



Systematic Review / Meta-analysis



## Is there a need to be worried about the new monkeypox virus outbreak? A brief review on the monkeypox outbreak

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### ABSTRACT

The Monkeypox virus (MPXV) is a double-stranded DNA virus related to the orthopoxvirus genus in the family of poxviridae. MPXV is endemic in central and Western African countries. There have been several outbreaks of MPXV in non-endemic countries since it was discovered in 1958 in lab monkeys. The current spread of MPXV is different from previous outbreaks, raising concerns about its potential to cause pandemics around the world. In order to reduce the spread of the disease, several countries imposed different preventive measures. The MPXV virus is believed to be transmitted either through wild animals, such as rodents or through infected individuals. Every year, Africa experiences a few thousand cases, mostly in the west and central regions. The number of cases outside Africa has previously been limited to a handful associated with travel to Africa or with the importation of infected animals.

In this narrative review, we will discuss the clinical diagnosis, transmission, distribution, treatment, and prevention of the recent monkeypox outbreak around the world.

### 1. Monkeypox: a brief overview

Originally known as monkeypox virus (MPXV), which is a double-stranded DNA virus related to the Orthopoxvirus genus in the family of Poxviridae [1]. Monkeypox was first discovered in 1958 when two outbreaks of a pox-like disease occurred in monkey colonies kept for research [2]. In 1970, during a period of intensified efforts to eradicate smallpox, the first human case of monkeypox was recorded in the Democratic Republic of Congo [3]. Clinical presentation of Monkeypox virus infection clinically appears similar to smallpox with additional symptoms such as adenopathy and papular rashes [4]. As of now, monkeypox has been reported in other countries in central and western Africa [5]. Several cases of monkeypox have been reported outside of Africa due to international travel or imported animals, including in the United States, Israel, Singapore, and the United Kingdom [3].

### 2. Monkeypox: signs and symptoms

There is no known natural reservoir for monkeypox. The virus may, however, be carried by African rodents and non-human primates (such as monkeys) [6]. Monkeypox incubation usually lasts 7-14 days but can also last up to 21 days [7]. The symptoms of monkeypox in humans are similar to those of smallpox but milder. A monkeypox infection begins with fever, headaches, muscle aches [8]. A rash usually appears within 1-3 days after the appearance of fever, beginning on the face and spreading to other parts of the body. It is still unknown which rodents are the primary disease carriers of monkeypox. However, African rodents are suspected of playing a role in transmission [9] (Fig. 4).

### 3. Monkeypox: clinical diagnosis

In light of the current outbreak, clinicians seeing patients with fever and rash should consider monkeypox. This is especially true if lymphadenopathy is also present. In a centrifugal pattern, the rash usually

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begins in the mouth, then moves to the face, then to the extremities, including the palms and soles. The definitive diagnosis is made by polymerase chain reaction testing of skin lesions or fluids. Tests of this nature are available at state public health laboratories. Commercially available tests do not exist yet [10].

#### 4. Monkeypox: transmission

Monkeypox virus is known to be transmitted by contact with infected secretions or lesions so, the Center for Disease Control and Prevention (CDC) recommended avoiding contact with infected individuals and UK Health Security Agency (UKHSA) recommended self-isolation for 21 days for populations who are at risk of catching the infection [6]. The monkeypox virus is transmitted when a person comes into contact with an animal, human, or contaminated material carrying the virus. Viral infections can be transmitted through broken skin, nasal passages, and mucous membranes. Animal-to-human transmission may occur through bites or scratches, bush meat preparation, direct or indirect contact with body fluids or lesion materials. Transmission from person to person mainly occurs primarily through large respiratory droplets. Droplets emitted by breathing cannot travel more than a few feet, so prolonged face-to-face contact is essential to prevent direct transmission. Besides direct contact with body fluids, such as saliva from coughing, or lesion material, indirect contact with lesion material may also occur via contaminated clothing or linens [11]. Consequently, a person with monkeypox is far less likely to infect close contacts than someone with SARS-CoV-2 (Figs. 2 and 3).

