

Review Article

Monkeypox virus outbreak: A new threat of virus to mankind

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Abstract

Viruses becoming day by day dominate over humans, as a covid-19 pandemic is not yet over, new monkeypox virus infection cases emerged in the month of May 2020. On 13th May 2020 WHO reported monkeypox virus cases from 12 member states that are epidemic for this virus. In the past monkeypox virus are rarely seen outside of west and central Africa. Investigations are going to establish a travel link between reported cases and epidemic areas. There are very little data regarding viral mechanism or time of shading and still, we have no licensed treatment. Two smallpox-approved drugs brincidofovir and tecovirimat have efficacy against monkeypox shown in animals. Now two smallpox-recommended vaccinations JYNNEOS and ACAM2000 are also available and are efficient to prevent the monkeypox virus. Two second- and third-generation Vaccinations are recommended by WHO for people that are immunocompromised and children's MVA-BN, LC16. This article aims to raise awareness of virus spread, providing information regarding virus detail, severity, precautions, and detection.

More Information

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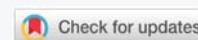
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Keywords: Monkeypox; Outbreak; Virus; Pandemic; Vaccination; Infection



Introduction

Monkeypox virus was first detected and isolated in 1958 from an ill monkey that is shipped from Singapore to a Denmark research facility [1]. However, in 1970 first case of the monkeypox virus in humans was confirmed in a child from the democratic republic of Congo that child was suspected to have smallpox [2]. Now on 21st May 2022, WHO reported 92 confirmed cases and 28 suspected cases of monkeypox virus in a non-endemic area of the virus. (who). It's a coincidence that immunity for monkeypox was developed by vaccinia vaccination of smallpox. However, eradication of smallpox and lack of vaccination efforts causes a raise in monkeypox cases [3]. As most of the monkeypox cases occurred in rural Africa, the number of suspected unreported cases may become a potential threat to this virus.

History and current situation

Monkeypox virus are endemic disease usually limited to west and central Africa, but the identification of confirmed cases without any travel history from an endemic area in the number of countries is uncommon. Hence there is an urgent need to raise alertness about the virus and comprehensive case findings, isolation, contact tracing, and supportive care to limit further transmission.

In 2003, there was a zoonotic outbreak observed in the USA that cause 47 confirmed cases [4-6]. This outbreak was linked to the rodent's importation to the USA (Gambian giant

rats, squirrels, and dormice) which was responsible for the transmission of the monkeypox virus to prairie dogs that were sold as pets. Out of these only 14 patients were hospitalized and there was no case of human-to-human transmission. After that monkeypox virus infection case in humans has been reported in the UK [7], Singapore [8], and Israel [9]. Human to Human transmission of the monkeypox virus has been recognized as significant public health threat science 15th august 2018 outbreak has few reports of monkeypox virus detection in blood and in upper respiratory tract swap. This case was reported in one man who traveled from Nigeria to Israel [10]. Another case was also identified In May 2019 in a man who traveled from Nigeria to Singapore [11]. Similarly, In May 2021 a family returned from the UK after traveling to Nigeria and become affected by the monkeypox virus [12]. Three family members became infected and the timing of symptom development in family members was 0 days, 19 days, and 33 days which could represent human-to-human transmission cases.[12]. Transmission cases were not stopped another case was identified in July 2021 in a man who traveled from Nigeria to Taxes [13]. In November 2021, one case of a man having a travel history from Nigeria to Mayland was identified [14]. Currently, on 21st May 2022, one case of monkeypox virus in a man who returned from Canada to Massachusetts is under investigation. Health care authorities also investigating a cluster of human monkeypox viruses in the UK [15]. Since 2nd June 2022, 780 confirmed cases of monkeypox have been reported and identified by WHO



from 27 Member States. These states are not endemic to the monkeypox virus. Epidemiological investigations are ongoing to study the real cause of transmission. [16]. In addition, WHO also provides updates on the monkeypox virus outbreaks in endemic countries of the African region data collected through established surveillance mechanisms From January to 1st June 2022, 1408 suspected and 44 confirmed cases including 66 deaths were reported from seven endemic countries.

