



Commentary

Expedition of monkeypox virus from Africa to rest of the world: What has made this old foe so powerful?

ARTICLE INFO

Keywords

Monkeypox
 Monkeypox virus
 Poxviridae
 Variola virus
 Disease outbreaks
 Public health

Monkeypox (MPX) is a rare zoonotic disease caused by the monkeypox virus (MPXV). In 1958, this virus was first discovered in the monkey colonies kept in a Danish research facility. MPX took an era for the animal to human transmission. The first human case was reported in 1970 in a child in the Democratic Republic of the Congo (DRC) [1]. Animal-to-human transmission can occur from direct contact with the bodily fluids, blood, or cutaneous or mucosal lesions of infected animals, whereas human-to-human transmission results from direct contact with body fluids of an infected person, mucous membranes, or broken skin, or contact with virus-contaminated objects. In addition, transmission via respiratory droplets may also result. The most common symptoms of MPX include fever, fatigue, muscle aches, lymphadenopathies, and headache [2]. Till now, there is no specific treatment options for MPX disease [1].

After the first identification of the MPXV in 1958, the virus became zoonotic in 1970; since then, human MPX cases have been reported in 11 African countries. The MPX remained endemic within the African region for the next 33 years. The first MPX incidence outside of Africa was reported in the USA in 2003. In 2017, MPX returned to Africa and re-emerged in Nigeria [3]. Cases of MPX were recorded among UK citizens who had a history of visiting endemic nations in 2018, 2019, and 2021 [2]. In the final week of July 2022, the World Health Organization (WHO) designated MPX as a Global Public Health Emergency. India has confirmed its first death caused by MPX on August 1, 2022; a man recently traveled from the United Arab Emirates. One week earlier, a death was reported in Brazil, and Spain confirmed two deaths due to the MPX virus [4]. The WHO has reported a total of 46,048 confirmed cases and 15 deaths from 99 countries or territories between January, 1 and August 25, 2022 [5]. In the evolution of the MPX virus since 1970 seems that the transmission ability of the virus has increased. We aimed to investigate what makes the MPX virus a threat to global public health.

Since MPX has expanded to every continent and gone from a local health issue to a global health emergency, the virus, as much as humans, may be to blame for the outbreak of MPXV. In previous outbreaks, West African and Central African clades of MPXV are identified; however, the 2022 MPXV is distinct from these two clades [1,6]. The recent outbreak

of MPXV occurred due to mutations in the virus. It means the virus is evolving to transmit more efficiently [7]. Unexpectedly, the MPX virus isolated from the epidemic in 2022 had 40 mutations, and mutation may occur due to its transmission capacity from human to human [8]. The evidence indicates that MPX has a mutation rate approximately ten times more than a typical virus. The CDC has isolated completely new ten different MPXV from current outbreaks in the USA [6]. Moreover, the MPXV may modify the human immune system like smallpox. The smallpox vaccination program has been terminated in most nations since the WHO declared the disease extinct more than 40 years ago. As a result, it is estimated that more than 70% of individuals globally lack smallpox immunity [3]. It could be a reason for the rapid re-emerging of MPX disease.

Recent outbreaks may have also been caused partly by MPX viral reservoirs in animals and human behaviors that favor the first round of animal to human transmission. During the US Midwest incident, dogs (animal reservoirs) were believed to have caught MPX from rats imported from Ghana. During the DRC epidemic in 1996, up to February of 1997, the authorities reported 89 confirmed cases of MPXV. According to reports, exposure to infected wild animals impacted roughly 27% of people. Though, 73% of individuals were affected due to human-to-human transmission. During the 2017 MPX outbreak in Nigeria, 10% of individuals were affected by the MPXV due to animal contamination. Such incidences mark the animal reservoir's contribution to the outbreak of the MPX disease, simultaneously indicating the human's potential role as a viral host [3]. The recent spread of the MPXV might be attributed to alterations in human lifestyle [8]. Most instances of the MPXV epidemic in 2022 were found among men who have sex with men [9,10]. Though MPXV is not only transmitted through sexual intercourse, some occurrences of genital and groin lesions have been linked to virus transmission [11]. Global travel and ease of moving from and to the MPX-endemic locations might be other reasons for increased MPX transmission worldwide [12]. In 2018, confirmed MPX cases in the UK and Israel have supported the involvement of international traveling for viral transmission. For a similar reason, the MPX virus was introduced in Singapore in 2019 [3]. Moreover, we do not have any specific preventive

<https://doi.org/10.1016/j.amsu.2022.104688>

Received 3 September 2022; Accepted 10 September 2022

Available online 15 September 2022

2049-0801/© 2022 The Authors. Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

and therapeutic antiviral agents for MPX infections. However, repositing of smallpox vaccines and antiviral agents are recommended for MPX infections [13].

To prevent the MPX virus from being another pandemic, the healthcare authorities must take effective measures to combat the virus outbreak [14]. Preventative strategies include education and good personal cleanliness, regarding established risk factors and epidemiology. Vaccination programs should be initiated widely and rapidly. The researchers should work on viral genomic studies, and find out the possible route of human-to-human transmission for a better understanding of the disease along to prevent it from the transmission. The self-isolation or quarantine program needs to be implemented for the patients or their close contacts by the local authorities for preventing the disease. Unprotected interaction with lab and wild animals should be avoided. To avoid the transmission of MPXV, more controls must be put in place on international trade in animals. Authorities need to be aware of the people regarding cough and hand hygiene. Youngsters, pregnant women, and the elderly require special consideration as a result of their greater susceptibility to transmission. Moreover, MPX has not been categorized as a sexually transmitted disease; however, populations with specific sexual orientations have been disproportionately infected by MPXV. Therefore, we need to create more awareness to reduce the stigma against MPX and the affected population. We saw a similar scenario for AIDS prevention strategies. Also, we recommend renaming the MPX disease with a suitable alternative as soon as possible.

