Monkeypox: World health emergency in 2022

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Received: July 23, 2022 Accepted: July 25, 2022 Published: October 01, 2022

Abstract

Monkeypox appeared in 1970 in Central Africa and since then the national and international health agencies have not given the proper response to this viral infection that hit small African populations until then. Today in 2022 it becomes an international emergency disease according to the World Health Organization. Monkeypox has been isolated and identified in more than 75 countries since the publication of this Emergency Technical Note. So far diagnosed cases exceed 15,000 cases worldwide. In Brazil, the main states with the highest identification activity for this Orthopoxvirus are Rio de Janeiro, Minas Gerais, Distrito Federal, Paraná and Goiás States. However, this disease that causes pustules all over the body, fever, malaise, body aches and has a high rate of transmissibility through sexual contact, especially by homosexuals, has become a major health problem internationally. Possibly we are talking about a new pandemic like the one we saw for Smallpox, Tuberculosis, Black Death, Covid-19 and Spanish Flu.

Keywords: Smallpox, *Orthopoxvirus*, Poxviridae, Pandemic, International public health emergency

Resumo

Monkeypox surgiu em 1970 na África Central e desde então os órgãos de saúde nacional e internacional não deram a devida resposta perante essa infecção viral que assolava até então, pequenas populações africanas. Hoje em 2022 torna-se uma doença de âmbito emergial internacional conforme Organização Mundial da Saúde. Monkeypox já foi isolado e identificado em mais de 75 países desde a publicação dessa Nota Técnica Emergencial. Até esse momento casos diagnosticados ultrapassam os 15.000 casos no mundo. No Brasil os principais Estados com maior atividade de identificação para esse Orthopoxvirus são Estados de Rio de Janeiro, Minas Gerais, Distrito Federal, Paraná e Goiás. No entanto, essa doença que provoca pústulas por todo o corpo, febre, malestar, dores pelo corpo e apresenta alta taxa de transmissibilidade por contato sexual, principalmente por homossexuais vem se tornando um grande problema de saúde a nível internacional. Possívelmente estamos falando de uma nova pandemia como o que vimos para Varíola Humana, Tuberculose, Peste Negra, Covid-19 e Gripe Espanhola.

Palavras-chave: Varíola, *Orthopoxvirus*, Poxviridae, Pandemia, Emergência internacional de saúde pública

Resumen

La viruela del mono apareció en 1970 en África Central y desde entonces las agencias sanitarias nacionales e internacionales no han dado la respuesta adecuada a esta infección vírica que azotaba hasta entonces a pequeñas poblaciones africanas. Hoy en 2022 se convierte en una enfermedad de emergencia internacional según la Organización Mundial de la Salud. La viruela del simio ha sido aislada e identificada en más de 75 países desde la publicación de esta Nota Técnica de Emergencia. Hasta el momento los casos diagnosticados superan los

15.000 casos en todo el mundo. En Brasil, los principales Estados con mayor actividad de identificación para este Orthopoxvirus son Estados de Río de Janeiro, Minas Gerais, Distrito Federal, Paraná y Goiás. Sin embargo, esta enfermedad que provoca pústulas por todo el cuerpo, fiebre, malestar general, dolores corporales y tiene un alto índice de transmisibilidad por contacto sexual, especialmente por parte de homosexuales, se ha convertido en un importante problema de salud a nivel internacional. Posiblemente estemos hablando de una nueva pandemia como la que vimos de Viruela, Tuberculosis, Peste Negra, Covid-19 y Gripe Española.

Palabras clave: Viruela, *Orthopoxvirus*, Poxviridae, Pandemia, Emergencia internacional de salud pública

1. Short Communication

Sometimes viruses scare us with pandemics that cause many deaths among humans and animals, depending on the type of virus and family to which these tiny infecting individuals belong, which until then, are not classified in any biological kingdom. In 1970 in the Democratic Republic of Congo (Zaire) (DRC) a case of a new disease was diagnosed in a child of just nine months. Those responsible assessed the situation and observed that they were facing a new pathological viral being. Cultures were performed from pustules spread over the body of this juvenile patient and the researchers discovered a new virus (Bunge et al., 2022). Several years ago, this new viral disease was endemic in the DRC and has spread to other African countries, mainly in Central and West Africa. It is known that the human-to-human transmission of monkeypox is well described including nosocomial and household tramission (Adler et al., 2022). However, human-to-human chains of transmission have historically been less well recognized (Learned et al., 2003; Yinka-Ogunleye et al., 2019).

