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Current Issues on Monkeypox Disease in Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Review Article

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ABSTRACT

Monkeypox (MPXV) is a viral infectious disease, capable of transmitting from animals to humans. It is a zoonotic virus responsible for causing the disease, and belongs to the same family (orthopoxvirus) as the smallpox virus. The first case of human monkeypox infection was recorded in 1970 in a town called Basankusu, in the Democratic Republic of Congo. There have also been reports of the disease outbreak across West Africa. The first recorded monkeypox case outside Africa was in 2003 in the United States of America, which later developed to 70 cases without any mortality recorded. In Nigeria, the spread of monkeypox has been reported across the South-East and South-South regions of the country and disease has since been recorded in states such as Akwa Ibom, Abia, Bayelsa, Benue, Cross River, Delta, Edo, Ekiti, Enugu, Imo, Lagos, Nasarawa, Oyo, Plateau, Rivers and the Federal Capital Territory (FCT). The monkeypox virus has been identified as a double-stranded DNA virus belonging to the genus *Orthopoxvirus,* of the family, Poxviridae with accompanying symptoms such as fever, severe headache, chills, swelling of the lymph nodes (lymphadenopathy), back and muscle aches (myalgia), and exhaustions (asthenia) and eventually the appearance of rashes which develops through various stages before eventually falling off as the patients recovers and wounds heals. Animal-human Zoonotic transmission occurs through direct contact with the biological materials from infected host animal such as blood, mucosal lesions, bodily fluids, or cutaneous, through broken skin, mucous membranes, or respiratory airways of the nose, eyes, or the mouth, while human-to-human infection occurs

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through direct contact with the infectious rash, scabs, or body fluids, of an infected person. It also spreads through secretion from the respiratory tract through prolonged face to face or intimate contact with an infected person, contact with contaminated surfaces from infected host, or to a fetus via the placenta, or close contact with infected mother (congenital monkeypox). It can be diagnosed through Polymerase Chain Reaction (PCR) laboratory testing in combination with gene sequencing, and the infected patient treated using tecovirimat specific for smallpox virus, while studies are ongoing to develop its particular medication. This study is aimed at discussing the current issues on monkeypox virus with respect to the Nigerian society.

Keywords: Monkeypox (MPXV); infectious disease; zoonotic transmission; orthopoxvirus.

1. INTRODUCTION

Monkeypox (MPXV) is a viral infectious disease, capable of transmitting from animals to humans [1]. According to the research conducted by Petterson and Damon [2], monkeypox virus is a zoonotic virus responsible for causing the disease, and belongs to the same family (orthopoxvirus) as the smallpox virus [2]. Monkeypox first originated in 1958 from monkeys being kept for scientific studies [3]. The Centers for Disease Control and Prevention (CDC) revealed that despite being named “monkeypox”, the specific disease source is yet to be determined [4]. The first case of human monkeypox infection was recorded in 1970 in a town called Basankusu, in the Democratic Republic of Congo (DRC), in a boy of 9 months old [1]. Monkepox viral infection has since been on the increase with more cases being recorded from the rural areas of DRC owing to their proximity to the rainforest. There have also been reports of the disease outbreak across West Africa [1].

Monkepox infection thought to be restricted to the rainforests [5] had that trend bridged in 2005 where 49 cases were reported in Sudan, but without fatalities [6]. In the study conducted by Nakazawa et al. (2013), it was reported from a genetic investigation that virus did originate from Sudan, but was highly likely imported from the outside [7]. Apart from DRC and Sudan (now South Sudan), monkeypox infection cases have also been reported in other African countries such as Cameroon, Gabon, Benin, the Central African Republic, Liberia, Sierra Leone, Cote d’Ivoire, and Nigeria [1]. Between 2011 to 2014, 2000 monkeypox cases have been reported although, the data provided comes with difficulties such as incompletion and non-confirmation [5], it still shows that monkeypox disease spread has widened beyond Africa since the year 2018. For instance, the first recorded monkeypox case outside Africa was in 2003 in the United States of America, which later developed to 70 cases without any mortality recorded [1]. The contact was linked to an infected pet dog, kept together with a Gambian dormice mice and pouched rats brought into the country from Ghana [1]. Other cases recorded outside Africa includes those in Israel September 2018 and the United Kingdom, in September 2018, December 2019, May 2021 and May 2022, in Singapore, May 2019, and to the United States of America in July and November 2021 all from Nigerian travelers [1]. The World Health Organization (W.H.O) reports noted that as of May 2022, there have were reports of multiple monkeypox infections outside the non-endemic regions and following this, efforts are being made to further understand the epidemiology, infection sources as well as transmission mode and patterns [1].

