DOI: 10.21088/ijpm.2321.5917.13125.3

Indian Journal of Preventive Medicine
Volume 13 Number 1, January - June 2025

REVIEW ARTICLE

Mpox: A Threatening Pandemic

Sanjeev Kumar[1], Narendra Kumar[2], Vijay Kumar[3]

HOW TO CITE THIS ARTICLE:

Sanjeev Kumar, Narendra Kumar, Vijay Kumar. Mpox: A Threatening Pandemic. J Prev Med. 2025; 13(1): 17-22.

ABSTRACT

Mpox is a zoonotic viral illness caused by monkeypox virus which belongs to family Poxviridea and genus orthopoxvirus. Smallpox, vaccinia and cowpox are the poxvirus of this genus. Vaccination to smallpox provides some cross immunity against mpox but with cessation of smallpox vaccination, incidence of mpox has gradually increased, especially in endemic area.

Mpox is usually a self limiting disease and presents with fever, myalgia, headache, lymphadenopathy and skin lesions. It spread by the body fluid, skin secretion and direct contact with the infected person or animal. Confirm diagnosis is made by detection of virus DNA by PCR. Antibodies are not useful as they do not distinguish between different poxviruses. There is no specific approved treatment for mpox at present but many are under trial. Vaccination for mpox is available and approved by FDA.usually the case fatality is <10% but can increase in high risk group

Earlier mpox was endemic in West and Central Africa with sporadic cases in some other part of the world. But the outbreak in 2022 has affected non endemic area with different target population and different clinical presentation. This raised concern and mpox is now considered as disease which can cause another pandemic and therefore efforts are to be made to prevent its further outbreak

KEYWORDS

• Mpox • Monkeypox • Pandemic

INTRODUCTION

Mpox, previously known as Monkeypox, is a zoonotic viral illness caused by the Monkeypox virus. It was first found in monkeys and hence named as Monkeypox. Mpox closely resembles smallpox infection and presents with fever, headache, myalgia, lymphadenopathy and skin lesions. Vaccination against small pox

AUTHOR'S AFFILIATION:

[1] Assistant Professor, All India Institute of Medical Sciences, Patna, Bihar, India.
[2] Assistant Professor, All India Institute of Medical Sciences, Patna, Bihar, India.
[3] Additional Professor, All India Institute of Medical Sciences, Patna, Bihar, India.

CORRESPONDING AUTHOR:

Sanjeev Kumar, Assistant Professor, All India Institute of Medical Sciences, Patna, Bihar, India.
E-mail: dr.sanjeev11308@aiimspatna.org

Received: 10-05-2025 **Revised:** 08-06-2025

provides some protection against mpox also.[1] After cessation of smallpox vaccination in 1980, the heard immunity declined steadily which favored emergence of mpox.[2]

Earlier mpox was endemic in Central and Western Africa and was mostly concentrated in the Democratic Republic of the Congo. But since 2021 onwards, sporadic cases have been detected in other part of world mainly United States of America, Italy, France and United Kingdom. In 2022, an outbreak of mpox was noted in non endemic countries which was different from classical mpox in many aspects and has drawn the attention of the whole world as another pandemic disease.[3]

VIROLOGY

1. Monkeypox virus belongs to the family Poxviridae, subfamily Chordopoxvirinae and genus Orthopoxvirus. Other poxviruses including smallpox, vaccinia, and cowpox belong to this genus. It is a brick shaped, double stranded DNA virus surrounded by a lipoprotein envelope.[4]
2. There are two genetic clades. The Clade I (with subclade Ia and Ib) is endemic in Central Africa and Clade II (with subclade IIa and IIb) is endemic in West Africa. The outbreak in 2022 has many differences from the two clades and is proposed to be caused by West African Variant (probably Clade III).[5]

EPIDEMIOLOGY

Mpox was first isolated in Denmark (1958) in monkeys kept for research and hence termed as Monkeypox virus. It was found only in animals until 1970 when first human case was reported in a nine month old boy in Democratic Republic of the Congo. In 1980, after eradication of smallpox and cessation of smallpox vaccination, mpox gradually emerged in Central, East and West Africa. Thereafter sporadically cases have been reported from Central and West Africa. In 2003, an outbreak in United States of America was reported and linked to imported wild animals (Clade II). Since 2005, many cases were reported in Democratic Republic of the Congo every year. In 2017, mpox was reported in Nigeria.[6]

In May 2022, an outbreak of mpox appeared and rapidly spread across Europe, America and then all six WHO regions. Over 120 countries have reported mpox between Jan 2022 - Aug 2024 with over 100000 laboratory confirmed cases and over 220 deaths among the laboratory confirmed cases.[7]

Although mpox is a zoonotic disease, the animal reservoir is unknown but squirrels, rat, mice and monkey are considered as possible reservoirs.[8]

TRANSMISSION

Mpox is transmitted by the body fluids, skin secretions and direct contact with the infected person or animal via four possible way.[9]

1. Person-to-person through close contact (kissing, touching, sex, droplet infection)
2. Contact with contaminated objects like clothing, needle injuries etc.
3. From pregnant lady to baby during pregnancy and birth
4. Animal–to-human transmission through infected animals from bites or scratches, cooking, playing, eating etc.

