

Monkeypox Epidemiology and Transmission

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Introduction

Monkeypox virus is an enveloped double-stranded DNA virus which belongs to Poxviridae family and genus Orthopoxvirus. Two different genetic clades of the monkeypox virus were reported: the central African clade (Congo Basin) and the west African clade [1,2]. Historically more severe disease caused by the central African clade and was reported to be more transmissible. Both virus clades have been found in the same country and the geographical division between the two clades has so far been in Cameroon. The monkeypox disease, first reported in 1970 in Zaïre, which resembles smallpox clinically but more complex epidemiologically [2,3]. A 14% case-fatality rate has been reported but some cases may remain undetected and unreported due to exceedingly mild or atypical. The only clinical feature found commonly in monkeypox is lymphadenopathy but not in smallpox [2]. Since 1970, about 57 cases of human monkeypox have occurred, in which the majority of cases approximately 45 were reported from Zaïre. The disease emerges to be more common in dry season. The 84% of the cases were also reported to be children which were below ten years of age. In 1996, cases of monkeypox were reported from villages in the Zaire Congo Basin, particularly in the Democratic Republic of the Congo [3]. The World Health Organization (WHO), in collaboration with CDC, investigated this outbreak and identified 92 suspected cases with onset during February 1996-February 1997, and isolated virus from lesions of active cases. Cases continued to be reported, and a new investigation was initiated by WHO and CDC in October 1997 [4].

Nowadays Monkeypox is a global public health important disease as it not only affects the central and west Africa, but also the rest of the world. In the spring of 2003, in the America, the first monkeypox outbreak were reported outside of Africa country and was relate to contact with infected pet prairie dogs. These dogs had been kept with Gambian pouched rats and dormice which were imported into the country from Ghana. The outbreak leads to more than 70 cases of monkeypox in the America which were clinical and epidemiologic different from Africa, including sex distribution, case fatality, morphology of skin lesions, and associated lymphadenopathy. These divergent clinical presentations could be caused by mode of transmission (skin inoculation vs ingestion), the skin color of affected patients, the training backgrounds of those who saw and documented disease outbreaks, the virulence of monkeypox strains involved, nutritional status, access to advanced medical care, and the prevalence of prior smallpox vaccinations [4].

Nolen et al. [5] reported 104 cases of monkeypox virus infection from the Bokungu Health Zone (Democratic Republic of the Congo) from January to December in 2013 which were confirmed by real time PCR and 10 deaths (9.6%) were also reported. Vaughan et al. [6] in September 2018 diagnosed two cases of monkeypox in the United Kingdom which were travelled to the UK from Nigeria. Monkeypox virus DNA was detected by multiple molecular assays and subsequently confirmed by sequencing analysis. Yong et al. [7], confirmed monkeypox from 38-year-old man from Nigeria (in May 2019) that had travelled to

Singapore and confirmed monkeypox from swab specimen using a panorthopoxvirus PCR targeting E9L [8] and by direct visualization of virus particles using transmission electron microscopy, which showed features characteristic of Orth poxviruses. Detailed molecular analysis using PCR for monkeypox was positive for 2 monkeypox genes (B6R and B7R) [9]. We further confirmed monkeypox by next-generation sequencing using the Illumina MiSeq platform.

The current world outbreak (2022) is caused by the less severe West African strain. Recently, WHO reported 84% confirmed cases (n=1773) of monkeypox from WHO European Region from January 2022 to 15 June 2022. Similarly, 12% confirmed cases (n=245) also been reported from America, whereas 3% confirmed cases in the Region of African (n=64), Less than 1% cases from Eastern Mediterranean Region (n=14) and Western Pacific Region (n=7). In addition, 99% of cases were reported in men which were sexually transmitted among men [10].

