IADVL Academy Position Statement on Emerging Dermatoses in India: Monkeypox

Abstract
As we were on the road to recovery from the coronavirus disease-19 (COVID-19) pandemic, the world is waking up to yet another potential adversary. Monkeypox (or human monkeypox) caused by monkeypox virus (an orthopox virus) is fast emerging in more than 80 countries worldwide, where it has never been historically reported. We in India, have already seen the advent of this outbreak since July 2022, with a progressive rise in number of cases being seen. Though the virus is not a novel virus; it is presenting with atypical manifestations as compared to our conventional knowledge of the disease. Through this document, the Indian Association of Dermatologists, Venereologists, and Leprologists Academy aims to sensitize dermatologists toward recognizing the clinical features and responding promptly, to contain the outbreak at the earliest. In view of the non-availability of specific antiviral drugs as well as vaccines; early detection, isolation, and prevention of spread form the mainstay of our approach towards the outbreak, which has been declared to be a “Public Health Emergency of International Concern” by the World Health Organization.

Keywords: Diagnosis, India, monkeypox, monkeypox virus, prophylaxis, treatment, World Health Organization

Introduction
As we recovered from the deadly wave of COVID-19 pandemic, caused by the Delta variant, the second half of 2022 has presented us with another potential threat in the form of monkeypox. It is a viral infection caused by monkeypox virus (MPV) a double-stranded DNA virus belonging to the group Orthopoxviruses. It was largely considered an endemic zoonotic infection for years; however, now human-to-human transmission and occurrence in naïve population is being increasingly documented. The name “monkeypox,” is considered a misnomer as monkeys are neither the origin nor the reservoir of the virus. Though its origin is largely unknown, several rodents and small mammals are known to harbor MPV.[1] With 43 years gone by since smallpox vaccination was discontinued, we now have a substantial pool of susceptible population world over and in India. In addition, the overarching issues of overcrowding, poor hygienic conditions, malnutrition, parasitic infestations, and unsafe sexual practices seem to play an important role in its spread.

Monkeypox, an emerging viral infection with prominent cutaneous findings, has been declared a “Public Health Emergency of International Concern” by the World Health Organisation (WHO) on July 23, 2022.[2] As most dermatologists have not commonly seen it, the Indian Association of Dermatologists, Venereologists, and Leprologists (IADVL) Academy compiled this document with an aim to familiarize them with its presentation and management. Most of the cases of monkeypox are diagnosed based on the characteristics of the skin rash; hence, dermatologists need to be sensitized regarding the same. This article aims to present an updated overview of this ongoing outbreak, in the context of existing knowledge. It is important for health care workers (HCW) to update their knowledge regarding its prevention, management and prophylaxis, to effectively contain its spread, as well as to protect themselves. We hope that this document will serve as a primer for dermatologists presented with a situation where the need to identify monkeypox and differentiate it from other skin rashes arise. This document reflects the current understanding and the latest information available.

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currently available knowledge; however, the scenario is fast evolving and further changes may occur with increasing research.

History of Evolution

MPV was first isolated in 1958 in monkeys transported from Africa to Copenhagen.[1] Despite this nomenclature, it is now known that rodents including squirrels, rats, and small mammals form the largest animal reservoirs of MPV. A 9-month-old child from Democratic Republic of Congo (DRC) was the first human case identified in August 1970. Since then small outbreaks have been reported infrequently in central and western African countries.[2]

Initially, the disease remained confined to endemic African countries, with DRC reporting the maximum number of cases. However, since the turn of the century, limited outbreaks outside of endemic regions have been reported. These include the United States in 2003–2004, in 2013 (47 cases) and Nigeria in 2017–2018 (over 80 cases).[3] The situation dramatically escalated from May 2022, with much larger numbers being reported from many non-endemic countries with a travel link to Europe and North America. The current outbreak is mainly centered in European countries, and the Western hemisphere.[4] India was the first country to report a case in the South-East Asian Region, with travel links to the middle-east region.[5] It is currently unclear as to when and why this outbreak began, but the effects are now widespread. As on August 16, 2022, there were 38019 cases worldwide, in 93 countries (of which 86 had never reported monkeypox historically).[6]

