

Research Article

HUMAN MONKEYPOX DETECTED FIRST TIME IN INDIA: ROLE OF TRADITIONAL HERBAL TREATMENT

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ABSTRACT

This overview highlights about the recent detection of human monkeypox viral infection in India. As of December 2022, there are **20 confirmed** human monkeypox virus infection cases have been reported from India. Monkeypox is caused by monkeypox virus which is an enveloped **double-stranded DNA** virus that belongs to the Orthopoxvirus genus of the **Poxviridae** family. Monkeypox is transmitted to humans through close contact with an infected person or animal, sex with an infected person, or with material contaminated with the virus. There are two distinct **Genetic Clades** of the monkeypox virus: the central African (**Congo Basin**) Clade and the **West African** Clade. The Congo Basin Clade has historically caused more severe disease and was thought to be more transmissible. WHO has considered monkeypox outbreak represents a public health emergency of international concern. Vaccines used during the smallpox eradication programme also provided protection against monkeypox. **Monkeypox** typically presents clinically with fever, rash and swollen lymph nodes and may lead to a range of medical complications. The most prominent symptoms of monkeypox, are people with monkeypox have **pockmarks** or vesicles or pustules on the face, palms and soles. As a precaution, India has increased surveillance, imposed travel restrictions as monkeypox reaches multiple nations in the first week of June, 2022. The herbal treatment options for controlling monkeypox virus and antiviral activities of the plants have been listed.

Keywords: India, Indian pitcher plant, viral infection, monkeypox, lymph nodes, rash, fever, Sarracenia purpurea, smallpox vaccine.

OVERVIEW

A total of **20 cases** of monkeypox have been reported in India in 2022 and a national task force has been set up to monitor the development of diagnostics and vaccines (1-2). The first case of monkeypox virus in India was discovered on July 14, 2022 after a UAE traveller returned to **Kerala** (1-3). The patient has been confirmed the first case of monkeypox infection in India (1-2). India reported its second and third case of monkeypox in **Kannur district of Kerala** state (1-2). The fourth monkeypox case was reported in India with the previous three cases being reported from the state of Kerala, **India** (1-2). The first case of monkeypox was detected in **Delhi** as a 31-year-old man with no foreign travel history was diagnosed with the disease (1-2). Another foreign national has been tested positive for monkeypox in Delhi, the fourth such case in the national capital (1-2). The patient is a 31-year-old woman and it is not yet known if she travelled abroad recently (1-3). Altogether, 20 cases of monkeypox viral disease infections have been surfaced in India which were detected in **Kerala** and **New Delhi** (1-2). Currently, India has reported 20 confirmed cases of monkeypox, **12** of them in Kerala and **8** of in Delhi (25). Furthermore, eight suspected cases, one case each in Delhi and Telangana, four in Bihar and four in Uttar Pradesh. The monkeypox outbreak in India is now a global health emergency (1-2, 25). This emphasizes the significance of timely clinical and laboratory diagnosis for early detection and patient management leading to recovery without secondary complications (1-18, 25).

As of November 22, 2022, a total of **80,611 laboratory confirmed monkeypox cases** and **1,519 probable cases**, including **53 deaths**, have been reported to WHO (96-97). Since 13

May 2022, a high proportion of these cases have been reported from countries without previously documented monkeypox transmission (1-18, 98-100). This is the first time that cases and sustained chains of transmission have been reported in countries without direct or immediate epidemiological links to areas of West or Central Africa.

Monkeypox viral outbreak was **endemic** restricted to African zone but now the disease is a **pandemic** (1-3, 98-99). Therefore, monkeypox is a serious health crisis and the World Health Organization (WHO) has called for an international response to curb the outbreak (1-18). A new report has described 6 cases of human monkeypox infection detected in New Delhi without any international travel history, suggesting under-diagnosed monkeypox infection in the community (25). Researchers from **Maulana Azad Medical College in New Delhi, Indian Council of Medical Research (ICMR), National Institute of Virology in Pune and AIIMS, New Delhi, India** have emphasised the need for active surveillance of monkeypox virus (MPXV) in the high - risk population such as men having sex with men and female sex workers (25).