Monkeypox (MPV) (Figure 1) so called, is a virus very similar to human Smallpox that caused a devastating pandemic in the past. MPV is a double-stranded DNA virus belonging to the *Orthopoxvirus* genus and Poxviridae f., and the reservoir for MPV is still unknown. However, there are data to suggest that monkeys, bearing some resemblance to humans, may be the incidental hosts, and that the reservoir is likely to be populations of rodents or squirrels that naturally inhabit secondary forest areas of Central Africa. Other viruses of an emergency nature belong to the same group, human Smallpox, Vaccinia and Cowpox virus are included among the Orthopoxviruses. Poxviruses are known to have a brick-shaped or oval structure measuring 200-400 nm (Louten, 2016).

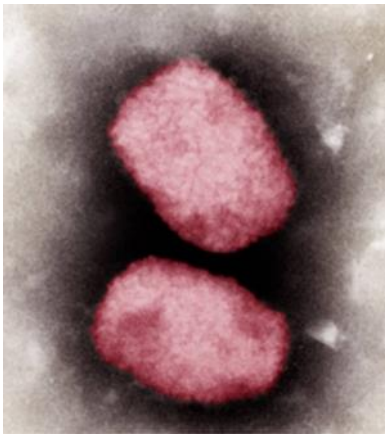

Figure 1. Transmission Electron Microscopy (TEM) image of Monkeypox virus. Image source and copyright: Andrea Maennel, AFP, 2022.

MPV was not recognized as a disease distinct from Smallpox until 1970, when smallpox was eliminated in Zaire. Studies report that the continued occurrence of a Smallpox-like disease continued to occur in rural areas of this country, today, the Democratic Republic of Congo (Nalca et al., 2005).

The signs and symptoms of MPV infection reflect a milder form of human Smallpox, where after infection, the manifestations in patients infected with MPV resemble human Smallpox with fever, chills, accompanied by generalized headache, muscle aches and fatigue with progression to exhaustion, rash, and presence of maxillary, cervical, or inguinal lymphadenopathy (McCollum; Damon, 2014) (Figure 2).

Studies suggest that the presence of lymphadenopathy may be an indication that there is recognition by the

Immune System with greater effectiveness in response to infection with MPV vs. The incubation period for MPV is commonly between 7-14 days but can take up to 21 days. With the onset of fever, the patient diagnoses develop rashes (pustules) on the face, followed by spread to other parts of the body, including the genitals. Serum antibodies are detected after 2 weeks of exposure to the MPV virus. The mortality rate is low between 1-10% based on the clade of the infecting MPV strain and the availability of therapies and modern health system, although the cases recorded in 2022 have still at that time, presented a death rate with only 5 cases confirmed for MPV (CDC, 2022; Moore, 2022; Adlja; Inglesby, 2022; Fiocruz, 2022).

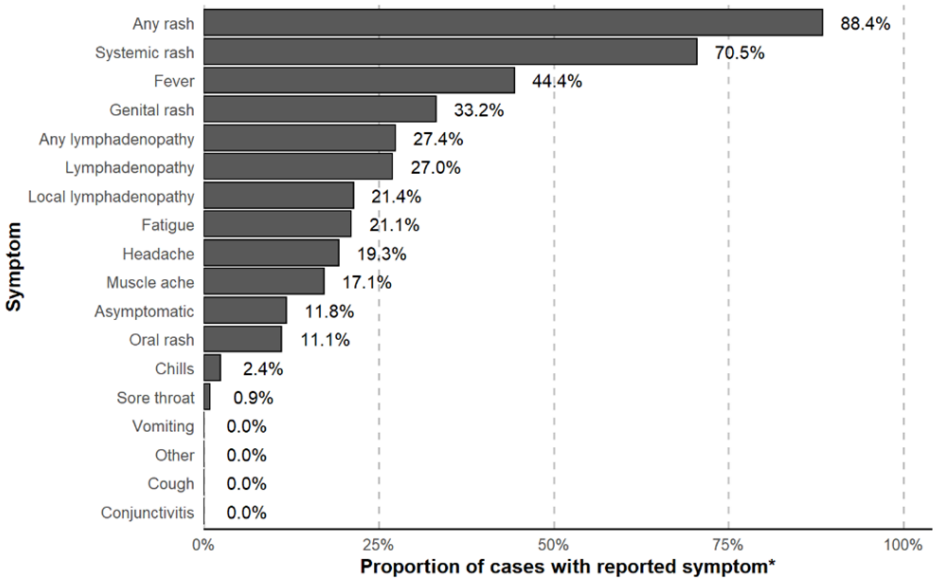

Figure 2. Symptoms reported in cases attended. Source: WHO, 2022c.

