



Monkeypox: An Emerging Zoonoses

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Introduction

Monkeypox is a rare viral zoonotic disease (i.e., it can spread from animals to humans) that is caused by monkeypox virus. Monkeypox virus is an Ortho poxvirus which is an enveloped double-stranded DNA virus and is genetically distinct from other members of the Poxviridae family, e.g., variola, vaccinia, ectromelia, camel pox, cowpox and rabbitpox viruses. Monkeypox is not related to chickenpox which is caused by Varicella-zoster virus which is a member of Herpes virus group. The disease is called monkeypox because it was first identified as the cause of a pox-like illness in group of monkeys kept at the State Serum Institute in Copenhagen in 1958. Monkeypox was later detected in humans in 1970 and regarded as the most important Ortho poxvirus infection in human beings since the eradication of smallpox which had a quite similar clinical presentation as that of Monkeypox. The first human case was reported in the Democratic Republic of Congo in 1970 and then in Central and Western African countries. In 2003, there was an outbreak in the US with 47 confirmed cases that were spread due to the import of animals like Gambian giant rats, striped mice, squirrels and dormice that spread the virus to pet Prairie dogs. Now in 2022, there has been a notable surge in the cases. India reported its first case of monkeypox on 14 July, from the state of Kerala. There are two distinct genetic clades of the monkeypox virus: the central African (Congo Basin) clade and the west African clade. Monkeypox is commonly endemic to central and west Africa which are in proximity of tropical rainforests but now it has been spread to various countries inside and outside Africa.

Transmission

Although, the disease is called monkeypox but the source of the pathogen remains unknown. Monkeypox virus has a wide range of hosts which has allowed it to maintain a reservoir in wild animals while sporadically causing human disease. Rodents are the most likely natural host of Monkeypox,



though it has also been found in rope squirrels, tree squirrels, Gambian pouched rats, dormice and non-human primates (especially, monkeys) in Africa. Monkeypox shows both zoonotic and human to human transmission.

Zoonotic transmission occurs via direct contact with blood, body fluids or monkeypox lesions of infected animals and inadequately cooked meat/wild meat preparations or other animal products of infected animals. It's also possible for people to get monkeypox from infected animals, either by being scratched or bitten by the animal. People living in or near forested areas may have indirect or low-level of exposure to infected animals. Captive animals that are potentially infected with monkeypox should be isolated from other animals and placed into immediate quarantine. Any animals that might have come into contact with an infected animal should be quarantined, handled with standard precautions and observed for monkeypox symptoms for 30 days. Imports of rodents and non-human primates should be restricted from the affected areas.

Human to human transmission occurs via large respiratory droplets, direct contact with skin lesions or body fluids of infected humans, or indirect contact with objects contaminated from lesion material or body fluids of an infected person, clothing's or linens of infected person and nosocomial infection. Intrauterine and transplacental transmission (congenital monkeypox) or during close contact during and after birth has also been reported.

Clinical Manifestations

In **animals**, symptoms such as lack of appetite, history of fever, conjunctivitis, cough, respiratory signs and rashes have been observed in the prairie dogs and experimental non-human primates. Some animals may experience a milder form of illness with fewer symptoms.

In **human population**, the prodromal symptoms before the skin eruptions include fever, chills or sweats, headache, mouth sores, sore throat, cough, back aches, malaise, regional lymphadenopathy of neck, armpits or groin (this feature distinguishes monkeypox from small pox), sometimes vomiting and exhaustion. Cutaneous manifestations are observed after 1–3 days of appearance of fever and include successive stages of macules, papules, vesicles, pustules, crusting and scars for 2–4 weeks. They start to appear first on face, head and neck region and then moves towards the periphery. The rash then forms a lesion or scab that falls off. When the scab falls, the animal or person is no longer infectious. The number of lesions on one person can range from a few to several thousand. The clinical presentation of monkeypox resemble that of smallpox as both have non-pleomorphic skin eruptions. It is usually self-limiting disease with symptoms lasting for 2–4 weeks. Generally, cases are mild and recover in weeks but in some individuals, they can lead to medical complications and even death. New-



borns, children and immunocompromised persons may be at risk of more serious symptoms and death from monkeypox disease.