PATHOPHYSIOLOGY

After entering through various routes, virus replicates at the inoculation site and then spread to the local lymph nodes. The virus then enters the bloodstream (initial viremia) and spreads to the other organs. This is the incubation period, typically lasting for 7 to 14 days (maximum 21 days).

Symptoms occur following secondary viremis. Prodromal stage consists of fever myalgia, headache and lymphadenopathy which is followed by Eruptive phase. It begins from oropharynx followed by skin lesions. Patient becomes contagious at this stage and antibodies become detectable in blood. The patient became non contagious with the healing of the skin lesion and appearance of new skin beneath.[10]

Symptoms severity and disease duration are proportional to the density of skin lesion. Mpox is usually a self limiting disease but children, pregnant woman and immunocompromised people including people living with HIV are at higher risk for serious illness and death due to complications.

Presence of following features characteristically differentiates mpox from chicken pox

1. Lymphadenopathy
2. Skin lesions over palm and sole
3. All skin lesions are at same stage of development.

A patient with mpox infection is considered for referral to higher center if have following symptoms:

- Pain in eye or blurring of vision
- Shortness of breath or chest pain
- Altered sensorium or seizure
- Decrease in urine output
- Poor oral intake
- lethargy

Clinical Features[11]

- Fever
- Myalgia
- Headache
- Fatigue
- Lymphadenopathy
  - Typically occurs with onset of fever
  - Periauricular, Axillary, Cervical or Inguinal
  - Unilateral or bilateral
- Eruptive lesions
  - Starts from oropharynx
  - Followed by skin lesions on face and extremities (including palm & Sole)
  - Centrifugally distributed
  - Sometimes involves genitals and conjunctiva
  - Evolves through macular, papular, vesicular and pustular phase synchronously
  - Characteristically firm, deep seated and 2-10 mm size.
  - Lesions crust by 5-7 days and desquamate by 7-14 days
  - Resolves in 3-4 weeks.

Differential Diagnosis[12]

- Small pox
- Chicken pox
- Disseminated herpes zoaster
- Eczemz herpeticum
- Syphyllis
- Scabies
- Measles
- Drug associated eruptions

DIAGNOSIS

It is difficult to diagnose mpox on clinical features because of its close resemblance to other infections like chicken pox, measles etc. Co-existence of other diseases like scabies, chicken pox etc in children, sexually transmitted diseases like syphilis in person with multiple sexual partners, opportunistic and secondary infections in immunocompromised persons, makes the diagnosis more difficult.

Complications[14]

- Bacterial super infection of skin - Pneumonia
- Permanent skin scarring - Sepsis
- Hypopigmentation or hyperpigmentation - Encephalitis
- Permanent corneal scarring (vision loss) - Dehydration
- Death

Confirmed diagnosis is made by detection of viral DNA by Polymerase Chain Reaction (PCR). Center for Disease Control and Prevention (CDC) recommends the collection of two specimens, each from multiple lesions from different locations. In the absence of skin lesion, swab from throat or anus should be collected. Antibody detection method is not useful as they do not distinguish between different Orthopoxviruses.[13]

Treatment

Currently there is no specific approved treatment for mpox infection. The treatment is usually supportive as in other viral infection. However there are preventive measures to be followed to prevent outbreak.[15]

Do

- Seek advice from your health care worker
- Home isolation in a well ventilated room
- Wash hands often with soap and water or hand sanitizer, specially before and after touching sores.
- Wear mask and cover lesions in presence of other people until rash heals
- Keep skin dry and uncovered when alone
- Avoid touching items in shared spaces and disinfect shared spaces frequently.
- Use salt water rinses for sores in mouth.
- Take bath with hot water and baking soda or Epsom salt for body sores.
- Take medications like paracetamol or ibuprofen for pain.

Do Not

- Pop blister or scratch sores. This delay healing, spread rash to other part of the body and sores may get infected.
- Shave areas with sores until healed. This may spread rash to other part of the body.
- Indulge in sexual activity. This may spread infection to other partner.