Since early May 2022, cases of Monkeypox have been reported from countries where there was no history of monkeypox (3). The World Health Organization (WHO) has declared the ongoing monkeypox outbreak as a global health emergency (1-18). In the United States, 4,638 cases are confirmed in 44 US states and the District of Columbia, according to the Centers for Disease Control and Prevention (1-18). In New York, which has reported the highest number in the US, a total of 900 cases of monkeypox have been confirmed, with the vast majority of them (93%) detected in New York City. The US has reported 4,638 confirmed cases of monkeypox and **Canada** has reported **1,449** confirmed cases monkeypox (1-18). More than 1,800 people in France have caught the monkeypox virus, with most of the infections in the Paris region, representing around 10% of infections globally (1-18). **The United States now leads** the world in monkeypox cases where the disease has been detected, according to data from the federal Centers for Disease Control and Prevention, a leap that has risen within a few months (96-97). The

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CDC reported **4,638** U.S. cases and the disease that can cause a characteristic rash (96-97). Other countries with high cases include **Spain** (3,738), **Germany** (2,459), **United Kingdom** (2,432) and **France** (1,837) (97).

Monkeypox is one of the four **Orthopoxvirus** species pathogenic for humans, together with **variola virus**, the causative agent of smallpox, largely eradicated in nature; **cowpox virus**, and **vaccinia virus** (1-18, 98-100). The global outbreak of monkeypox is clearly unusual and concerning. The infectivity of monkeypox is less but it can be fatal in children (1-18, 98-100). The COVID-19 infection has more transmissibility, but monkeypox infection occurs after prolonged exposure with an infected person. So the infection rate is very high in COVID and an infected person can infect many. But monkeypox is less contagious (1-18). WHO has declared the monkeypox as emerging global health threat (1-18). Monkeypox, is a rare disease with an unknown source, and it is a part of the same family of viruses, Variola that causes smallpox (1-18). It is not related to chickenpox, and it is rarely fatal which was discovered in 1958 in colonies of monkeys used for research; the first human case was recorded in 1970 (1-18).

Figure-1: Swollen Skin lymph nodules (Photo courtesy taken WHO source & from NDTV website, New Delhi, India)



Figure-2: Initial stage of monkeypox infection. Swollen Skin lymph nodules (Photo courtesy taken from NDTV website source, New Delhi, India)



According to World Health Organization (WHO), monkeypox is a viral zoonosis (a virus transmitted to humans from animals) with symptoms similar to those seen in the past in **smallpox** patients, although it is clinically less severe (1-18). Monkeypox is transmitted to humans through close contact with an infected person or animal, or with material contaminated with the virus (1-18). It is usually a self-limited disease with symptoms lasting from two to four weeks (3). Monkeypox virus is transmitted from one person to another by close contact with lesions, body fluids, respiratory droplets and contaminated materials such as bedding (1-18). Monkeypox is a zoonotic virus with symptoms similar to the smallpox, but less severe

(3). The virus transmission occurs from infected animals to humans via direct or indirect contact (1-18). It can also be transmitted from humans to humans through direct contact with the infected person's skin or lesions, and respiratory droplets (1-18). The monkeypox virus mainly spreads through skin-on-skin contact, but it can also transmit through touching linens used by someone with the infection (1-18). Monkeypox is spread through direct contact with pustules, rashes, scabs or bodily fluids; via respiratory secretions during prolonged face-to-face contact or through kissing, sex or intimate physical contact (3). By touching clothing or linens that have been touched by the infectious rash or bodily fluids; and to a fetus via the placenta (1-18).

The vast majority of cases reported have been in men who have sex with men, though health officials have stressed that anyone can catch the virus (1-18). However, in the current outbreak, most of the spread has come from coming into contact with infected people's lesions or bodily fluids, making it less transmissible than other viruses such as COVID-19 (1-18). Most cases have been reported among men who identify as gay, bisexual or men who have sex with men, though experts have emphasized anyone can be infected (1-18). There is currently no evidence that monkeypox is a **sexually transmitted infection** (3). The researchers said that although sexual closeness is the most likely route of transmission in most of these cases, the virus can be transmitted by any close physical contact through large respiratory droplets and potentially through clothing and other surfaces (1-18).

The typical symptoms of monkeypox include fever, intense headache, muscle aches, back pain, low energy, swollen lymph nodes and a skin rash or lesions (Figure-1,2) (1-18). People with monkeypox may experience fever, body aches, chills and fatigue (3). Many in the outbreak have developed **Zit-like bumps** on many parts of the body. Once monkeypox gets into humans, the virus causes **flu-like** symptoms including fever, aches, and exhaustion, as well as a red rash that turns into **pus-filled boils** (1-18). As the boils burst and crust over, the infection can spread through direct contact with the lesions (3). The **scabs** it creates are very, very infectious, and can even be transmitted on a blanket or **bed sheet** (3). The virus is a **double-stranded DNA virus**, and fortunately, monkeypox can be scoured off surfaces easily with **bleach** (1-18). Clinicians treating patients often wear gowns, gloves, eye protection, and face masks, but the disease is not so transmissible that people need to be in all-encompassing hazmat suits around infected patients (1-18). The **symptoms of monkeypox** include fever, intense headache, muscle aches, back pain, low energy, swollen lymph nodes and a skin rash or lesions (3). As per WHO, **the rash** usually begins within 1-3 days of the start of a fever. Skin lesions can be flat or slightly raised, filled with clear or **yellowish fluid**, and can then crust, dry up and fall off (**Figure-1, 2**) (1-18). The number of **lesions** on one person can range from a few to several thousand (3). The rash tends to be concentrated on the face, palms of the hands and soles of the feet. They can also be found on the mouth, genitals and eyes (1-18). The **lesions** were most commonly observed on the genitals, groins, lower limbs, trunk and upper limbs. The oral lesions were painful and showed ulceration. The **skin lesion** severity score for all the cases was moderate (1-18, 25).

