

The Monkeypox Review 2022: Transmission of A Zoonotic Disease Over the World Including India

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Abstract

Background: Since May 2022, it was determined that monkeypox, a viral disease, was still on the rise. The first case was discovered on May 6, 2022, in a person with travel ties to Nigeria, and the initial group of cases was confirmed there. This review article provides an updated overview of monkeypox for healthcare and medical experts around the world. The existing 2022 monkeypox outbreak spanning multiple nations is the biggest healthcare problem outside of Africa in recorded history. On July 14, 2022, a 35-year-old man traveling from the U.A.E was diagnosed with monkeypox in Kerala, India, becoming the first episode of the disease in the WHO region of South-East Asia. A new A.2 strain has been found in 2 cases in India that had returned from the UAE that is different from the strain causing the worrying outbreak of Monkeypox cases in Europe. In 2003, the first case of monkeypox had been officially identified outside Africa in the American West.

Objective: The main aim of this article is to create meaningful data on monkeypox cases around the world including India during the 2022 pandemic.

Method: Online survey of the records of the patients has been performed through various websites.

Result: The data of the monkeypox infected patients has been collected from India as well as from the entire world.

Conclusion: In the current scenario monkeypox outbreak is the biggest issue outside of Africa in recorded history, but the data obtained from India to date shows that monkeypox became stable.

Keywords: Monkeypox; A.2 Strain; Endemic; Poxvirus; Blister

Introduction

It has been determined that the monkeypox virus is a high risk disorder that creates a serious threat to the public's health clinically, similar to smallpox but frequently less severe. Monkeypox is an emerging zoonotic disease because it has long been thought to be an infectious disease with significant pandemic potential [1]. Transmission appears to happen mostly through direct bodily contact, including sexual behavior, in the recent outbreak nations and among the reported monkeypox cases. Infected objects that contain contagious skin particles, such as contaminated linens, clothing, appliances, and apparel, can also transmit the MPXV virus. This virus is typically prevalent in West and Central Africa, but in May 2022, medical professionals began receiving reports of an outbreak of the virus in several locations outside of Africa. In the past, incidences of the human monkeypox virus in Britain have solely come from illnesses in West Africa. Without any evident epidemiological links to endemic areas, the number of cases of monkeypox among persons visiting sexual health clinics is already rising significantly in the UK, India, and other countries. The worst problem outside of Africa has ever occurred is the multi-nation monkeypox outbreak that is now occurring in 2022 [2].

History of monkeypox virus

A pox-like illness outbreak in 1959 in primates (mainly in monkeys) maintained at a research facility in Copenhagen, Denmark, was the very first instance of the monkeypox virus [3]. After smallpox was eradicated in 1968, the 1st case of human MPXV was identified on 1st September, 1970, when a 9-month-old baby was taken to the Basankusu Hospital in the Democratic Republic of the Congo (at that time also known as the Republic of the Congo). The MPXV-like virus was isolated from the baby boy who had a smallpox-like disease [4-9]. In October 1970 and May 1971, 6 MPXV cases were reported in humans in Sierra Leone, Nigeria, and Liberia. Ten MPXV cases were recorded between 1971 and 1978 in Nigeria, with the first index MPXV case being identified there in 1971 [10]. Since that time, thousands of monkeypox cases have been reported in humans in 15 nations, 11 of which are African nations: Benin, Central African Republic, Cameroon, Cote d'Ivoire, the Democratic Republic of the Congo, Gabon, Liberia, Nigeria, and the Republic of the Congo, Sierra Leone, and South Sudan. The real burden of monkeypox is unknown [11].