Provenance and peer review

Not commissioned, externally peer reviewed.

Sources of funding

No funding was required for the study.

Ethical approval

Not applicable.

Consent

Not required.

Registration of research studies

1. Name of the registry: Not applicable
2. Unique Identifying number or registration ID: Not applicable
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): Not applicable

Author contribution

Md. Sohan and Mst. Sarmin Akter: Conceived the idea, performed data collection, and writing the initial draft of manuscript. Md. Rabiul Islam: Conceived the idea, revised and edited the manuscript, and supervised the whole work.

Guarantor

Md. Rabiul Islam: Department of Pharmacy, University of Asia Pacific, 74/A Green Road, Farmgate, Dhaka-1205, Bangladesh.

Declaration of competing interest

No conflict of interest declared.

References

- [1] B.K. Titanji, B. Tegomoh, S. Nematollahi, M. Konomos, P.A. Kulkarni, Monkeypox: a contemporary review for healthcare professionals, *Open Forum Infectious Diseases* 2022 9 (7) (2022), <https://doi.org/10.1093/ofid/ofac310> ofac310.
- [2] World Health Organization (WHO), Monkeypox. <https://www.who.int/news-room/fact-sheets/detail/monkeypox>. (Accessed 14 August 2022).
- [3] K. Simpson, D. Heymann, C.S. Brown, W.J. Edmunds, J. Elsgaard, P. Fine, et al., Human monkeypox - after 40 years, an unintended consequence of smallpox eradication, *Vaccine* 38 (33) (2020) 5077–5081, <https://doi.org/10.1016/j.vaccine.2020.04.062>.
- [4] Hindustan Times (HT), Kerala government confirms India's first death due to monkeypox. <https://www.hindustantimes.com/india-news/india-reports-its-1st-death-from-monkeypox-virus-101659368798625.html>. (Accessed 15 August 2022).
- [5] British Broadcasting Corporation (BBC), Monkeypox: Kerala confirms India's first death and isolates 20 contacts. <https://www.bbc.com/news/world-asia-india-62344928>. (Accessed 11 August 2022).
- [6] Center for Disease Control and Prevention (CDC), Monkeypox outbreak global map. <https://www.cdc.gov/poxvirus/monkeypox/response/2022/world-map.html>, 2022. (Accessed 14 August 2022).
- [7] N. Kumar, A. Acharya, H.E. Gendelman, S.N. Byrareddy, The 2022 outbreak and the pathobiology of the monkeypox virus, *Journal of Autoimmunity* 131 (2022), 102855, <https://doi.org/10.1016/j.jaut.2022.102855>.
- [8] M.R. Islam, M. Hasan, M.S. Rahman, M.A. Rahman, Monkeypox outbreak - No panic and stigma; Only awareness and preventive measures can halt the pandemic turn of this epidemic infection, *Int J Health Plann Manage* (2022), <https://doi.org/10.1002/hpm.3539>.
- [9] N. Luna, A.L. Ramirez, M. Muñoz, N. Ballesteros, L.H. Patiño, S.A. Castañeda, et al., Phylogenomic analysis of the monkeypox virus (MPXV) 2022 outbreak: emergence of a novel viral lineage? *Travel Medicine and Infectious Disease* 49 (2022), 102402 <https://doi.org/10.1016/j.tmaid.2022.102402>.
- [10] K. Ghazvini, M. Keikha, Human Monkeypox resurgence 2022; a new presentation as a sexual pathogen, *Ann Med Surg (Lond)* 80 (2022), 104267, <https://doi.org/10.1016/j.amsu.2022.104267>. Published 2022 Jul 31.
- [11] A. Nalca, A.W. Rimoin, S. Bavari, C.A. Whitehouse, Reemergence of monkeypox: prevalence, diagnostics, and countermeasures, *Clinical Infectious Diseases: An Official Publication of The Infectious Diseases Society of America* 41 (12) (2005) 1765–1771, <https://doi.org/10.1086/498155>.
- [12] M.R. Islam, M. Asaduzzaman, M. Shahriar, M.A. Bhuiyan, The spreading of monkeypox in nonendemic countries has created panic across the world: could it be another threat? [published online ahead of print, 2022 Jun 7], *J Med Virol* (2022), <https://doi.org/10.1002/jmv.27919>.
- [13] M.R. Islam, M.J. Hossain, A. Roy, et al., Repositioning potentials of smallpox vaccines and antiviral agents in monkeypox outbreak: a rapid review on comparative benefits and risks, *Health Sci Rep* 5 (5) (2022) e798, <https://doi.org/10.1002/hsr2.798>. Published 2022 Aug 23.
- [14] M. Ahmed, H. Naseer, M. Arshad, A. Ahmad, Monkeypox in 2022: a new threat in developing, *Ann Med Surg (Lond)* 78 (2022), 103975, <https://doi.org/10.1016/j.amsu.2022.103975>. Published 2022 Jun 7.

Md Sohan, Mst. Sarmin Akter, Md Rabiul Islam*
Department of Pharmacy, University of Asia Pacific, 74/A Green Road,
Farmgate, Dhaka, 1205, Bangladesh

* Corresponding author.

E-mail address: robi.ayaan@gmail.com (M.R. Islam).