Heath care workers should follow infection prevention control measures to protect themselves by wearing Personal Protective Equipment (PPE) and adhering to other safety protocol.

DRUGS

Although there is no drug currently approved for the treatment of mpox but many drugs are under trial.

- **Tecovirimat-** inhibits the orthopoxviruses protein p37, blocking cell to cell viral transmission. Although approved for the treatment of smallpox, it has not received full regulatory approval for the treatment of mpox. Drug has undergone phase 1 and 2 clinical trials.[16]
- **Brincidofovir -** inhibits the viral DNA polymerase. The drug has shown benefits in mice and rabbit. Its safety profile is inferior to Tecovirimat. Randomized clinical trials are needed for further evaluation.[16]
- **Vaccinia Immune Globulin –** is a purified plasma gamma globulin retrieved from person vaccinated with live vaccinia virus vaccine. Approved in United States of America for the treatment of complication of smallpox vaccination. Randomized clinical trials are needed for its use in mpox infection.[17]
- Several laboratories are currently developing monoclonal antibodies, with preclinical trials already under way.[18]

VACCINATION

Vaccines helps in both pre-exposure and post exposure prophylaxis. Pre-exposure prophylaxis is recommended in high risk people, especially during an outbreak. High risk people are:

- Heath care workers at risk of exposure.
- People in the same household or close community with mpox infected person, including children.
- People who have multiple sexual partner, including men who have sex with men.
- Sex workers of both gender and their client.

Post exposure prophylaxis is given to person who came in contact with someone who has mpox, within 4 days after contact. The vaccine can be given up to 14 days if the person has not developed any symptoms.

Two vaccines are available for mpox: ACAM 2000 and MVA-BN[19]

- **ACAM 2000** is a second generation line, attenuated vaccinia vaccine with Food and Drug Administration (FDA) approval for use before or after exposure to mpox. It is associated with a risk of cardiac complications.
- **MVA-BN** is a third generation lives, attenuated, non-replicating, modified vaccinia Ankara vaccine. It was licensed by the FDA in 2019 for mpox prevention.

MPOX OUTBREAK 2022

Mpox outbreak in 2022 was different from the classical form of mpox. It differs in following respects:[20]

- Caused by West African Variant Virus (probably Clade III)
- Spread in countries where mpox was not endemic (Europe, America, Middle East, Australia)
- Affected young men (age 31-40 yr) who have sex with men
- Has exclusive human-to-human transmission.
- Disseminated mostly by sexual networking, condomless sex with multiple male partner.
- Prodromal stage was not always present and Eruptive phase has lesions at unusual site, especially on genitals.
- Symptoms mostly consist of penile rash, perianal lesions, ulcerative lesions and vesicular rash, painful inguinal lymphadenopathy, pharyngitis and proctitis.

- Low case fatality rate of 0.025%.

CONCLUSION

The increase in the incidence of mpox in endemic area is partly explained by the decrease in the immunity to smallpox. But the current epidemic has raised concern in the manner it has affected the non endemic area with different target population and new clinical presentation. Therefore there is a need to increase the awareness and educate the population, especially people at risk, to prevent infection and reduce transmission and spread. There is also need to develop rapid and sensitive diagnostic tools as well as to evaluate the effectiveness of existing treatment, vaccine and vaccination strategies so that treatment and vaccination should be available to all affected group and region.