Since 2017, Nigeria has experienced roughly 500 suspected cases, 200 reported cases, and a case-fatality rate of about 3%. Cases are still being verified right now. The first monkeypox epidemic outside of Africa erupted in 2003 in the Americas, and interacted with domestic prairie dogs that carried the disease. These animals had been kept with dormice and pouched rats that were brought from the Ghana. This pandemic resulted in about 70 cases of human monkeypox in the USA. Furthermore, cases have been confirmed among tourists from Nigeria to Israel in September 2018, Great Britain in September 2018, December 2019, May 2021, and May 2022, Singapore in May 2019, and the States of America in July and November 2021. Monkeypox cases were found in several non-endemic nations in May 2022 [12].

The pathogen

The monkeypox virus (MPXV), which belongs to the genus Orthopoxvirus, is what causes monkeypox in humans. The genus Orthopoxvirus of the family Poxviridae contains the enclosed double-stranded DNA virus known as the monkeypox virus, which replicates in the cytoplasm of infected cells [13]. When studied under an electron microscope, poxviruses are found to have a brick-like or oval structure that is surrounded by a folded lipoprotein outer membrane and measures 200–400 nanometers. Because they have been detected in insects, reptiles, birds, and mammals, poxvirus is frequently referred to an old virus [14,15]. It is believed that these viruses produced visible "pox" before invertebrates and vertebrates split apart. The Chordopoxvirinae and Entomopoxvirinae subfamilies of the family Poxviridae are separated based on the host. The first subfamily is known to infect vertebrates, and it is split into 18 genera while the last is known to infect invertebrates, and it is grouped into 4 genera as shown in (Chart 1). Monkeypox viruses have two distinct genetic clades, the Central African (Congo Basin) clade, and the West African clade. The Congo Basin group has historically caused more severe illness and was supposed to have been more contagious. The geographical difference between the two groups is Cameroon, the only nation where both virus groups have been identified [16].

Carrier for the transmission of the monkeypox virus

Only wild animals (rodents and primates) have been recognized to carry the monkeypox virus in endemic regions. However, the spread of the monkeypox virus from infected imported animals to prairie dogs in the US and captive primates in Europe have been

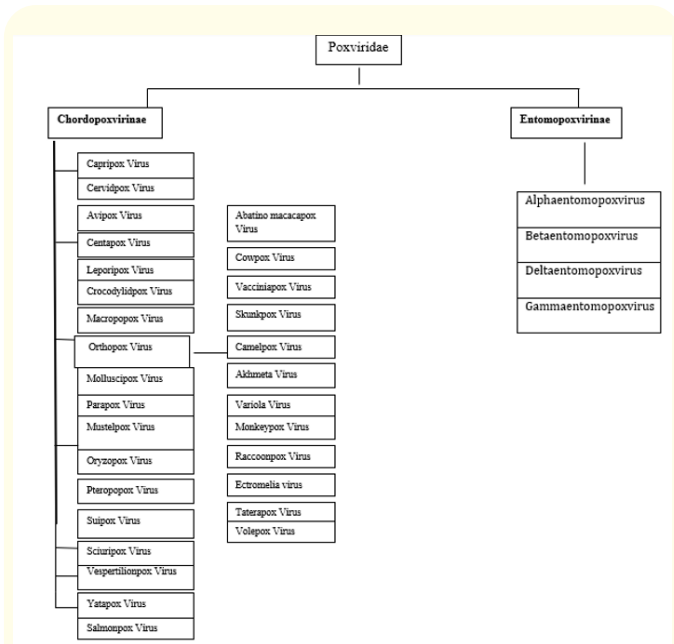


Chart 1: Taxonomical Classification of Monkeypox virus.

reported. It has never been observed that domesticated animals like dogs and cats are infested.

There are two distinct transmission methods

- Animal-to-Human Transmission (Figure 1)
- Human-to-Human Transmission (Figure 2) [13].