Although news about MPV has not been widely reported before in 2022, this disease has been gaining on the international health scene, along with the Covid-19 pandemic. As discussed earlier, MPV was initially isolated in Central Africa, where there were reports of 47 cases after virus isolation in patient zero. The recorded cases were dispersed to five countries in Central and West Africa, where 38 of these cases were recorded in Zaire (Breman et al., 1980). Since then, MPV has been diagnosed in several countries in 2003, 2019 and now in 2022 (PHE, 2019; Yong et al., 2020; CDC, 2022).

At the beginning of 2022, 366 cases were confirmed United Kingdom, 275 Spain, 209 Portugual, 165 Germany, 112 Canada, 91 France, 60 Netherlands, 45 USA, 32 Italy, 24 Belgium, 14 Switzerland, 13 UAE, 9 Irland, 8 Australia, 6 Czech Republic, 6 Slovenia, 6 Sweden, 5 Ghana, 4 Denmark, 4 Israel, 3 Finland, 3 Hungary, 2 Argentina, 2 Mexico, 2 Norway, 2 Latvia, 1 Austria, Malta, Greece, Gibraltar, Marocco, Brazil and Poland with a total of 1,475 confirmed positive cases (Kumar et al., 2022). However, the disease spreads to more than 75 countries, and in Brazil, 1025 cases have already been confirmed by July 2022. The Brazilian states of greatest concern are Rio de Janeiro, Minas Gerais, Distrito Federal, Paraná and Goiás, which until now At the time of this survey, 151 cases were registered (Menezes Filho et al., 2022).

Until the closing of this Short Communication, the MPV moves in 75 countries and exceeds 15,000 cases (WHO, 2022b). Studies highlight that human-to-human transmission of the MPV virus occurs at a higher rate among the gay community. However, these are preliminary data that need more information worldwide (Moraes et al., 2022). In Figure 3, observe the epidemic curve provided by the WHO (2022) for all continents, (Figure 4) Monkeypox reporting completeness.

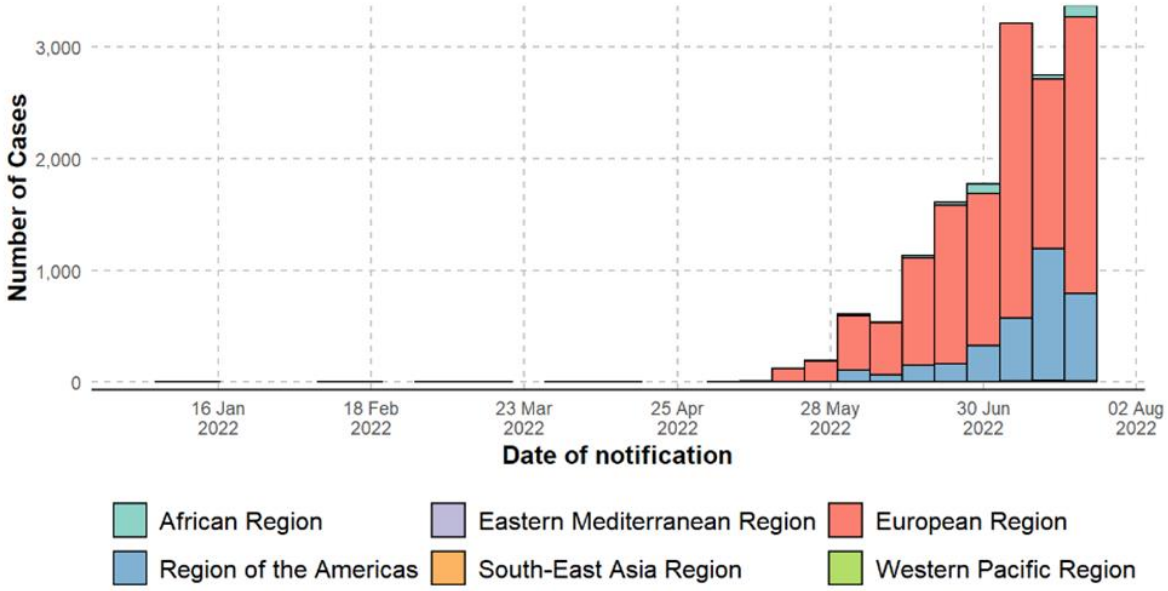

Figure 3. Epidemic curve shown for cases reported up to 18 July, 2022. Source: WHO, 2022c.

Total confirmed cases in MPV, total detailed confirmed cases and % detailed cases reported as of 21 July, 2022 (WHO, 2022c).