Symptoms typically last between 2 to 4 weeks and go away on their own without treatment (3). However, in some people, an infection can lead to medical complications and even death. Newborn babies, children and people with underlying immune deficiencies may be at risk of more serious symptoms and death from monkeypox (1-18). The WHO recommends distinguishing monkeypox from other illnesses such as Chickenpox, Measles, Bacterial skin infections, Scabies, Syphilis and medication-associated allergies (1-18). Single genital lesions and sores on the mouth or anus have been identified as symptoms of the monkeypox virus (3). These symptoms

include single genital lesions and sores on the mouth or anus. The clinical symptoms are similar to those of sexually transmitted infections (STIs) and can easily lead to **misdiagnosis** (1-18). In some people, anal and oral symptoms have led to people being admitted to hospital for management of pain and difficulties swallowing (1-18).

Evidence suggests that the **smallpox vaccine** can help to prevent monkeypox infections and decrease the severity of the symptoms. **ACAM200** and **JYNNEOS™** (also known as Imvamune or Imvanex) are the two currently licensed **vaccines** in the **United States** to prevent smallpox (1-18). One vaccine known as **JYNNEOS™ Imvamune or Imvanex** is licensed in the U.S. to prevent monkeypox and smallpox. Because monkeypox virus is closely related to the virus that causes smallpox (1-18). **Smallpox vaccine** can also protect people from getting monkeypox (3). In another major development, the so-called **dose-sparing** approach also calls for administering the **Jynneos** vaccine with an injection just under the skin rather than into deeper tissue a practice that may rev up the immune system better. Recipients would still get two shots spaced four weeks apart (1-18). The **new approach** would produce up to five more doses from each vial by using an injection method that requires less vaccine per shot. The vaccine would be injected into the **second layer of the skin**, just below the first visible layer. Most routine vaccinations are given as intramuscular or subcutaneous shots, which go deeper (1-18).

Monkeypox: Traditional Herbal Medicine Treatment

In a traditional **Indian Ayurvedic** system of medicine, plants and plant-based constituents have been extensively used for the treatment and management of different types of viral and other diseases (26-95). Plant extracts have a wide variety of active compounds, including flavonoids, terpenoids, lignans, sulphides, polyphenolics, coumarins, saponins, feryl compounds, alkaloids, polyines, thiophenes, proteins, and peptides (26-95). Herbal medicines and purified natural products provide a rich resource for novel antiviral drug development (26-95). Following is the list of plants used as antiviral agents during the outbreak of viral diseases and wound healing agents (19-24).

1. Sarracenia purpurea (Indian Pitcher Plant). In India only known pitcher plant species is **Nepenthes khasiana** (Family-Nepenthaceae) Hook. f., which is an evergreen shrub considered endemic to Meghalaya. **2) Resveratrol** is a small, natural compound in many plants like grapes, cocoa beans, peanuts and blueberries. **3) Turmeric (Curcuma longa) (Zingiberaceae)** Rhizomes. **4) Triphala** (Sanskrit; Tri = three and Phala = fruits) is defined as a well known tri-herbal Indian *Ayurvedic* formulation consisting of dried fruits of the three plant species, *Emblica officinalis* (Amalaki or the Indian Gooseberry) (Family-Euphorbiaceae), *Terminalia bellirica* (Bibhitaki or Karitaki) (Family-Combretaceae), and *Terminalia chebula* (Haritaki) (Family-Combretaceae) that are native to the Indian subcontinent (81). **5) Liquorice or Mulethi (Glycyrrhiza glabra) (Fabaceae)** Roots. **6) Neem (Azadirachta indica) (Meliaceae)** All the parts of plant were used. **7) Centella (Centella asiatica) (Apiaceae)** Leaves. **8) Carbonal (Mimosa tenuiflora) (Fabaceae)** Leaf and stem parts used. **9) Costus speciosus (Zingiberaceae)** Rhizome used. **10) Forest Champa (Spermadictyon suaveolens) (Rubiaceae):** Roots used **11) Chlorophytum borivillianum (Liliaceae):** Rhizome parts. **12) Sesame (Sesamum indicum L) (Pedaliaceae)** seeds were used. **13) Calendula officinalis (Asteraceae):** Flowers and leaves used. **14) Trumpet tree (Cecropia peltata):** Leaves. **15) Kencur (Kaempferia galanga) (Zingiberaceae)** Rhizomes. **16) Jhand tree Druce (Prosopis cineraria) (Fabaceae)** Leaves. **17) Maidenhair (Ginkgo biloba) (Ginkgoaceae)** Leaves and seeds. **18) Madagascar periwinkle (Vinca rosea or Catharanthus roseus) (Apocynaceae)** Leaves and flowers. **19) Asthma Weed (Euphorbia hirta) (Euphorbiaceae)** Leaves. **20)**