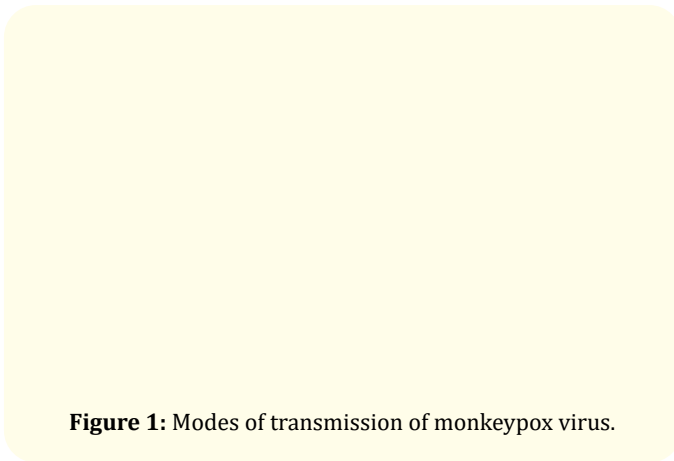


Figure 1: Modes of transmission of monkeypox virus.

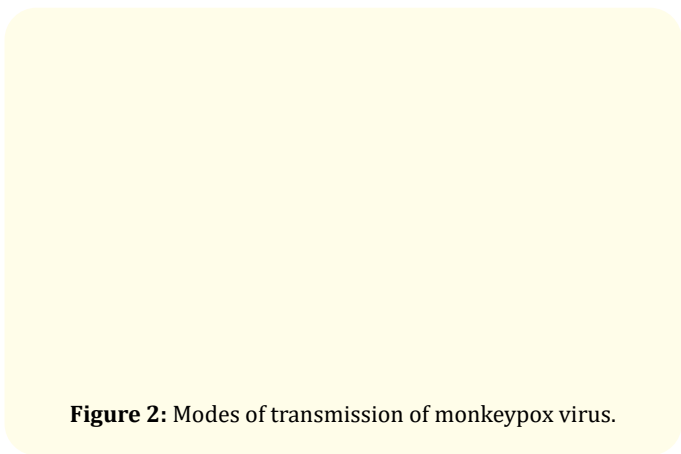


Figure 2: Modes of transmission of monkeypox virus.

The import of non-human primates and rodents and is prohibited in several countries according to rules and regulation. Monkeypox possible captive animals must be isolated and kept separate from other animals as soon as possible [17-19]. There is a list of infected animals from the monkeypox virus (Table 1) [20,21].

S. no.	Infected Animals	Geographic Location	Method of Detection
1.	Asian monkeys (<i>M. fascicularis</i>)	Copenhagen	Viral isolation
2.	Sooty mangabey monkey (<i>Cercocebus atys</i>)	Cote d'Ivoire	Reverse transcription-Polymerase chain reaction
3.	Gambian pouched rat (<i>Cricetomys gambianus</i>)	Africa	Viral isolation and Polymerase chain reaction
4.	Rhesus macaques (<i>Macaca mulatta</i>)	Copenhagen	Serological test
5.	Cynomolgus macaque (<i>Macaca fascicularis</i>)	Copenhagen/ Singapore	Viral isolation
6.	Prairie dogs (<i>Cynomys spp.</i>)	United States of America	Viral isolation and Polymerase chain reaction
7.	Rope squirrel (<i>Funisciurus sp.</i>)	Zaire	Viral isolation and Polymerase chain reaction
8.	Elephant Screw (<i>Petrodomus tetradactylus</i>)	Democratic Republic of Congo	Serological test

9.	Domestic Pig (<i>Sus scrofa</i>)	Democratic Republic of Congo	Serological test
10.	African Dormice (<i>Graphiurus</i> spp.)	United States of America	Viral isolation and Polymerase chain reaction.
11.	Porcupines (<i>Atherurus africanus</i>)	Zaire	Viral isolation and Polymerase chain reaction
12.	Woodchucks (<i>Marmota monax</i>)	USA	Viral isolation and Polymerase chain reaction
13.	Sun squirrel (<i>Heliosciurus</i> sp.)	Zaire	Antibody detection test
14.	African hedge hogs (<i>Atelerix</i> sp.)	Africa	PCR, Antibody detection & Viral isolation

Table 1: List of Monkeypox virus (MPXV) infected animals.