Evolution in India

The first case documented in India was from Kerala, reported on July 15, 2022. Infact, this was the first case reported from the whole WHO South-East Asian Region.[5] It was reported in a 35-year-old man with travel history from the middle-east. By mid-August, 2022, there were nine cases in India, with many more suspected cases.[7] On 1st August, India confirmed its first monkeypox death, that too in a patient who had travelled back from middle-east.[8] The Indian scenario is fast evolving and ever changing by the time this article was compiled. Dedicated isolation and observation rooms have been, and are being identified across the country and in various hot-spots. Confirmatory testing, initially being done in the National Institute of Virology, Pune, was started in AIIMS (Delhi), and is now available in 15 different specialized laboratories with an aim to make it available more widely and to reduce the testing time.[9] Guidelines on management of monkeypox disease were issued by the Ministry of Health and Family welfare, Government of India (MOHFW-GOI) on 31st May, 2022.[10]

Etiology

MPV belongs to the family Poxviridae, subfamily Chordopoxviridae, and genus Orthopoxvirus. Orthopox viruses are large, double-stranded DNA viruses, residing in many hosts including rodents, rabbits and small primates. It has been circulating as a zoonosis for long, with human cases being reported occasionally as spill-over infections. The genus Orthopoxviruses contains 12 species, of which the most well-known is the variola virus, responsible for smallpox. Smallpox was eradicated globally in 1977, primarily through increased vaccination coverage. Other diseases caused by orthopoxviruses included cowpox, horsepox, camelpox, molluscum contagiosum, and so on, with the most recently described disease being Alaskapox (reported in 2015).[11] Evolution of orthopoxviruses has entailed progressive loss of genes, leading to better virus survival, evasion of host immunity, changing transmission, and clinical features.[12] The virus may be becoming more adapted to humans.[13]

MPV is known to have two distinct clades. The Central African (Congo Basin) clade is considered more virulent, and causes more severe disease, with greater morbidity, mortality (up to 10%) and viremia.[9] It was responsible for the 2003–2004 outbreak in the United States with human-to-human transmission. The West African clade, with reduced virulence, is considered less severe with lesser mortality rates (3.6%). In the current outbreak, it is being proposed that the MPV responsible possibly belongs to clade 3, (West African clade lineage B.1) which clusters with 2018–2019 cases. It still seems to segregate in a divergent phylogenetic branch.[14] This may be a result of continuous accelerated evolution. MPV is resistant to destruction by ether or drying. It is susceptible to chloroform, methanol, formalin, and heating at 56°C (30 mins).[15]

Orthopoxviruses are known to be dangerous pathogens, as reflected by the scourge of smallpox, which caused massive fatalities throughout recorded human history. Even the smallpox virus is presumed to have evolved from a rodent orthopoxvirus; serving as a grim reminder towards the potential danger posed by monkeypox resurgence. With continuing deforestation, and altered environments, zoonoses continue to adapt to human hosts, as reflected by the COVID-19 pandemic. Coming on its heels, the monkeypox epidemic should be taken seriously, considering our poor herd immunity. Orthopoxviruses exhibit considerable cross-reactivity and cross-protection; thus, infection with any member of the genus confers some protection from another member.

Epidemiology

It is presumed that monkeypox has been occurring in Sub-Saharan Africa for thousands of years, though not recognized as a distinct disease till 1970.[15] The slow
disappearance of smallpox highlighted its distinctive features. The virus was laboratory identified in 1958 in State Serum Institutes in Copenhagen, Denmark, and Africa.[1] Though, clusters of cases continued to be reported from Africa, widespread smallpox vaccination probably kept it under check for many years. However, this temporary control is now largely waning. The ongoing civil war in endemic areas, with increased deforestation, hunting for food and increased animal contact have probably contributed to its resurgence.

The disease assumed global public health importance in 2003, when clusters were reported outside of an endemic area, that is in the US mid-west region. This outbreak was traced to contact with pet prairie dogs kept with exotic rodents imported from Ghana.[16,17] Since then, sporadic cases or clusters have been reported, with the largest one (excluding the 2022 scenario) being from Nigeria in 2017.[18]

Epidemiologically, the R0 (reproductive ratio) value for monkeypox in areas where there is negligible exposure to Orthopoxviruses, is estimated to be 0.8–1.0 while being higher in certain populations, even up to 1.8.[15] This indicates a high degree of transmissibility of the disease, pointing toward an imminent epidemic, if special measures are not taken to social distance and quarantine infected individuals.

Certain epidemiological features of the current epidemic are atypical, unique, and noteworthy.

