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WHO declared monkeypox a public-health emergency of international concern: A case for prevention rationale

Dear editor,

Monkeypox is caused by a rare virus (MPXV) which belongs to the genus *Orthopoxvirus*, family *Poxviridae*. Our understanding of the sylvatic hosts of the virus has been limited and warrants detailed investigation. In the previous three decades, monkeypox was considered to be a controllable disease. This disease has been endemic in certain African regions for decades. The first human monkeypox case was detected in the Democratic Republic of the Congo in 1970. The virus is now rapidly spreading into new countries with more than 90 already reporting MPXV cases <https://ourworldindata.org/monkeypox> by August 2022.

MPXV is genetically classified into two distinct clades: Congo Basin (highly contagious, virulent, high mortality rate $\approx 10\%$) and west African (low transmissibility, low case–fatality ratio $< 1\%$) [1,2]. Monkeypox outbreaks in non-African regions were documented in the UK, Portugal, and Singapore during 2018–2021; however, those outbreaks were associated with travel following the largest documented outbreak that happened in Nigeria in 2017 [3–5]. The true statistics of the disease burden are still to be realized while all cases are not effectively registered or documented because of lack of routine surveillance systems.

Several factors may have driven the MPXV reemergence in 2022: 1) climate change, 2) exploitation of rain forests, 3) geopolitical conflicts, 4) international travel, and 5) waning herd immunity following cessation of smallpox vaccination [6]. The 2017 monkeypox outbreak in Nigeria occurred during heavy rainfalls and flooding season, bringing animal hosts and humans into proximity [6]. Presence of infectious viral particles of at least two distinct MPXV lineages in feces of human-habituated western chimpanzees (*Pan troglodytes verus*) was reported to represent adaptation of the virus to ecological changes [7]. Declining herd immunity thanks to cessation of smallpox vaccination in the 1970s have contributed to continued MPXV transmission within human societies [6]. The most frequent route of monkeypox transmission is contact with animals; however, the recent outbreak suggests that the nature of viral transmission has changed. Cumulative epidemiological evidence regarding the 2022 outbreak suggests a human–human transmission chain with no previous travel history or contact with infected animals. Genomic evolution of MPXV may have also caused its propagation in nonendemic countries. However, the virus is thought to lack sufficient “genetic fitness” to enable its propagation among humans as previously reported on the west African MPXV clade detected in the USA, UK, Israel, Portugal, and Singapore [1,8]. Contrarily, a genetic deletion was reported in 10 human samples (2005–2007; Democratic Republic of the Congo); the deletion seemingly correlated with human–human transmission and four distinct viral lineages [9].

Unfortunately, the evolutionary history of MPXV still remains uncertain. A comprehensive number of sequences does not exist to allow

determination of the viral evolution (e.g., genomes listed for MPXV in the NCBI nucleotide database). Preliminary findings, however, confirm that the 2022 MPXV outbreak is closely related to the west African clade (<https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON396>).

Due to the less-known viral epidemiology and absence of surveillance systems, this MPXV outbreak progressed from endemic African regions to other non-endemic continents undetected, with Europe becoming the 2022 epicenter [1,4]. In late July 2022, WHO declared the monkeypox outbreak as a public-health emergency of international concern (<https://www.who.int/europe/news/item/23-07-2022-who-director-general-declares-the-ongoing-monkeypox-outbreak-a-public-health-event-of-international-concern>; <https://www.aljazeera.com/news/2022/7/25/eu-approves-smallpox-vaccine-for-use-against-monkeypox>). Because confirmation of any new case at a national level can be considered as an outbreak in a country, guidance on the countermeasures to control the outbreak at the global level is urgently required. We highlight some urgent countermeasures below.

Vaccination against the vaccinia virus (family *Poxviridae*, genus *Orthopoxvirus*) can indeed confer 85% protection against MPXV and is one of the best strategies for local control of infection in non-endemic countries [10]. The smallpox revaccination is presently recommended every 10 years, whereas cohort investigations have shown that protection against smallpox may last much longer [10]. Europe has approved the smallpox vaccination against monkeypox after WHO’s declaration of the global health emergency [6] (<https://www.who.int/europe/news/item/23-07-2022-who-director-general-declares-the-ongoing-monkeypox-outbreak-a-public-health-event-of-international-concern>). The USA Food and Drug Administration had approved two smallpox vaccines (ACAM2000® and JYNNEOS™) for prophylaxis against monkeypox. Vaccination of individuals at high risk of monkeypox has been initiated in the USA and the European union.

Realizing the biologic causes of such outbreaks is important for timely implementation of control measures. Monkeypox is a self-limiting infection less likely to develop into severe disease; however, the increasing number of monkeypox cases through the 2022 outbreak has concerned the global healthcare authorities. Public awareness, global surveillance systems, case-finding, contact-tracing, isolation, screening, face-masking, and vaccination of high-risk individuals (e.g. healthcare workers) are crucial measures to tackle the global spread of monkeypox.

Future perspective

WHO declared monkeypox as a public health emergency in addition to COVID-19 and polio. Therefore, recommendations must be updated to efficiently tackle the outbreak. Genomic surveillance should be boosted

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to identify the genetic changes that may have affected the viral transmission modes. This requirement is similar to genomic surveillance of SARS-CoV-2. New approvals are required regarding application of available vaccines against monkeypox. Early identification of cases and timely referral to healthcare providers will enable healthcare systems to react and urgently care for suspected cases. Taken together, therapeutic modalities and new vaccines are needed to control the surge of new positive cases in both endemic and non-endemic countries.

Emergence of MPXV highlights the gravity of the zoonotic outbreaks within human societies in the face of deep health-equity chasms internationally. Sophisticated advances in science and technology have facilitated convenient living conditions many people enjoy in high-income and upper-middle-income countries. For example, global travel only takes hours and helps viruses travel across international borders with speed and ease. Human urbanization and civilization has disturbed the biologic equilibrium among humans, animals, microorganisms, and viruses. Indeed, overwhelming effects of COVID-19 on fabrics of the human society have focused scientific, clinical, pharmaceutical, political, and societal efforts on establishing preventive tools instead of therapeutic means. Resources spent on curing COVID-19 could have easily been used to prevent its grip on the society, at least according to a mathematical model [11]. The same prevention rationale [12] applies to the MPXV outbreak.

Reconsidering, investigating, respecting, and protecting the balanced relationships between human civilizations and natural global systems will prevent other major zoonotic outbreaks in future because humans and their civilizations must only be bound and act within, not outside, the natural systems.

Ethical approval

This article does not require any human/animal subjects to acquire such approval.

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