Symptoms and signs of monkeypox

Monkeypox typically takes 5 to 12 days to develop, although it can take between about 5 to 21 days for symptoms to be appearing [22].

- Invasion period- (Between 0-5 days) Identified by mild grade to high grade fever, Lymphadenopathy (lymph node swelling), muscle pain (myalgia), and loss of energy. Swelling of lymph nodes is a peculiar feature of monkeypox.
- Incubation period- (Begins from 5-21 days) Eruption on the skin starts to begin within 1-3 days, rashes mainly occur on the face (in 95% case), in the palms and hands, the foot soles (in 75% incidence), genital organ (30%), and mouth and throat ulcer [23].

Diagnostic methods for monkeypox virus

An individual with the symptoms listed above the table may have monkeypox, specifically if they have traveled or had contact with people who have the infection [24]. The polymerase chain reaction (PCR) test can be used to confirm a monkeypox case. The Polymerase chain reaction (PCR) test is the gold for diagnosis which ought to be carried out first. Other diagnostic methods described in Table 3 can be performed if monkeypox infection is still suspicious after a negative Polymerase chain reaction (PCR) test [25]. Contact

tracing, screening, and, if feasible, vaccination of those exposed to the patient must be carried out after a positive monkeypox PCR test (Table 2) [26,27].

S. NO.	Diagnostic methods	Description	Sample.
1.	RT-PCR (Polymerase Chain Reaction)	It depends upon the Nucleic Acid Amplification Test for the identification of monkeypox RNA. Nowadays PCR is the standard method for viral detection including SARS-CoV-2.	Skin lesion material, Lesion fluid.
2.	Viral culture	The viral culture test is used to detect the specific virus that causes infection. The sample of the virus is isolated from a patient and grown in culture media.	Lesion fluid, Tissue fluid.
3.	Electron microscopy	With the help of the TEM (Transmission Electron Microscopy) technique, rapid visualization of the virus has been done.	Tissue sections, Biopsy specimen, scab material, vesicular fluid.
4.	Immunocytochemistry	It was discovered by Von Behring. Antibodies are used to detect the presence of Orthopoxvirus-specific antigens.	Tissue section Particularly not for monkeypox virus.
5.	Anti-Orthopoxvirus IgG (Immunoglobulin G) and IgM (Immunoglobulin M) tests	It can be used to detect recent exposure to Orthopoxvirus.	Serum sample is required.

Table 2: Diagnostic methods for identification of monkeypox virus.

Current status of monkeypox around the world

Monkeypox cases have been detected in non-endemic nations since early May 2022, and they have continued to be reported in several endemic nations. Most confirmed cases with travel histories reported visiting Europe and North America, as opposed to West or Central Africa, where the monkeypox virus is common. Multiple monkeypox clusters have been discovered concurrently for the first time in both endemic and non-endemic countries over a wide variety of geographical regions. From January 1st to 22nd June, 3413 laboratory cases have been identified and one death has been recorded from Nigeria to W.H.O from 50 nations in 5 WHO Regions (Table 3) [28].

S. NO.	WHO Region	Total cases / Out of	% cases detected
1.	European Region	2933/3413	86%
2.	Region of the Americas	381/3413	11%
3.	African Region	73/3413	2%
4.	Eastern Mediterranean Region	15/3413	<1%
5.	Western Pacific Region	11/3413	<1%

Table 3: Total cases of monkeypox in WHO region between 1 January and 22 June 2022.

Monkeypox outbreak in India as of July 2022

The earliest instances of monkeypox were discovered in the U.K, where the 1st case was recognized on 6th May, 2022, in a person having connections to Nigeria through travel (where disease is endemic since the nation’s first instance of the disease was identified [29]. Eight patients have recovered from the illness while one patient is still in the recovery stage. One individual has died of the infection. The vigilance squad is working, and none of these people’s contacts have tested positive for monkeypox. More than 350 swab samples from suspected cases have been analyzed at the laboratory, and all of them came back negative for the virus. 15 diagnostic and research centers around the nation were trained by the Indian Council of Medical Research to detect the virus with ease. To perform the diagnostic tests for monkeypox, the Viral Research and Diagnostic Laboratories (VRDLs) received training from the ICMR-National Institute of Virology, a nodal center for testing and coordinating with its headquarters in Pune.