In Nigeria, the spread of monkeypox has been reported across the South-East and South-South regions of the country [8]. The disease has since been recorded in states such as Akwa Ibom, Abia, Bayelsa, Benue, Cross River, Delta, Edo, Ekiti, Enugu, Imo, Lagos, Nasarawa, Oyo, Plateau, Rivers and the Federal Capital Territory (FCT) [9,10]. The federal government of Nigeria has since been working towards arresting the spread and providing cure for those infected [11]. Since the September 2017 case report, monkeypox spread across other states of the nation has continued to be recorded [12]. According to the Premium Times Nigeria, in May 29 2022, 21 cases of monkeypox infection were reported by the CDC, of which there was one death [13]. The one death recorded was a 40 years old immunocompromised patient [12]. The September 2017 monkeypox virus outbreak recorded in Nigeria was a re-emergence of the disease after it was first reported 39 years ago [13] and the case recorded in Bayelsa state (a state in Southern Nigeria). Young males were found to be highly affected and transmitted the infection at greater rate than others and as

reported in the study conducted by Ogoina et al. (2019), the infected young people were found to have other disease conditions such as syphilis, ulcers of the genitals, and HIV [14]. According to the WHO report on "Multi-Country monkeypox outbreak: situation update", the statistics of monkeypox reported cases in Nigeria between January 1 2022 to June 1 2022 stands at 21 confirmed cases, 66 suspected cases, and 1 death [15]. In an article published by Tomori Oyewale on the Conversation, it was that the monkeypox infection rate in Nigeria through the 2021 year was not appropriately represented owing to the avoidance of healthcare centers being avoided by most of the population as a result of the outbreak of COVID-19 and the phobia of contracting the infection [16].

2. CAUSATIVE AGENT AND TYPES

The monkeypox virus has been identified as a double-stranded DNA virus belonging to the genus *Orthopoxvirus,* of the family, Poxviridae [1,5]. Of all the viruses in the *Oethopoxvirus*, monkeypox is known to exhibit high degree of virulence with case fatality rate (CFR) of 3.6% for the West African clade and 10.6% for the Congo Basin clade [17]. Some studies reveal that the West African clade which is less fatal has a CFR less than 1% [5].

3. TYPES

Adler et al. [18] and other studies identified two genetically distinct clades of monkeypox viruses which affects humans: the Congo Basin clade and the West African clades [1-2,5,18]. As already established, the Congo Basin clade according to the WHO [1] causes more illness. It is also thought to be more transmissible when compared with the West African variant [1,17,19]. Although monkeypox is limited by itself, it has been discovered to be severe in persons such as the pregnant women, infants, and immunocompromised persons [17].

4. NATURAL HOST ANIMALS

Contrary to the name, monkeys are not the natural host for monkeypox virus. The nomenclature was given because of the first reservoir it was identified in (monkeys being housed for scientific studies) [3]. Falendysz et al. and other studies reported Gambian pouched rats (*Cricetomys gambianus*), dormice (*Graphiurus* spp.), non-human primates, and African squirrels (*Heliosciurus*, and *Funisciurus*) to be natural hosts for monkeypox virus, in addition to monkeys [20,1]. Although uncertainty continues to plague studies about the accurate reservoir of monkeypox virus, African rodents remains implicated as the actual host for the disease [1,21].

5. TRANSMISSION MODES

Zoonotic transmission occurs from direct contact with the biological materials from infected host animal such as blood, mucosal lesions, bodily fluids, or cutaneous, through broken skin, mucous membranes, or respiratory airways of the nose, eyes, or the mouth [1-2]. The CDC also reported that animal-human transmission happens by the preparation or consumption of improperly cooked meat, bites, or scratches from infected animals [22].

Person to person transmission occurs through direct contact with the infectious rash, scabs, or body fluids, of an infected person. It also spreads through secretion from the respiratory tract through prolonged face to face or intimate contact with an infected person, contact with contaminated surfaces from infected host, or to a fetus via the placenta, or close contact with infected mother (congenital monkeypox) [22,1]. Transmission via sexual routes is yet to be determined [1].