	Total Confirmed Cases	Total Detailed Confirmed Cases	% Detailed Cases reported
European Region	10,604	9,281	87.5%
Region of the Americas	1,981	1,842	93.0%
African Region	301	173	57.5%
Western Pacific Region	53	8	15.1%
Eastern Mediterranean Region	18	16	88.9%
South-East Asia Region	2	1	50.0%

[1] Total confirmed cases shown as of date of last detailed case report for the WHO Region of the Americas and WHO European Region.

Figure 4. Monkeypox reporting completeness in world until July 21, 2022. Source: WHO, 2022c.

Note: [1]Total confirmed cases in MPV, total detailed confirmed cases and % detailed cases reported as of 21 July, 2022. Source: WHO, 2022c.

The evaluation criteria for differential diagnosis for Monkeypox, Smallpox and Chickenpox, presents the following variables: monkeypox presents incubation period, days 7-17; prodrome period, days 1-4; symptom: fever, severity, headache, severity, lymphadenopathy, severity (moderate), lesions: depth (diameter in mm), distribution and evaluation (superficial to deep (4-6)), centrifugal (mainly), homogenous rash; time to desquamation, days (14-21) and frequency of lesions on palms or soles of feet (common) (Nalca et al., 2005). In addition, we are equipped with highly sensitive and specific tests for MPV, however, initially the diagnosis of MPV infection is based on the history, clinical symptoms and laboratory tests, such as PCR, ELISA, Wertern Blot and Immunohistochemistry. The exudate collected from the patient's pustules has its genetic material analyzed. The viral DNA is then used for real-time polymerase chain reaction (RT-PCR) serotesting specific to the MPV genome that has more than 200,000 base pairs (Fiocruz, 2022).

The MPV DNA was sequenced by Fundação Oswaldo Cruz (Fiocruz), collected from the first patient registered

in Brazil, in the Rio de Janeiro State, the sequencing carried out identified that the viral material in this patient belongs to the MPV clade B (group of microorganisms originating from a single common ancestor that is circulating in the world) as described by AgênciaBrasil (2022). The MPV protein content is used for the Western Blot test to confirm Monkeypox virus infection, the World Health Organization (WHO, 2022) establishes that RT-PCR is the most sensitive test with the lowest false-positive rate to diagnose Poxvirus.

Effective treatment is based on the vaccination system, individuals aged up to 45 years vaccinated against Smallpox have According to WHO (2022) 85% immunity, this is because the MPV is very similar to its companion Smallpox. Some drugs such as Cidofovir with antiviral characteristics that inhibit viral DNA polymerase are effective against poxviruses in in vitro and preclinical studies (Kumar et al., 2022).

Another drug option is Tecovirimat (ST-246) also an antiviral used for both adult and pediatric patients, this drug has been approved by the Food & Drug (FDA, 2022) and can be a beneficial weapon in the treatment of MPV, being administered orally or injected. Vaccinia Immune Globulin Intravenous (VIGIV) is used to treat complications due to Vaccinia vaccination, including vaccinium eczema, severe generalized Vaccinia virus. Brincidofovir, also an FDA-approved antiviral agent for the treatment of smallpox patient, can also be used in cases of MPV (Kumar et al., 2022).

ACAM 2000 produced by Sanofi has already been approved in the US for MPV, this being an updated version of the vaccine applied in 1970 for the eradication of Smallpox. This vaccine contains a live virus known as Vaccinia which, after being applied to humans, initiates a protective immune response against the three main viruses presented above. Imvamune or Imvanex or Jynneos produced by the Danish pharmaceutical Bavarian Nordic is already being applied in the USA, United Kindon, Canada and Germany, Brazil is in line for the purchase of this immunizer for the entire population. Jynneos has the same system as the ACAM 2000 however the Vaccinia virus is weakened this is specific for HIV carriers (Anvisa, 2022; Fiocruz, 2022).

The worldwide data observed above suggest that disciplinary measures of prevention, rapid diagnosis and treatment with specific immunizers and drugs provide and guarantee effective herd immunization. However, the negligence between the various world governments, turned their eyes against the African continent and now they have observed a disease from 1970 to reach and possibly devastate the world population in the coming months waiting for the vaccine loads that can supply and supply the need of all nations without privileges.

Therefore, the Director-General of the WHO, Tedros Adhanom Ghebreyesus (WHO, 2022a) and the Organização Pan-Americana da Saúde (OPAS) in English “Pan American Health Organization” (PAHO) 2022, declares and institutes Monkeypox as a global health emergency from 1 pm on Saturday, 2022.

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