On 29th August 2022, 48,844 cases are reported globally, of which 48401 cases are located in the non-historical background of the monkeypox virus and 443 are from the historical background of the monkeypox virus [17].

Etiology of monkeypox virus

Genus: Orthopoxvirus

Family: Poxviridae

Subfamily: Chordopoxvirinae

Monkeypox virus is 200-250 nm in length. Poxviridae family viruses are brick-shaped, surrounded by lipoprotein envelope, and contain linear double-stranded DNA [18,19]. Virus follows the same mechanism of hijacking host ribosome for translating components of virus protein assembly that combine within a host cell and make a complete virus [18,20].

Epidemiology of monkeypox virus

Monkeypox is a viral zoonotic disease (transmitted from animals to humans) having symptoms similar to smallpox but clinically less severe than it. There are two genetically different clades of monkeypox virus: West African clades and Central African clades. The Name monkeypox virus originated from the initial discovery of the virus in monkeys at a Danish laboratory in 1958 and the first case of human transmission was detected in a child in the Democratic Republic of the Congo in 1970 [15,21].

Susceptible animals

Several animal Species are susceptible to the monkeypox virus the infection has been identified in squirrels, rats, mice, monkeys, prairie dogs, and humans [21,22]. Because of Uncertainty in the history of the monkeypox virus, further studies are needed to find the exact reason for the virus reservoir, circulation, and maintenance in nature. [15]

Transmission of virus

Person-to-person transmission is by close contact with body fluids, lesions, respiratory droplets, and contaminated materials. Eating inadequately cooked meat and other animal products from infected animals is also a risk factor for infection. Transmission of the virus also happened via the placenta from the mother or during close contact during, and after birth to the fetus. While any kind of physical close contact is the main risk factor for virus transmission, to date it is unclear about

the transmission of monkeypox specifically through sexual routes. Further studies are needed to understand more risk factors [15, 23].

Incubation and infection period

Viruses enter from any route such as oropharynx, nasopharynx, or intradermal (infection occurs through skin wounds as similar to HSV-1) and replicate themselves on the incubation site then spreads to local lymph nodes. The incubation period for the monkeypox virus is 6-13 days but it can range from 5 to 21 days. Symptoms start appearing after 1-2 days after mucosal lesion infection. First lesions started in the oropharynx (mouth) and then appear on the skin of the face and rest of the body including the palm and soles. The number of lesions may vary from a few to thousands and may or may not spread all over the body of the patient [24]. Infected patients become contagious at this time. Serum antibodies are detectable at the time the lesion appeared [25]. For 5-7 days lesion remain in the pustular phase then crusts began to form that remain for 7-14 days, and the condition become normal after 3-4 weeks. A patient has not considered contagious after the crust falls off [26].

Symptoms

Rashes on the face and whole body appeared including palms and feet. Severe fever above 38.5 °C. Other symptoms like Headache muscle, body aches, Backpain, and Profound weakness may also appear depending on person to person [15].

Complications

Pneumonitis

Encephalitis

Bacterial infection

Sight-threatening keratitis [27,28].

Sepsis

Permanent skin scar

Dehydration

Death [5].

Mortality rates: Mortality rates vary from person to person but it is ranging from 1% to 10% have been reported during the Congo Basin outbreak [18,19]. The severity of infection has been observed more usually among children and is also related to the extent of viral exposure, the health of a person, and complications in nature. The primary factor in the severity of infection is immune deficiencies that may lead to worse outcomes. While smallpox vaccination was protecting from the monkeypox virus in the past, today because of the cessation of smallpox vaccination campaigning Globally after smallpox eradication, persons younger than 40 to 50 years



of age may be more susceptible to monkeypox. Historically case fatality ratio has ranged from 0% to 11% in the overall population and it has been higher among young children [29].