6. SIGNS AND SYMPTOMS

The symptoms of monkeypox begins to set in during the incubation period of 6 to 13 days, although it can range also from 5 to 21 days [1,23]. According to WHO report, the infection can be divided into two phases: the period of invasion usually ranging from 0-5 days after infection, and is characterized with symptoms such as fever, severe headache, chills, swelling of the lymph nodes (lymphadenopathy), back and muscle aches (myalgia), and exhaustions (asthenia) [1,22]. The second phase is the eruption of the skin which starts from first to the third day of fever onset. It is marked by appearances of rashes like blisters or pimples on the face, inside the mouth, palms of the hands and soles of the feet as well as other parts of the body [1,22-23]. The WHO report reveals that the rash tends to be more prevalent on the face and the extremities instead of around the trunk [1].

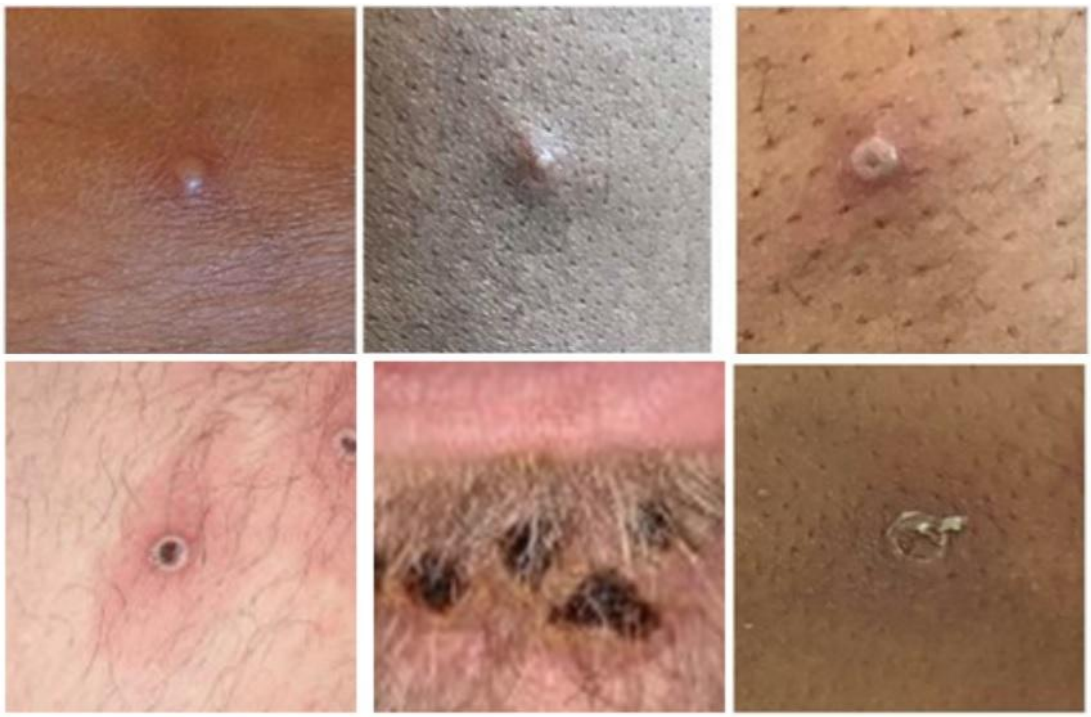

Fig. 1. Stages of lesion development: early vesicle 3mm small pustule 2mm umbilicated pustule 3-4mm ulcerated lesion 5mm crusting of a mature lesion partially removed scab [24]

The impact of the blisters on the body varies. In most of the cases reported, the face is affected in 95%, the palms and feet 75%, the mucous membrane 70%, the genitalia 30%, and conjunctivae (20%), and the cornea also [1]. The sequential evolution of the rashes occurs from the formation of lesions with flat base (macules), to the appearance of lesions firmly slightly raised (papules), to clear fluid filled lesions or vesicles, to yellowish fluid filled lesions also called pustules, and the crust, which dries up and sloughs off [1,23]. Fig. 1 is a representation of monkeypox stages of lesion development captured by Dr. O.O. Afuye [24].

7. DIAGNOSIS

In the diagnosis of monkeypox infection, other rash causing illnesses such as chickenpox, measles, scabies, allergies due to medications, syphilis, and skin infections from bacteria needs to be taken into account for accurate results [1], although monkeypox is distinguished from other pox-like illnesses by presence of lymphadenopathy at the first period of the symptoms manifestation [1]. Appropriate sample collection, storage and transport (where necessary) must equally be considered when diagnosing monkeypox virus so as to obtain the best quality of specimen for the laboratory tests. The specimen storage, packaging and transportation must be done following the gold standard [1].