#### 5. Current outbreak

In the last two weeks, there have been many reports of monkeypox cases in non-endemic countries, according to the latest epidemiology updates. However, this is not the first time monkeypox has been reported outside Africa. In 2003, the United States declared an outbreak of monkeypox attributed to contact with infected pets and produced more than 70 reported cases [12]. Based on the available data from the WHO, nineteen non-endemic countries have reported monkeypox cases, including the UK, U.S., Canada, Italy, Australia, Portugal, Spain, Sweden, Netherlands, France, Germany, and Belgium, and there is no clear link between travelling and developing the disease. Endemic countries such as Cameroon, the Democratic Republic of Congo and Nigeria still

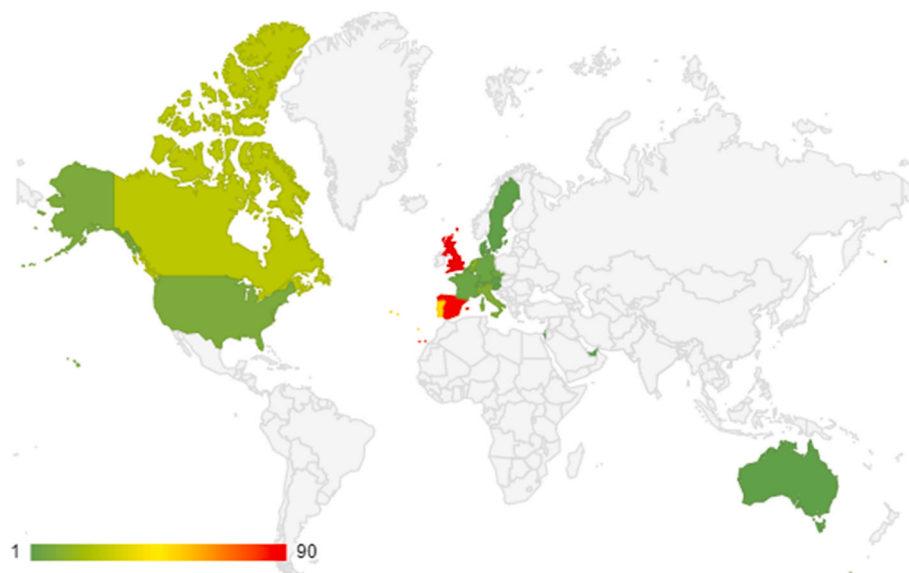
report cumulative cases of 28, 1238, and 46 respectively according to a recent report by WHO [3].

In September 2018, another outbreak occurred in Israel after a case was confirmed by immunofluorescence, tissue culture, ELISA laboratory evaluations for cases with a history of travelling abroad from Nigeria and even UK anniversary report cases for four consecutive years [3]. A recent outbreak had been declared on 13th May 2022 by 92 laboratory-confirmed cases, which was different in the burden of cases and its source [3].

According to the World Health Organization (WHO), there were 131 confirmed cases, confirmed by PCR, and 107 suspected cases in 19 countries worldwide as of May 24th, and there is no scientific information about the speed of spread [6]. Most of the reported cases are homosexual men, which supports the hypothesis that the virus is transmitted by sex, especially in homosexuality [7]. However, Brooks said, unlike sexually transmitted diseases, monkeypox is not transmitted through semen or vaginal fluids. Some current patients have anal or genital lesions that may be mistaken for sexually transmitted diseases such as herpes or syphilis, in addition to chickenpox.

On 13th May 2022, The World Health Organization reported that the United Kingdom has two confirmed cases of monkeypox and one suspected case. The suspected cases were epidemiologically linked to the confirmed cases and recovered later. Neither a history of travel to endemic countries nor an infection source was identified. The first reported case was identified on 5th May after hospital admission secondary to rash, which was confirmed as monkeypox on twelve may by referral to a specialist in infectious diseases. The other case was presented on 30 April but was confirmed on 13 May. A further four cases were presented among homosexual men on 15 May. The number of cases is likely to continue to increase as more cases are identified but there is no clear scientific information about the extent of spreading [13].

The United Arab Emirates reported the first monkeypox case in the Arabian Peninsula on 24th May, while Israel reported the first case in the Middle East on 21st May [14]. These two cases both have a history of travelling abroad. In the UAE, the case came from West Africa, and in Israel, from Western Europe [14,15] and they are still under treatment and have not recovered yet. Other Mediterranean East countries such as Saudi Arabia and Jordan set up all preventive measures that can help to prevent and detect any Monkeypox cases. The health authorities of European Union countries are concerned that this new wave may progress to a pandemic, but there is no information to support or ignore



**Fig. 1.** Distribution of MPXV cases worldwide till 26 May 2022, the Country with the Highest number of cases is the UK while Austria, United Arab Emirates and Israel reported the lowest number of cases.

this concern [16].