Complications of monkeypox may include bronchopneumonia, encephalitis, secondary bacterial infections, conjunctivitis, sight-threatening keratitis, sepsis, ulcerated inguinal lesions with delayed healing, deep tissue abscess, pruritis and contact dermatitis. Case fatality ratio has been around 3%-6% in recent times in the endemic countries but in the past years has varied from 1-10%. But smallpox had a case fatality ratio ranging from 30-50% and thus it was more severe than monkeypox.

Diagnosis

The **clinical differential diagnosis** that must be considered includes other rash illnesses, such as chickenpox, measles, bacterial skin infections, scabies, syphilis and medication-associated allergies. Regional lymphadenopathy during the prodromal stage of illness can be a clinical feature to distinguish monkeypox from chickenpox or smallpox. **Polymerase chain reaction** test can be performed in which adequate sample is taken from skin eruptions and is further processed for the test. **Serological testing** can also be performed but it cannot confirm monkeypox as the members of Ortho poxviruses show cross reactivity among themselves.

Prevention And Treatment

- Earlier it was reported that monkeys could be immunised against monkeypox by smallpox vaccination which can provide upto 85% cross protection against monkeypox. With fading immunity against Smallpox, it is important to counter the threat of monkeypox with newly developed vaccines. Due to non-availability of first-generation small pox vaccine to the general public, newer generation vaccines have been developed *viz.* **ACAM2000** and **MVA-BN** (Modified Vaccinia Ankara-Bavarian Nordic). MVA-BN is specifically developed for Monkeypox and is live attenuated, non-replicating virus vaccine based on modified vaccinia virus (Ankara strain). Adverse reactions of vaccine administration may include injection site reactions such as pain, swelling, and redness.
- Health care professionals including the veterinarians are the most vulnerable to catch the infection, and it is important to identify the infected cases as soon as possible. Avoid contact with animals that can spread monkeypox virus, usually rodents and primates. Also, avoid sick or dead animals, as well as bedding or other materials of such animals. Veterinarians who treat the animals suspected of monkeypox infection should use infection control precautions to protect themselves, staff, clients, as well as other animal patients in the clinic. While examining animals suspected of monkeypox, veterinarians and staff should practice proper hand hygiene, should use personal



protective equipment, perform proper disposal of contaminated waste material and ensure environmental cleaning.

- It is important to avoid close, skin-to-skin contact with people infected with Monkeypox to reduce human-to-human transmission. Individuals traveling from impacted countries should be subjected to mandatory health screening and quarantine period of at least three weeks.

treatment

There is no specific treatment for monkeypox. Patients should be offered sufficient fluids and food to maintain adequate nutritional status. Secondary bacterial infections should be treated as per the indicated antibacterials. Various antiviral medicines like Tecovirimat, Cidofovir and Brin cidofovir can be used for treatment. These drugs have proved efficacy against Ortho poxviruses. But the side effects of these drugs nephrotoxicity and cytomegalovirus infections, nausea and abdominal discomfort. Tecovirimat is considered safest among the mentioned antivirals. Mouth rinses and eye drops can be used for the respective lesions but corticosteroid containing preparations should be avoided. Vaccinia immune globulin may be recommended for severe cases.

Conclusion

Monkeypox is a disease of global public health importance as it not only affects countries in west and central Africa, but now the rest of the world has been affected and it has been emerged as the most important Ortho poxvirus of public health concern. Although monkeypox has a very low incidence rate, it is still a significant threat that must be dealt with as quickly as possible. The probability of monkeypox spreading to many other countries is very high. Direct or indirect contact with the infected animal or person should be avoided So, raising awareness of risk factors and educating people about the measures that can be taken to reduce exposure to the virus is the main prevention strategy for monkeypox along with vaccination of high-risk personnel.