Red sandalwood (*Pterocarpus santalinus*) (Fabaceae) Bark wood. **21) Lawsonia alba (Lawsonia inermis) (Lythraceae)** Leaves and roots. **22) Jandi or Ghaf (Prosopis cineraria) (Fabaceae)** Leaves and pods. **23) Aloe (Aloe vera) (Liliaceae)** Leaves. **24) Bay (Sphagneticola trilobata) (Asteraceae)** Leaves. **25) Adusa (Adhatoda vasica) (Acanthaceae)** Leaves. **26) Humble plant (Mimosa pudica) (Leguminosae)** Whole plant is used for wound healing. **27) Papaya (Carica papaya) (Caricaceae)** Latex, fruit. **28) Jungle flame (Ixora coccinea) (Rubiaceae)** Roots and leaves. **29) Betle Piper (Piper betle L) (Piperaceae)** Leaves. **30) Common wireweed (Sida acuta) (Malvaceae)** whole plant. **31) Drumstick tree (Moringa oleifera) (Moringiaceae)** Leaves. **32) Indian olive (Olea europaea) (Oliaceae)** Leaves and oil. **33) Burdock (Arctium lappa) (Asteraceae)** Root extract used treatment of sore throats and skin pathologies boils, rashes, and acne in North America, Europe, and Asia. **34) Ginseng (Panax ginseng) (Araliaceae)** Root or Rhizome part is used wound healing in China, Japan, Korea, and Eastern Siberia. **35) German chamomile (Chamomilla recutita) (Asteraceae)** Apigenin is the rarest flavonoid in chamomile flora and has a remarkable effect on the wound healing process. **36) Pinus pinaster (Leaf and stem part).** **37) Lavandula angustifolia (Lamiaceae), 38) Argania spinosa (Sapotaceae), 39) Bursera morelensis (Burseraceae), 40) Hypericum patulum and H. perforatum (Hypericaceae) 41) Copaifera paupera (Fabaceae), 42) Avicennia schaueriana (Verbenaceae), 43) Cucurbita pepo (Cucurbitaceae) , 44) Euphorbia hirta (Euphorbiaceae) 45) Cydonia oblonga (Rosaceae) 46) Chrozophora tinctoria (Euphorbiaceae) 47) Nigella sativa (Ranunculaceae) 48) Elaeis guineensis (Arecaceae) 49) Ficus racemose (Moraceae), 50) Artocarpus communis (Moraceae), 51) Aegle marmelos (Rutaceae), 52) Ephedra alata (Ephedraceae), 53) Ficus racemose (Moraceae), 54) Calotropis procera (Apocynaceae) 55) Salvia miltiorrhiza (Lamiaceae), 56) Alchemilla vulgaris (Rose family) 57) Phyllanthus muellerianus (Euphorbiaceae), 58) Andrographis paniculata (Acantheaceae), 59) Angelica sinensis (Apiaceae) in wound healing. 60) Boswellia sacra (Bursaraceae) Frankincense, a resinous extract from *Boswellia sacra*, is valued in Africa, India, and the Middle East for the treatment of trauma and inflammatory diseases such as rheumatoid arthritis, and wound healing. 61) *Celosia argentea* (Amaranthaceae). *Celosia argentea*, also known as silver cock's comb, is used in traditional medicine to treat skin sores, eruptions, ulcers, mouth ulcers, and other skin diseases. 62) *Cinnamomum camphor* (Lauraceae), 63) *Commiphora myrrha* (Burseraceae), 64) *Terminalia chebula* (Combretaceae), 65) *Terminalia arjuna* (Combretaceae), 66) *Kutaja (Holarrhena antidysenterica) (Apocynaceae)* Bark and leaf.**

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