The recommended laboratory for monkeypox virus is the Polymerase Chain Reaction (PCR) [25,1] test and is preferred most owing to its high rate of sensitivity and accuracy in the detection of the monkeypox unique viral DNA [1,26]. PCR can be combined with Gene Sequencing for more accurate diagnosis [26]. The type of sample recommended for monkeypox laboratory confirmation is skin lesion material, including swabs of lesion surface and/or exudates, roofs from several lesions, or crusts of lesions [26]. Inclusiveness mar's blood PCR testing because the short term duration of the virus in the blood [1].

Other laboratory testing techniques that could be used, but are not recommended for monkeypox laboratory investigations includes: serological cross-reactivity, antigen and antibody detection methods [1]. These procedures are not recommended because of the inaccuracy of their results, which occurs due to non-specificity in the exact identification of monkeypox viral DNA [1]. Other factors that must be carefully considered

while testing are those who may have had recent vaccination against smallpox or similar pox related vaccines. For proper diagnosis reading, important patient data such as: onset fever date, rash onset date, sample collection date, age, and the general rash status of the patient must be documented [1].

8. TREAMENT AND PREVENTION

8.1 Treatment

At the time of this study, no specific treatment is available for monkeypox viral according to an article published in the Punch Nigeria [27] and Nigerians have been advised by the NCDC to take precautions to avoid the disease contraction. While researches proceeds to find a specific treatment for monkeypox, an antiviral medication known as tecovirimat has been approved by the European Medicines Agency (EMA) for the management of monkeypox [28,1]. Tecovirimat is a medication employed for the treatment of pox-like illnesses such as smallpox, cowpox, and other pox-diseases belonging to the *Orthopxvirus* family [28]. Tecovirimat mechanism of action rests on its ability to block a protein on the surface of the orthopoxviruses called VP37, thereby slowing down the rate at which the viruses reproduce, as well as its spread [28]. The EMA advises that this treatment must be obtained based on prescription. Where secondary bacterial infection occurs, it should be treated, as advised by licensed healthcare personnel [1]. According to BMJ Best Practice, antibacterial treatment can be administered alongside monkeypox medication [29]. The BMJ Best Practice also recommends brincidofovir, used in smallpox treatment as first line medicine for monkeypox [29]. Other measures to be taken in the clinical management of monkeypox includes offering of fluids and foods to maintain proper nutritional health of the patient.

8.2 Prevention

According to the research carried out by Marriott et al. vaccination from smallpox virus offers immunity against monkeypox infection since they belong to the same family of viruses (Orthopoxvirus) [30]. This vaccine also provides protection to animals during scientific researches against deadly monkeypox difficulties. The WHO [1] reported that the smallpox vaccine was found to offer up to 85% protection against monkeypox infection. This measure has been recommended by the USA CDC for frontline healthcare workers studying monkeypox virus [4], while others are advised to refrain.

The use of complete and appropriate personal protective equipment has also been proven to protect against the disease especially among health workers exposed to the virus through caring for infected persons. Rapid identification and response to reported new infection alongside surveillance plays critical role in controlling the spread of the disease [1]. Other preventive measures include: isolation of both suspected case and ongoing infected patient, massive and continuous publicity and education of the population through all available media, proper cooking of meat from animals before consumption, quality training for all healthcare personnel, regulations on animal handling and exportation, and maintenance of proper hygiene [1].

9. COMPLICATIONS

The research of Petersen and Damon [2] shows that persons who suffered from monkeypox illnesses may have pale marks which may become dark scars even after healing. Other complications such as secondary infections from bacteria, pneumonia, sepsis, encephalitis, and infection of the cornea capable of leading to loss of vision [1].

10. CONCLUSION

Monkeypox is a chronic viral illness with no exact treatment at the time of this study. Following the recent re-emergence across non-endemic regions, there is the call for alertness, and critical measures and also structures to be established, to contain the spread of the disease while researches are ongoing towards its complete eradication.

11. RECOMMENDATION

Popular medium such as the social media should be adopted on a larger scale for educating the general population on the exact symptoms of monkeypox virus, preventive measures, and a channel for reporting any suspected case to the appropriate authority.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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