- The infection is prevalent among individuals less than 40 years of age, with a median age of 31 years.[18] This is possibly due to the unimmunized segment of population. Conventionally, monkeypox used to be a disease of the children; however, its mean age of incidence has been rising over the past decades.
- A higher prevalence is being seen in males. The exact reasons for the same may not be known; however, higher detection rates as well as higher chances of travel may be responsible.
- The disease is being reported in sexual contacts of infected individuals. However, it is not clear, whether MPV is sexually transmitted or the spread occurs only due to close contact.
- The disease is being seen more commonly in men having sex with men (MSM) or those who identify themselves as gay and bisexual. The significance of this finding and its reflection on modes of transmission remains under research. Though the virus has been isolated from semen, the implications may take time to establish.[19,20]

### Modes of Transmission

Even though the exact mode of transmission is still under investigation, several possibilities have been proposed; all have an association of contact with infected animals or infected humans. These are summarized in Table 1. The human-to-human transmission was considered less common than animal-to-human transmission, but the current outbreak is fueled by the former. The most common mode for human transmission was considered through respiratory droplets; however, sexual transmission is being actively investigated.[15,21]

#### Transmission in healthcare settings

The risk of transmission of monkeypox in healthcare settings, outside of endemic regions is not well defined. Transmission to HCW or to other patients had been characterized well in endemic settings, but these happened to be resource poor all along. A review of published reports from 2000 to May 2022 (excluding the current global outbreak), found a single reported transmission event in a non-endemic region. The study concluded that transmission to HCW seems to be rare with adequate personal protective equipment (PPE) and hand hygiene.[22] Nevertheless, the extent of exposure, and risk stratification need to be defined. Adequate PPE as well as pre-exposure prophylaxis (PrEP) in the form of vaccines, is recommended for the following occupational groups:

- Frontline workers or members of the medical response team, engaged in patient care and sample collection

#### Table 1: Proposed modes of transmission of human monkeypox

| Mode                                      | Source                                      |
|-------------------------------------------|---------------------------------------------|
| Animal to human transmission (primary mode)| Direct contact with or exposure to an infected animal |
|                                           | Bites or scratches                          |
|                                           | Most commonly due to body fluids like saliva, respiratory secretions |
|                                           | Exudate from cutaneous/mucosal lesions      |
|                                           | Exposure to faces of an infected animal     |
|                                           | Hunting, cooking, or consumption of infected animals |
|                                           | Now human to animal transmission is also being suspected |
| Human to human transmission (secondary transmission) | Close contact |
|                                           | Respiratory droplets in cases with prolonged face-to-face contact |
|                                           | Direct contact with lesions                 |
|                                           | Recently contaminated objects/surfaces like bedding, dishes or utensils of infected individual |
| Sexual transmission?                      | Not confirmed as per WHO                    |
| Vertical transmission?                    | Transmission can be attributed to close contact |
|                                           | It can also be due to semen/vaginal fluid (not confirmed yet) |
|                                           | Mother to child transmission during pregnancy (through placenta) |
|                                           | More reports needed                         |
Clinical Features

Conventionally, monkeypox has been a mild and self-limiting disease, with resolution of cutaneous lesions in 2–4 weeks. However, children, pregnant women, and immunocompromised persons can develop severe disease with complications. WHO reported skin rash as the most frequent symptom in 16,016 patients reported till July 22, 2022. This was followed by fever, lymphadenopathy, fatigue, headache, and muscle aches. Typically, an incubation period of 5–21 days (most frequently 7–14 days) from the day of infection, is followed by a prodrome of fever, chills, headache, muscle aches, sore-throat, and fatigue. Symptoms are nonspecific, and may not be taken seriously. This phase is generally associated with lymphadenopathy that lasts for 1–5 days.

The prodrome is followed by an exanthem in the form of oral ulcers on tongue and buccal mucosa. They can be quite symptomatic and compromise oral intake. It is closely followed by an exanthem within 24 hours. The hallmark of monkeypox is a disseminated vesico-pustular rash. However, in the current outbreak, more localized exanthem is seen, appearing even without a prodrome. The cutaneous lesions start as macules, progressing to papules, vesicles, and pustules over a period of 3–6 days. The pustules commonly develop central umbilation and heal with scab formation, which falls off in 7–14 days, leaving behind hypopigmented or hyperpigmented pitted scars. Typically, the lesions are monomorph in nature, exhibiting a centrifugal distribution, with predilection for mucosae (oral and genital) and extremities (palms and soles). The number of lesions can vary from 10 to over 500 with size ranging from 0.5 to 2.5 cm. The lesions are initially painful, become pruritic once healing starts. The patient is deemed infectious from the start of symptoms until all scabs have fallen off with epithelialization.