India is the first country in the WHO South-East Asian Region to record a monkeypox virus case from Kerala’s Kollam district on July

14, 2022; the patient was released from the hospital a week later. The patient returned from UAE. On July 18, the second confirmed case of the virus was reported in the Kannur district, and on July 22, the third confirmed case was recorded in the nearby Malappuram district. In the middle of July and at the end of the month, Kerala state received reports of all three incidents.

A man from Kerala who had tested positive for monkeypox in another nation died in Thrissur on July 30 after contracting the disease for four days, according to the first case of viral zoonosis reported in India. The man had returned from the high-risk UAE on July 21 and stayed with his family until seeking treatment for acute exhaustion and a cerebral fever at a private hospital on July 27. Of the 10 persons who were infected, five were from New Delhi, and five were from Kerala. However, contacts of all these infected patients have tested negative. When the virus genomes were collected from the infected patients in Kerala, a new strain of monkeypox A.2 strain found in 2 cases in India had returned from the UAE that is different from the strain causing the worrying outbreak of monkeypox cases in Europe (Table 4). A.2 strain belongs to the hMPXV-1 lineage of Clade 3 (West African Clade). There are 2 Strains of monkeypox i.e. The Central African (Congo Basin) and West African is known. The Congo basin strain causes acute illness has a fatality rate of 0–11% and is more contagious. The genomes which are responsible for the excessive outbreak of monkeypox cases in Europe and the rest of the world belong to B.1 lineage.

S. no.	Date	Patient Age	Symptoms
1.	5 th July 2022	35year old	Experience myalgia and a low-grade temperature. He first faced multiple vesicular rashes on his lips and mouth, then one lesion on the genital areas. On both of his hands, he also experienced rashes.
2.	8 th July 2022	31year old	Experienced dysuria and genital swelling. On July 13, he flew from Dubai to his native Kerala. He went to a local government hospital, and on July 16 he was quarantined on the basis that he might have monkeypox.

Table 4: Symptoms of Patients Infected with A.2 Strain.

A seven-year-old boy who exhibits the symptoms of the viral illness has been identified as having a possible case of monkeypox in Kerala. In Kerala’s Kannur Government Medical College Hospital, he has been admitted. The child had just returned from the UK and displayed symptoms typical of the pandemic. The sample has been delivered to the Pune-based National Institute of Virology. The child has been receiving treatment in a room designated just for isolation. A suspected case of monkeypox in the district of Uttara Kannada had a negative test result.

The study found that the infection starts with a febrile illness that lasts for an approximated 5 to 13 days before swelling of

the lymph nodes and deep umbilicated vesicular or pustular rashes appear. The rashes typically begin on the face, genitalia, or perineum region and then spread to other parts of the body before becoming crusted over [30].

Monkeypox situation update as of august 4, 2022 around the world

There were 26,208 cases of monkeypox reported in 87 countries till August 4. Here are the top 10 nations where monkeypox cases have been documented (Table 5) [31].