Case confirmation and treatment

All suspected cases should be detected and confirmed in the laboratory by real-time PCR or by sequencing. The confirmed patient should be isolated until lesions have crusted, the scab has fallen off and a new layer of skin has formed [24,15]. Although viral DNA has been detected in body fluids like saliva, urine, faces, and semen viral infection can reside in these body fluids or is transmitted sexually from one person to another person and remains under study [30].

Different detection methods are given in Table 1 [29].

Surveillance and reporting

To stop further transmission of monkeypox virus infection surveillance and case identification are required to rapidly identify cases, and the source of infection provides optimal clinical care, isolation, contact tracing, control, and prevention from the spread. Reporting of cases should include, the date of report, location of the patient, name, age, sex, and residence, date of onset of symptoms, travel history, close contacts, sexual partner, and smallpox vaccination status [15].

Treatment for monkeypox viral infection and prevention management

To date, there is no clinically proven treatment for monkeypox virus but smallpox virus vaccination shows efficiency against the virus. As in the case of most viral infections, treatment plays the role of supportive symptom management but prevention measures help to control the outbreak.

An infected person should remain in isolation, wear a surgical mask, and cover lesions properly until all lesions crust has fallen off naturally and new skin has formed. Oral drugs such as Brincidofovir (DNA polymerase inhibitor), tecovirimat (viral release inhibitor), and intravenous vaccinia immune globulin have efficacy against the monkey virus [24]. According to a CDC report vaccination after 4 days of infection

may prevent disease onset, and vaccination after 14 days may reduce disease severity [26].

Vaccinations

Smallpox vaccination was gone through several experimental studies that show it is about 85% effective in preventing the monkeypox virus. Thus, prior smallpox vaccination may result in milder illness. At present original smallpox vaccines are not available to the general public. A new modified attenuated vaccinia virus vaccine (Ankara strain) was approved to prevent monkeypox in 2019 [29]. CDC Experts are also confident that smallpox vaccination after monkeypox exposure may help in preventing the disease or make it less severe [32].

The fellow is the vaccines that are approved for the prevention of smallpox and monkeypox viral infection:

JYNNEOS (Smallpox vaccine) (Outbreak in the U.S.) vaccine was administered in two doses. That is given 28 days apart from 1st dose. CDC recommends getting both doses of vaccine to provide a high level of protection.

ACAM2000 (Smallpox vaccine) Single dose that is given by multiple pricks and you are considered vaccinated after 28 days [33].

MVA-BN New and safer (second- and third-generation) smallpox vaccines may be helpful for the monkeypox virus too [34].

LC16 Both (MVA-BN and LC16) have been approved for the prevention of monkeypox. The availability of these drugs is limited at this time.

Conclusion

It's necessary to inform the world about any contagious disease so that early efforts are taken place to control disasters. This article provides all information about viruses, precautions, detection, treatments, and drugs so that this disease cannot spread worldwide like COVID-19.

Declaration

The declaration includes the following subheadings.

Availability of data and material: Data was collected from different sources and research articles including updates by WHO.

Authors' contribution: SK is the single author who analyzed, interpreted data, and wrote the final manuscript. She is also the corresponding author of the publication.

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Table 1: Different detection methods are given below [29].

Sr.No	Detection methods	Specimen type	Feasibility
1	PCR	Skin lesions (the roof or fluid from vesicles), pustules, and dry crusts. Blood samples are not recommended for PCR, because the virus resides in the blood for a short time period during the course of infection.	Because of its accuracy and sensitivity, PCR has been a highly recommended test by WHO
2	Biopsy	Lesion	If feasible, Lesion biopsy is an option
3	Rapid Antigen and Serology	Because of serologic cross-reactivity of Orthopoxviruses, antigen and antibody detection methods do not provide monkeypox virus-specific confirmation	Not recommended



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