In the current multicity outbreak, atypical presentations of monkeypox are being described. Awareness regarding these features can help suspect and diagnose cases better. The reasons for these atypical presentations could be many, including immunocompromised hosts, altered modes of entry, poor orthopoxvirus immunity, alterations in the virus, and involvement of naive population subsets.

Complications

These include secondary bacterial infections and cellulitis; bronchopneumonia and respiratory distress; sepsis and septic shock; and encephalitis. These are associated with both increased morbidity and mortality. Corneal infection, conjunctivitis, and keratitis can lead to corneal scarring and vision loss. However, data regarding the timeframe of development of complications and their

Figure 1: Clinical course of monkeypox infection

| Period of infectivity | Incubation period (4-21 days) |
|-----------------------|-------------------------------|
| Prodrome              |                               |
| 1-5 days              |                               |
| Enanthem (tongue and buccal mucosa) | 1-2 days |
| Exanthem              |                               |
| Macule                | 1-2 days                      |
| Papule                | 1-2 days                      |
| Vesicle               | 1-2 days                      |
| Pustule (deep seated with umbilation) | 5-7 days |
| Crusting & scab formation | 7-14 days |
| Scabs fall & new skin forms |                   |
| Hypo/ hyperpigmented pitted scars |                   |

Figure 2a, b: [Illustration of the clinical course of monkeypox infection]
incidence is lacking, even though it largely appears to be a mild and self-limiting illness.[27] Historically, the mortality associated with monkeypox has been 1%–10% cases, being higher with the Central African clade.[4] The West African clade, has been associated with less mortality, though morbidity is still noticeable. In preliminary data analysis, mortality risk has been found to be 0.4%–4% for the present outbreak, with no deaths being reported in two large series.[6,19,20,28] As with other resurging infections, the media hype, scare as well as stigma associated with the infection are also taking their toll; hampering prompt reporting and effective containment of the spread.

### Differential Diagnosis

The clinical differentiation of monkeypox rash from disseminated herpes simplex virus infection, varicella, 

| Differences seen in Monkeypox 2022 | Atypical features seen |
|-----------------------------------|------------------------|
| Differences in epidemiology       | Human-to-human transmission (earlier not seen with West African clade, which was animal to human transmission) |
|                                   | Involvement of adults, not children (earlier it was a disease of children) |
|                                   | Male predilection (>90%) |
|                                   | Detected more in patients who identify themselves as gay, bisexual, and MSM |
|                                   | Most spread reported with sexual contact; however, up to 20% patients have reported no previous sexual contact (suggesting an asymptomatic group, or fomite transmission) |
|                                   | Correlation with high risk sexual behavior |
|                                   | Poor correlation with HIV status or vaccination status |

| Differences in clinical presentation | Mild to absent prodrome |
|--------------------------------------|------------------------|
|                                     | Few localized lesions or even a single lesion |
|                                     | Rash beginning in genital area. Initial presentation as a genital/perianal rash |
|                                     | Preferential involvement of oral and genital mucosae. Mucosal “chancriform” ulcers |
|                                     | May not involve face or extremities at all |
|                                     | Starts as localized homogenous papules, in area of inoculation (called “pseudopustules” instead of pustules, similar to other orthopoxvirus lesions) |
|                                     | Initial papular lesions at entry site, followed by distant pustular lesions |
|                                     | Generalized small pustules may appear in some of the patients |
|                                     | Monkeypox “whitlow” described in many cases |
|                                     | Involvement of palms and soles |
|                                     | Lesions can be seen in different stages of development (pleomorphic/heterogenous/asynchronous) rather than the early monomorphic rash |
|                                     | Lesions preceding prodromal symptoms (fever) |
|                                     | A small subset of patients presenting without skin lesions, but with anal pain and bleeding (proctitis). |
|                                     | Macular (morbilliform) eruption in 6% patients |