Transmission of Monkeypox

Monkeypox is a zoonotic virus, which means it spread mostly through human contact with infected animals. In addition to monkeys, virus also found in other primates and certain rodents in Africa. Infected animals can pass on the virus if they bite or scratch the person. Virus can also get it from eating uncooked contaminated meat. Monkey pox also be spread through skin-to-skin contact with an infected person or spread from person to person through close contact as follows:

- A. Contact with blood or semen or other body fluids.
- B. Contact with monkeypox lesions on the skin
- C. During breathing in contaminated air through Respiratory droplets
- D. Through bedding or clothing if previously contaminated with infected body fluids.
- E. By eating uncooked contaminated meat

The virus can penetrate the body through a wound in the skin or through the mouth, nose, or even eyes. Through breathing only possible if person must be in close contact for a fairly long time. Monkeypox is not considered a Sexually Transmitted Infection (STI) since person can get it from other forms of contact. But people infected with monkeypox can pass it on during intercourse. WHO officials reported that most of the May 2022 cases were sexually transmitted, especially among men [10].

Typically, monkeypox virus incubation period is usually from 6 to 16 days but may vary from 5 to 21 days depending upon the route and nature of exposure [11]. Besides the initial typically symptoms (Fever, Tiredness, Headache, Aching muscles, Chills, Backache, Sore throat, Dry cough, Swollen lymph nodes and Trouble breathing (in serious cases), lymphadenopathy a unique feature of monkeypox followed by a maculopapular rash appears in different stages [11]. The new monkeypox symptoms may include:

- A. Painful rash that may start out on the pubic area, genitals, or around the anus
- B. Bumps that look like blisters, pus-filled bumps, or open sores
- C. Bumps in different stages, even when they're found around the same area
- D. Some people may not get a fever or flu-like symptoms before the rash. Some people don't get a fever at all.
- E. In some cases, people have reported other symptoms such as pain around the anus, the need to poop even though your gut is empty (tenesmus), bleeding in the lower part of large intestine (rectum), and painful inflammation of the anus and rectum lining (proctitis).

Illness is usually self-limiting, and most people recover within several weeks (usually 14 to 21). The illness typically runs its course in 2 to 4 weeks. It can be quite serious, especially in children that were exposed to a heavy load of the virus or in people with other health conditions or immuno-compromised individuals.

In some cases, thousands of lesions grow together and cause the loss of large sections of skin at once. In monkeypox virus infection death is rare but possible. In Africa, monkeypox leads to death in up to 1 of every 10 people which got infection. But many people in this region live in areas without adequate medical care. Children are most at risk for serious illness and death [10,12].

There's no specific treatment for monkeypox. To control an outbreak, doctors could turn to antivirals and vaccinia gamma globulin (made from the blood of people recently vaccinated against smallpox) as well as the smallpox vaccine. Studies show that the smallpox vaccine is 85% effective at preventing monkeypox. The U.S. has two vaccines to prevent smallpox: ACAM2000 and JYNNEOS (Imvamune, Imvanex). In 2019, the FDA also approved JYNNEOS to prevent monkeypox. According to the CDC, the pregnant or breastfeeding females are at a higher risk of becoming seriously ill if infection happened. There's limited information on the effects of monkeypox during pregnancy, but the WHO states that it is possible for a mother to pass the virus to an unborn baby before delivery through placenta.

As for prevention, the JYNNEOS monkeypox vaccine has not been specifically approved for pregnant women. But a study of 300 pregnant women who got the shot found no side effects or failed pregnancies linked to the vaccine. According to the CDC, if infected with monkeypox, individuals should wear a surgical mask, especially if have respiratory issues like cough, shortness of breath, or a sore throat. This can reduce the risk of infection.

To avoid catching monkeypox

- a. Stay away from animals that might have the virus, especially dead animals in areas where monkeypox is common.
- b. Stay away from bedding and other materials that have touched a person with monkeypox or a sick animal.

c. Separate infected persons or animals from others at risk for infection.

d. If you must be close to an animal or person with the virus, wash your hands with soap and water often.

e. Use protective gear like masks, safety goggles or glasses, and gloves if you can't avoid contact.

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