REFERENCES

1. Walsh D. Poxviruses: Slipping and sliding through transcription and translation. PLoS Pathog. 2017 Nov; 13(11): e1006634.
2. Rimoin A.W., Mulembakani P.M., Johnston S.C., *et al.* Major increase in human monkeypox incidence 30 years after smallpox vaccination campaigns cease in the Democratic Republic of Congo. Proc Natl Acad Sci U S A 2010; 107: 16262-16267.
3. Sklenovská N., Van Ranst M. Emergence of Monkeypox as the Most Important Orthopoxvirus Infection in Humans. Front Public Health. 2018; 6:241.
4. Moss B. Poxviridae: the viruses and their replication. In: Knipe D.M., Howley P.M., eds. Fields' virology 5th Ed. New York: Lippincott Williams and Wilkins, 2007: 2905-2946.
5. Chen N., Li G., Liszewski M.K., *et al*. Virulence differences between monkeypox virus isolates from West Africa and the Congo basin. Virology 2005; 340: 46-63.
6. Centers for Disease Control and Prevention (CDC). Multistate outbreak of monkeypox--Illinois, Indiana, and Wisconsin, 2003. MMWR Morb Mortal Wkly Rep. 2003 Jun 13; 52(23): 537-40.
7. Velavan T.P., Meyer C.G. Monkeypox 2022 outbreak: An update. Trop Med Int Health. 2022 Jul; 27(7): 604-605.
8. Doty J.B., Malekani J.M., Kalemba L.N., *et al*. Assessing monkeypox virus prevalence in small mammals at the human-animal interface in the Democratic Republic of the Congo. Viruses 2017; 9: 283-283.
9. Grant R., Nguyen L.L., Breban R. Modelling human-to-human transmission of monkeypox. Bull World Health Organ. 2020 Sep 01; 98(9): 638-640.
10. Hutson C.L., Carroll D.S., Gallardo-Romero N, Drew C., Zaki S.R., Nagy T., Hughes C., Olson V.A., Sanders J., Patel N., Smith S.K., Keckler M.S., Karem K., Damon I.K. Comparison of Monkeypox Virus Clade Kinetics and Pathology within the Prairie Dog Animal Model Using a Serial Sacrifice Study Design. Biomed Res Int. 2015; 2015: 965710.
11. Orviz E., Negredo A., Ayerdi O., Vázquez A., Muñoz-Gomez A., Monzón S, Clavo P, Zaballos A., Vera M., Sánchez P., Cabello N., Jiménez P., Pérez-García J.A., Varona S., Del Romero J., Cuesta I., Delgado-Iribarren A, Torres M., Sagastagoitia I., Palacios G, Estrada V., Sánchez-Seco M.P., Grupo Viruela del Simio Madrid CNM/ISCIII/HCSC/Sandoval. Monkeypox outbreak in Madrid (Spain): Clinical and virological aspects. J Infect. 2022 Oct; 85(4): 412-417.
12. Monkeypox. Wkly Epidemiol Rec. 2011 Oct 07; 86(41): 448-51.
13. Aden T.A., Blevins P., York S.W., Rager S., Balachandran D., Hutson C.L., Lowe D., Mangal C.N., Wolford T., Matheny A., Davidson W., Wilkins K., Cook R., Roulo R.M., White M.K, Berman L., Murray J., Laurance J., Francis D., Green N.M., Berumen R.A., Gonzalez A., Evans S, Hudziec M, Noel D, Adjei M., Hovan G., Lee P., Tate L, Gose RB, Voermans R., Crew J., Adam PR, Haydel D, Lukula S., Matluk N, Shah S, Featherston J., Ware D., Pettit D., McCutchen E., Acheampong E., Buttery E., Gorzalski A., Perry M., Fowler R., Lee R.B., Nickla R., Huard R., Moore A., Jones K., Johnson R., Swaney E., Jaramillo J., Reinoso Webb C., Guin B., Yost J., Atkinson A., Griffin-Thomas L., Chenette J., Gant J., Sterkel A., Ghuman H.K., Lute J., Smole S.C., Arora V., Demontigny C.K., Bielby M., Geeter E., Newman KAM, Glazier M., Lutkemeier W., Nelson M., Martinez R., Chaitram J., Honein M.A., Villanueva J.M. Rapid Diagnostic Testing for Response to the Monkeypox Outbreak - Laboratory Response Network, United States, May 17-June 30, 2022. MMWR Morb Mortal Wkly Rep. 2022 Jul 15; 71(28): 904-907.
14. Reynolds M.G., McCollum A.M., Nguete B., Shongo Lushima R., Petersen B.W. Improving the Care and Treatment of Monkeypox Patients

in Low-Resource Settings: Applying Evidence from Contemporary Biomedical and Smallpox Biodefense Research. Viruses. 2017 Dec 12; 9(12)

15. World Health Organization / newsroom/ fact sheets/ detail / mpox, 26 august,2024

16. Rizk J.G., Lippi G., Henry B.M., Forthal D.N., Rizk Y. Prevention and Treatment of Monkeypox. Drugs. 2022 Jun; 82(9): 957-963.

17. Wittek R. Vaccinia immune globulin: current policies, preparedness, and product safety and efficacy. Int J Infect Dis 2006; 10: 193-201.

18. WHO Advisory Committee on Variola Virus Research. Report of the twenty-third meeting: virtual meeting, 3–4 November 2021. Geneva: World Health Organization, 2021 (https://apps.who.int/iris/rest/bitstreams/1423719/retrieve).

19. McCollum A.M., Damon I.K. Human monkeypox. Clin Infect Dis. 2014 Jan; 58(2): 260-7.

20. Thornhill J.P., Barkati S., Walmsley S., *et al*. Monkeypox virus infection in humans across 16 countries — April–June 2022. N Engl J Med 2022; 387: 679-691.