| Differences in outcome | Mostly a mild, self-limiting illness. |
|------------------------|--------------------------------------|
| Hospitalization for various reasons required in up to 13% patients |
| Antiviral treatment administered in <5% |
| Average age of death 27 years (earlier occurred in children <10 yrs) |
| At 4% mortality (early data), the rates are less than Central African clade and comparable with West African clade. |
| Much lower rates of mortality (0.4%) also suggested, but not conclusively proven |

| Stigma attached | Current outbreak being viewed as an STI (Sexually Transmitted infection) |
|-----------------|-----------------------------------------------------------------------|
|                 | High possibility of co-existence of other STI's; patients should be thoroughly evaluated |
|                 | However, monkeypox is no more a “Gay disease” than it is an “African disease”[20] |
molluscum contagiosum, hand-foot-mouth disease (HFMD), and secondary syphilis can be quite challenging. This is compounded by a heightened awareness, anxiety, lack of information, and atypical presentations. The cutaneous lesions in herpes group of viruses are in the form of small vesicles and dissemination occurs in the setting of immunosuppression. Molluscum contagiosum typically affects children and presents with hard, pearly-white, umbilicated papules. The real clinical confusion as of now is being reported with varicella (Varicella Zoster Virus [VZV]) and HFMD (Coxsackie A16 most commonly). The clinical differentiation points are enlisted in Table 3. The presence of lymphadenopathy is considered to be an important differentiating feature as it develops early in monkeypox.[29]

**Diagnosis**

The diagnosis of monkeypox is based on WHO Surveillance case definition [Table 4]. It categorizes patients into suspected, probable, and confirmed. All suspected cases should be tested for diagnostic confirmation. However, since clinical differentiation from other causes of vesiculo-pustular lesions is difficult, the decision to test should be guided by both clinical and epidemiological factors. A high index of suspicion and thorough knowledge about atypical manifestations can help suspect a case. The MOHFW-GOI endorses a period of observation of 21 days for all asymptomatic travelers returning from outbreak/endemic regions. For all suspected symptomatic cases, samples need to be sent to Indian Council of Medical Research-National Institute of Virology (ICMR-NIV), Pune or the designated Virus Research and Diagnostic Laboratories (VRDL) for confirmation [Figure 3].[9] Table 5 describes the specimen collection and the transport requirements as per MOHFW-GOI.[10]

![Figure 3: Management flowchart for suspected cases with monkeypox](image)

| Table 3: Clinical characteristics of monkeypox as compared to Varicella and HFMD |
|--------------------------------------|---------------------------------|---------------------|
| **Clinical feature**                | **Monkeypox**                   | **Varicella**       | **Hand-foot-mouth disease (HFMD)** |
| Typical lesion morphology           | Classic monkeypox shows vesiculo-pustules with deep central umbilication and peripheral rim of erythema | Vesicles on an erythematous base (dew-drops on rose petals) | Gray oval vesicles |
|                                     | Size varies from 0.5 to 2.5 cm | Size varies from 0.2 to 0.4 cm | Size varies from 0.2 to 0.4 cm |
|                                     | Monomorphic lesions            | Polymorphic lesions   | Monomorphic lesions |
|                                     | Scab falls off leaving behind hypo/hyperpigmented pitted scars | Scab falls off leaving behind hyperpigmentation. Only some patients develop scars. | Heal with desquamation |
|                                     | Lesions are painful initially  | Lesions are often itchy. | Generally asymptomatic |
|                                     | Later become pruritic         |                      |                      |
|                                     | However, atypical presentations are being noted as described in Table 2. These may be the predominant presentations in the current outbreak. |                      |                      |
| Lesion distribution                | Centripetal distribution       | Trunk and proximal extremities predominantly involved | Palms, soles and oral mucosae preferentially involved |
|                                     | Starts from oral cavity and progresses to involve genitalia and extremities | Multiple crops of lesions | Few lesions over buttocks |
|                                     | Usually single crop of lesions | Mild prodrone |                      |
|                                     | Prodrone of fever, malaise, muscle ache, Cough, sore throat, nausea, vomiting, diarrhea | Fever, sore throat and cold | Sometimes a prodrome of fever |
| Systemic features                  | Commonly associated with lymphadenopathy |                      |                      |
Management

A suspected or confirmed case should be managed in an isolation room (with separate ventilation) at hospital or in-home setting. MOHFW-GOI has issued a standard Case Report Format for reporting such a case and submitting samples for testing.\[10\] Currently, reporting to the District Surveillance Officer is required with the list of State Surveillance Officers being available from Integrated Disease Surveillance Program (IDSP) website.\[10\] The samples can be sent to the 15 designated VRDL across the country.\[10\]