Massachusetts Department of Public Health confirmed the first monkeypox case in the United States on 18 May 2022. The man was recently from Canada. Different state agencies said they are working closely with the CDC and relevant health authorities to track any suspected cases and closely monitor the situation cautiously [9].

The Belgian ministry of health declared a 21-day mandatory quarantine for infected patients after 3 confirmed cases and increased the cases worldwide to more than one hundred cases [11]. The first reported case in the Middle East is Israel on 21 May 2022 who returned from western Europe, which is the first location for this outbreak to be detected, recently before confirmed diagnosis [17] and all Gulf countries including Saudi Arabia, the United Arab Emirates, Qatar, and Kuwait are doing everything possible to detect and prevent the disease [18] (Fig. 1, Table 1).

### 6. Monkeypox: prevention

Since the monkeypox virus can be transmitted by close contact with the lesion or fluid secretions, the most important preventive measure is to avoid close contact with infected individuals and isolate them.

Personal hygiene and avoiding contact are not the only methods of prevention. However, they are highly effective, there is a vaccine accepted for the prevention of monkeypox virus despite its non-specific nature, but cross-immunity with the pox virus may provide some protection against it [11,56].

Currently, there are two live attenuated vaccines available in the U.S. (JYNNEOS, the non-replicating live vaccine approved by the US Food and Drug Administration (FDA) for both smallpox and monkeypox) [36]. FDA-approved vaccine Jynneos (Bavarian Nordic) protects against monkeypox. According to Adalja and Inglesby, an older-generation vaccine (ACAM2000, Sanofi Pasteur Biologics Co.) may be used off-label for monkeypox. Therefore Monkeypox outbreaks in multiple countries are also different from Covid because there are already federally approved vaccines that prevent monkeypox [57]. Several countries took preventive measures, including Belgium, which imposed a mandatory quarantine for monkeypox cases [12]. France and other countries have a Campaign for monkeypox vaccination and highly recommended vaccines for people with close contact with infected people [58]. Early detection and management of cases are important preventive measures in preventing the further spread of the disease.



Fig. 3. An MPXV-positive patient from Prague, Czech Republic, presents with cutaneous lesions [65].

### 7. Monkeypox: treatment

Monkeypox virus is a self-limited disease that needs several weeks for recovery (1). Infected cases of monkeypox have a fatality rate ranging from 1% to 10% [6]. Monkeypox virus infection does not currently have a proven, safe treatment. However, the Smallpox vaccine, cidofovir, ST-246, and vaccinia immune globulin (VIG) are used to combat a monkeypox outbreak. The US Food and Drug Administration (FDA) has approved the use of cidofovir and tecovirimat drugs for treating smallpox. Although these two approved vaccines are not specific to the monkeypox virus, they are effective against it due to the similarity of the virus to smallpox. Most likely, such medications would only be prescribed for severe cases or in immunocompromised patients, and they would be obtained from a public health department or the CDC [57,59].

### 8. Challenges

Monkeypox poses a great risk to the stability of the world. Global cases are rising in appearing in further previously unaffected areas. The WHO states that it is unlikely to become a pandemic. Even though countries have begun to distribute smallpox vaccines to those exposed to the virus, the overall vaccination rates remain low. Only 15 out of 107 non-healthcare workers exposed to the virus have taken the vaccine, and only 169 out of 245 healthcare workers in the UK [60]. Furthermore,

