all the suspected cases were from correctional facilities (prisons).

Out of the 231 suspected cases, 21% (n = 49) came out as positive, confirmed cases following laboratory investigation. There were 27 males (55.1%) and 22 females (44.9%). There was no significant association between test positivity and sex of suspected cases ($p > 0.05$). Young adults between the age of 20 - 24 form the modal age group among the positive cases (22.4%, n = 11) while 18% (n = 9) were children under 14 years and 8%, (n = 4) were between 0-4 years. Association between positive test result and age group was not significant ($p > 0.05$).

Five LGAs (districts): Owerri Municipal (n = 8), Owerri North (n = 6), Owerri West (n = 5), Isu (n = 6) and Mbaitoli (n = 4), account for about 60% (n = 29) of all confirmed cases. However, none of the positive cases was from a correctional facility (prison).

Thirteen (26.5%) of the confirmed cases were hospitalized with a cumulative case fatality rate of 8% (n = 4). There was no significant association between mortality and age group. Only 5.6% (n = 13) and 4% (n = 2) of suspected and confirmed cases, respectively, had knowledge of contact with an infectious source.

4. Discussion

Previous studies have listed the male gender, children and young adults less than 25 years of age as factors associated with increased risk of Mpox infection [12]. Bunge *et al.*, 2022, also reported that the median age at presentation of Mpox disease has increased from 4 years in the 1970s to 21 years in 2010-2019 [17]. This study also found more males infected than females, this was however not statistically significant. The study however aligns with previous documentations on age susceptibility among young adults.

The 8 LGAs that accounted for the majority of cases (71%) in the State contribute only 32% of the total population in the State. This increase in reported cases is likely a true rise in disease occurrence and not merely attributable to improvement in surveillance systems [18]. Austin-Egole *et al.*, 2022, in a study carried out in the State reported that the insecurity situation affected the economic activities in the main city; businesses and farming activities were abandoned because of fear and attacks [19]. Kumbhar & Agarwala, 2022, have associated the surge of Mpox cases in Nigeria to armed conflict, mass population displacement, and increased consumption of bush meat, deforestation and greater global travel [20]. Further studies would be needed to determine the effects of these humanitarian and natural hazards on Mpox distribution in the State.

Contrary to most studies however, this study showed no significant association between mortality and age group. Mpox case fatality rate (CFR) is reported to vary between 1% and 10% for various outbreaks, with the majority of deaths occurring in younger age groups [21]. Bunge *et al.*, 2022, also reported a pooled case fatality rate ranging between 4 - 11 percent [17]. Petersena *et al.*, 2018 reported that as of October 2018, there have been 116 confirmed cases with 8 deaths giving a CFR of 6% [12].

Only 5.6% and 4% of suspected and confirmed cases, respectively, had knowledge of contact with an infectious source. Available data in the literature also suggest that human cases are most times not epidemiologically linked during outbreaks [20]. Studies suggest that it is either a multisource outbreak with limited human to human transmission or an outbreak that has arisen from increased human contact with previously undetected endemically infected humans [17] [22].

5. Conclusion

This study has been able to describe the epidemiology of Mpox outbreaks between 2017 and 2023. The findings have significant implications on surveillance and outbreak response activities. Intensified surveillance and detection of Mpox are crucial for understanding the continuously changing epidemiology of the disease. Roles of factors associated with mass migration of youths and young adults including insecurity and armed conflicts are also areas of further research interests.

Limitations

Reliance on secondary data gave some limitations in assessing the attack rate of the disease among suspected cases. Incomplete documentations also gave the study a small sample size reducing the power of the study.

Ethical Considerations

No conflict of interest is reported. Ethical approval was obtained from the Epidemiology Unit, Ministry of Health, Imo State. 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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