During the “rash phase” sampling is to be done from lesion roof, lesion fluid, and lesion base scrapings, in addition to nasopharyngeal and oropharyngeal swabs, blood, and urine [Table 5]. Highest diagnostic yield is expected from lesional sampling. However, during the recovery phase, serum samples are to be collected.\[10\]
Patient should wear a triple-layer mask to prevent transmission to the HCW or to household contacts. Lesions should be kept covered with appropriate clothing. HCW and close contacts must themselves wear appropriate PPE and follow hand-hygiene practices. The period of isolation is continued until all scabs fall and the reepithelialization has occurred.

Most infections, being mild, can be managed appropriately with supportive care and symptomatic management [Table 6]. However, for complications, expert advice must be sought and patients should be managed by a multispecialty team. Managing the fluid-electrolyte balance and nutritional needs of the patient is of utmost importance, considering decreased oral intake because of painful oral ulcers. Similarly, genital lesions need adequate cleaning to avoid secondary bacterial infection. Symptomatic management for fever, gastrointestinal symptoms, conjunctivitis, and pruritus form the mainstay of therapy. Predisposed individuals including children, pregnant women and immunocompromised persons should be monitored regularly for early detection of complications. “Danger signs” include pain in eye, blurring of vision, shortness of breath, chest pain, altered consciousness, decreased urine output, poor intake, or lethargy.

There are no USFDA-approved antivirals against MPV. Thus, specific management with antiviral drugs is not routinely recommended. However, cidofovir, brincidofovir, and tecovirimat have been shown to have antiviral activity against MPV and can be potential options in the future. Of these, tecovirimat, an antiviral drug approved by USFDA for use in children and adults with smallpox, has shown safety in clinical trials; though efficacy data is limited. Indications for antiviral treatment are summarized in Table 7. Currently, none of these drugs is available in India.

**Pre- and post-exposure prophylaxis**

The role of Vaccinia Immune Globulin Intravenous (VIGIV) and vaccinia virus-based vaccines are being explored for offering pre- and postexposure prophylaxis. However, this will depend on continuous availability of stocks if the need arises. These are currently unavailable in India.

VIGIV was approved for the management of complications following vaccination with vaccinia virus vaccine. It is currently under investigation for emergency use in the treatment of monkeypox.

There are no specific vaccines for MPV. Historically, studies conducted in DRC in 1980 reported a protection of 85% against monkeypox in those vaccinated for smallpox (1st generation or Dryvax vaccine). Based on this premise, currently two potential vaccines are being proposed. These are the 2nd generation ACAM2000™ (live replication competent vaccinia virus-based vaccine) (single percutaneous dose

| Table 6: Management protocol for patients suspected/diagnosed with monkeypox |
|---------------------------------------------------------------|
| **Supportive management**                                      | **Symptomatic management** | **Specific management** |
| **General care**                                               |                            | **Antiviral drugs***    |
| Adequate hydration and nutritional support                     | Antipyretics for fever     | Cidofovir: 5 mg/kg per dose weekly for two or more doses (with probenecid) |
| Maintenance of fluid-electrolyte balance                      | Antihistamines for pruritus| Brincidofovir: 4 mg/kg per dose weekly for two doses |
| **Cutaneous lesions**                                         | Antiemetics for nausea and vomiting | Tecovirimat: to be given for 14 days |
| Cleaning of lesions                                           | Management of complications | Intravenous (200 mg twice daily for 35-119 kg, 300 mg twice daily≥120 kg) |
| Topical antibiotics                                           | Secondary bacterial infection-consider oral antibiotics | Oral (600 mg twice daily for 40-119 kg, 600 mg thrice daily≥120 kg) |
| Covering with clothes/gown/light dressing                     | **Appropriate referrals and multispecialty management** |                                                                            |
| **Genital lesions**                                           | Respiratory distress and pneumonia (Pulmonologist) |                                                                            |
| Cleaning                                                      | Eye pain and decreased vision (ophthalmologist) |                                                                            |
| Sitz bath                                                     | Vomiting and diarrhea (gastroenterologist) |                                                                            |
| **Oral ulcers**                                               | Encephalitis (neurologist) |                                                                            |
| Soft and bland diet                                          | Sepsis (intensivist)       |                                                                            |
| Topical anti-inflammatory and anesthetic gels                 | **Consider co-infection with other STI’s if the setting suggests so** |                                                                            |
| **Eye (conjunctivitis and keratitis)**                       | Coinfection with HIV leads to larger skin and genital ulcers |                                                                            |
| Lubricating eye drops                                         | Consider gonorrhoea, chlamydia, herpes, syphilis, etc., and mange accordingly |                                                                            |
| Antibiotic eye drops                                          |                                                                            |                                                                            |
| To prevent catastrophic eye damage                           |                                                                            |                                                                            |