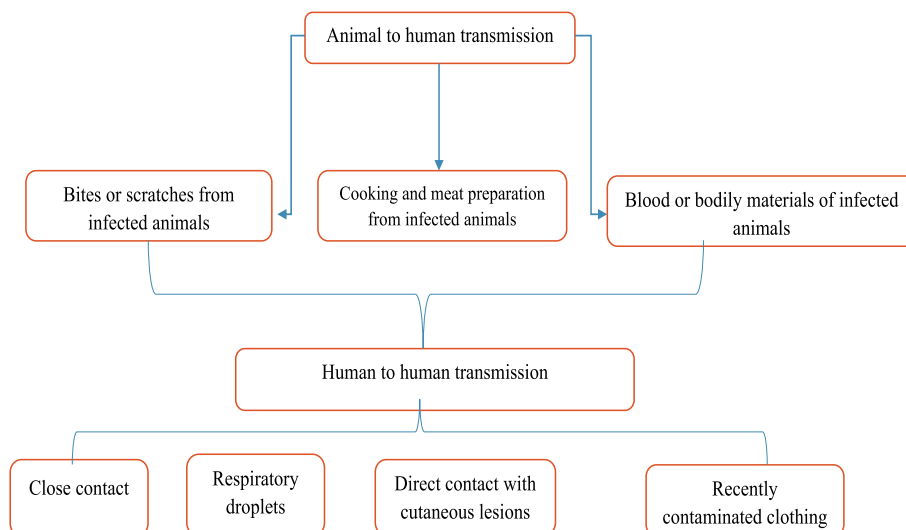


Fig. 2. MPX methods of transmission.

countries like the USA are administering the vaccine in a single dose, third-generation smallpox vaccine is meant to be given in two doses. Due to the lack of testing, it is unknown whether a single dose would be capable of stopping an infection. The method of vaccinating only those exposed to monkeypox poses risks as well. The highly rigorous contact tracing might not be implemented in all countries or might not be implemented effectively [61].

**9. Recommendations**

The globe is always in jeopardy due to the advent of new viral infections and strains. In the last 20 years, there have been several viral epidemics [62]. Despite medical advances that continue to evolve with every passing day, outbreaks of infectious diseases cause both major health and economic problems [62]. Through proper governmental intervention, measures such as travel restrictions, closure of unnecessary meeting areas, treatment, and prophylaxis can properly reduce the spread of infections and control the effect of outbreaks. This has been recently shown through the aggressive procedures taken during the spread of Covid-19 which minimized its impact. The best way to limit the spread of infections is through early containment. This was seen to be effective in the spread of SARS [63]. Herd immunity is another effective way of protecting the population from spreading infections. Herd immunity can be accomplished in two ways; the first of which is through developing immunity by exposure to the virus or through immunization with a vaccine. Therefore, the speeding up of vaccine development and distribution plays an important role in protecting the community [64].

**10. Conclusion**

A monkeypox epidemic has previously been recorded in non-endemic nations, but this outbreak has expanded far and wide with no

scientific proof of how quickly it is spreading. There have also been documented instances with no prior travel history to countries where the illness is endemic, and many of the cases have a history of homosexuality with males, which may be connected to direct touch with lesions or secretions rather than sexual interaction. Despite the continuous increase in cases, the spread may be less extensive than in the COVID-19 pandemic. The reason for this is due to the way the monkeypox virus spreads, which is through close contact with bodily fluids, such as saliva from coughing, and FDA-approved drugs, such as cidofovir and tecovirimat. There is also a non-specific vaccination available that protects against monkeypox. As a result, we propose that healthcare officials take all necessary precautions to avoid the spread of the illnesses as soon as possible.