*None of these drugs were developed for MPV. Cidofovir is USFDA approved for CMV retinitis in patients with AIDS. Brincidofovir and Tecovirimat are approved for smallpox.*
administered with multiple punctures, to be repeated at 3 years) and 3rd generation JYNNEOS™ (nonreplicating modified vaccinia virus-based vaccine) (two doses, given subcutaneously, 4 weeks apart). Of these, JYNNEOS™ appears a favored option, considering the risk of reactivation of the virus with ACAM2000™, which could result in progressive vaccinia, eczema vaccinatum, and myopericarditis in patients who are immunocompromised or have a pre-existing condition like atopic dermatitis.[35] Pre-exposure vaccination for HCW working with MPV and managing patients and post-exposure prophylaxis with vaccine is being considered for high-risk contacts of confirmed cases.

“Ring vaccination” is encouraged to contain the outbreak, like it did for Ebola. It involves vaccinating family members, and close contacts of a confirmed case.[36] This might not be easy to apply in the present scenario, but may evolve as a strategy later.

### Prevention of spread

Contact tracing and surveillance play an essential part in the containment of this outbreak. The aim is to check disease transmission, identify at-risk population, and institute appropriate treatment where required. Both backward and forward contact tracing is mandatory, to help find the source of infection as well as prevent spread.[10]

All the contacts of a probable or confirmed patient should be observed for 21 days after last contact with the index case (forward tracing) for development of any symptoms. However, quarantine or work exclusion is deemed unnecessary in asymptomatic contacts or HCW.

All close contacts within the last 21 days should also be examined for disease sequelae including scars. Confirmation can be done by testing for IgM antibodies against orthopoxvirus.[10] This helps in collecting useful epidemiological data.

Risk stratification, as suggested by WHO, categorizes contacts into high, intermediate, and low risk.[2]

- **High-risk exposure**: Direct contact of broken skin with the patient’s lesions, mucosa or body fluid. Close proximal contact including face-to-face contact and sexual contact.
- **Intermediate-risk exposure**: Direct contact of intact skin with a patient’s lesion, mucosa or body fluid and non-direct but close contact without appropriate PPE also belongs to this category.
- **Low-risk contact**: If proper PPE is worn, then the risk is considered low.

Just as with COVID-19 pandemic, stringent hand-hygiene and appropriate use of PPE appears essential in prevention of transmission of monkeypox.

### Useful resources

As the situation is fast evolving, dermatologists should keep abreast of the latest developments. Some useful online resources are summarized in Table 8. These are updated from time to time.

### Conclusions

HCW are faced with another formidable adversary in the form of monkeypox. However, armed with knowledge acquired over the past 3 years, we are in a better position to combat the spread and minimize the consequences. PPE and hand hygiene continue to play a pivotal role in preventing its spread. The well-oiled surveillance machinery with heightened awareness along with targeted research in the field may help us contain monkeypox effectively. Nevertheless, we need to be aware of the atypical features, and unclear modes of transmission to consider all possibilities and be prepared as the epidemic evolves.

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Nil.
Table 8: Useful online resources to keep abreast of the evolving outbreak (Last accessed 12th August 2022)

| Title | Available from |
|-------|---------------|
| Monkeypox outbreak Toolbox. | https://www.who.int/emergencies/outbreak-toolkit/disease-outbreak-toolboxes/mounty-pox-outbreak-toolbox. |
| Monkeypox | https://www.cdc.gov/poxvirus/monkeypox/index.html. |
| 2022 Monkeypox outbreak Global Map. | https://www.cdc.gov/poxvirus/monkeypox/response/2022/world-map.html. |
| Monkeypox outbreak 2022. | https://www.who.int/emergencies/situations/monkeypox-outbreak-2022. |
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Conflicts of interest

There are no conflicts of interest.

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