**Ethical approval**

Not applicable

**Please state any sources of funding for your research**

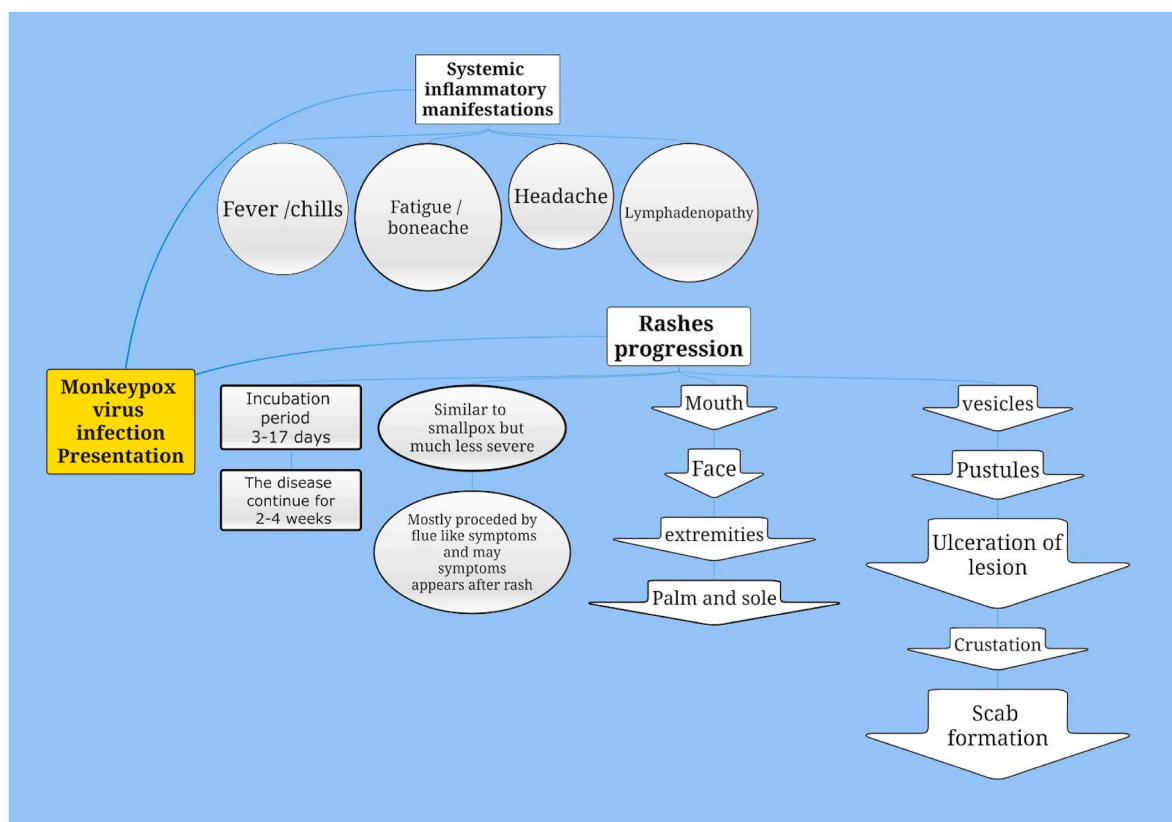
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**Author contribution**

All authors contributed equally to this work and the final manuscript was approved by Sheikh Shoib.

**Registration of research studies**

- 1.Name of the registry: Not applicable
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**Fig. 4.** Clinical presentation of MPX.

**Table 1**

Summary of reported monkeypox cases worldwide and their travel history [23]: The total confirmed cases is 313 (till 26 May) and the first non-endemic country to report cases during this outbreak is the United Kingdom on 4 May 2022 [13, 14]; N/A: not available.

Countries of monkeypox reported cases	Total confirmed cases	Last Update	First confirmed case	History of travel for the first confirmed cases
Australia	2	20 May 2022 [19]	20 May 2022 [20]	Travel to Europe [21]
Austria	1	22 May 2022 [22]	22 May 2022 [22]	N/A
Belgium	6	25 May 2022 [23]	19 May 2022 [24]	N/A (history of Homosexuality of men) [25]
Canada	25	26 May 2022 [26]	19 May 2022 [27]	N/A
Czech Republic	5	26 May 2022 [28]	24 May 2022 [29]	N/A
Denmark	2	25 May 2022 [30]	23 May 2022 [31]	N/A
France	5	25 May 2022 [32]	20 May 2022 [33]	N/A
Germany	5	25 May 2022 [34]	20 May 2022 [35]	N/A
Israel	1	22 May 2022 [36]	21 May 2022 [36]	Travel to western Europe [15]
Italy	10	26 May 2022 [37]	19 May 2022 [38]	Travel to the Canary Islands [39]
Netherlands	12	26 May 2022 [40]	20 May 2022 [41]	N/A
Portugal	49	25 May 2022 [38]	18 May 2022 [42]	N/A
Slovenia	2	25 May 2022 [43]	24 May 2022 [44]	Travel to the Canary Islands [38]
Spain	84	26 May 2022 [45]	18 May 2022 [46]	N/A (history of Homosexuality of men) [7]
Sweden	2	25 May 2022 [47]	19 May 2022 [48]	N/A
Switzerland	2	24 May 2022 [49]	21 May 2022 [50]	Travelling abroad [51] (N/A the destination)
the United Arab Emirates	1	24 May 2022 [12,14]	24 May 2022 [52]	Travel to West Africa [14]
the United Kingdom	90	26 May 2022 [53]	6 May 2022 [14]	No history of travelling abroad or identifying the source of infection [13]
the United States	9	26 May 2022 [54]	18 May 2022 [55]	Travel to Canada [36]
<b>Total</b>	<b>313</b>			

3. Hyperlink to your specific registration (must be publicly accessible and will be checked): Not applicable

**Guarantor**

Not applicable.

**Consent**

Not applicable.

**Declaration of competing interest**

All authors have no conflict of interest to disclose.

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