S. No.	Country Name	Reported Cases	Death Case	Remarks
1.	United States of America	6,616	0	780,000 doses of vaccines have been distributed across the country.
2.	Spain	4,577	2	Health authorities have administered over 5,000 doses of vaccines.
3.	United Kingdom	2,749	0	The epicenter of the illness occurred in London, and the nation has ordered more than 130,000 doses of the viral vaccine.
4.	Germany	2,781	0	Germany has intensified its campaign for vaccination protection. Those who are above 18 years will receive a Bavarian Nordic vaccine.
5.	France	2,239	0	Paris now has around 18 monkeypox vaccine facilities. Over 8,000 vaccines have been administered across the nation.
6.	Brazil	1,474	1	Most of the cases have been reported from Sao Paulo and Rio de Janeiro.
7.	Netherlands	927	0	On the first day, 50 individuals will be immunized in total in Amsterdam, and 100 people will be immunized each day after that.
8.	Canada	890	0	Imvamune vaccine was prescribed against illness.
9.	Portugal	633	0	The country has started vaccinating the confirmed cases of Monkeypox.
10.	Italy	505	0	The virus was first found in the semen of the patients who had been identified by Italian scientists.

Table 5: List of countries having high cases of monkeypox virus.

Monkeypox situation update as of august 12, 2022 around the world

A total of 31,799 cases have been confirmed as of the data collection date (12 August), of which 31,424 cases have been

recorded from areas where the disease has historically not been endemic and 375 instances where an endemic history has been established (Table 6) [32].

Country	Cases	Deaths	History	Reported Date and Time
Brazil	2131	1	Reported monkeypox historically	09 August 2022 17:00 PM
The Central African Republic	8	2	Reported monkeypox historically	09 August 2022 17:00 PM
Ecuador	10	1	Not reported monkeypox historically	09 August 2022 17:00 PM
Ghana	35	1	Not reported monkeypox historically	09 August 2022 17:00 PM
India	10	1	Not reported monkeypox historically	09 August 2022 17:00 PM
Nigeria	157	4	Reported monkeypox historically	09 August 2022 17:00 PM
Spain	5162	2	Has not historically reported monkeypox	09 August 2022 17:00 PM
Andorra	4	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Argentina	37	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Australia	58	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Austria	175	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Bahamas	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Barbados	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Belgium	546	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Benin	3	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Bermuda	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Bolivia	5	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Bosnia and Herzegovina	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Bulgaria	4	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Cameroon	7	0	Reported monkeypox historically	09 August 2022 17:00 PM
Canada	957	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Chile	91	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Colombia	55	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Costa Rica	3	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Croatia	12	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Cyprus	3	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Czechia	29	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Democratic Republic of the Congo (DRC)	163	0	Reported monkeypox historically	09 August 2022 17:00 PM
Denmark	126	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Dominican Republic	4	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Estonia	9	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Finland	22	0	Not reported monkeypox historically	09 August 2022 17:00 PM
France	2423	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Georgia	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM

Germany	2982	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Gibraltar	5	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Greece	41	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Guadeloupe	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Guatemala	2	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Hungary	51	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Iceland	11	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Ireland	101	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Israel	166	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Italy	599	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Jamaica	3	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Japan	3	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Latvia	3	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Lebanon	6	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Liberia	2	0	Reported monkeypox historically	09 August 2022 17:00 PM
Lithuania	3	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Luxembourg	34	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Malta	30	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Martinique	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Mexico	91	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Moldova	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Montenegro	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Morocco	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Netherlands	959	0	Not reported monkeypox historically	09 August 2022 17:00 PM
New Caledonia	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
New Zealand	3	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Norway	66	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Panama	2	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Peru	547	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Philippines	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Poland	85	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Portugal	710	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Qatar	3	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Republic of the Congo	3	0	Reported monkeypox historically	09 August 2022 17:00 PM
Romania	28	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Russia	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Saint Martin	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Saudi Arabia	5	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Serbia	23	0	Not reported monkeypox historically	09 August 2022 17:00 PM

Singapore	15	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Slovakia	8	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Slovenia	40	0	Not reported monkeypox historically	09 August 2022 17:00 PM
South Africa	3	0	Not reported monkeypox historically	09 August 2022 17:00 PM
South Korea	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Sudan	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Sweden	123	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Switzerland	347	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Taiwan	3	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Thailand	4	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Turkey	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM
U.A.E	16	0	Not reported monkeypox historically	09 August 2022 17:00 PM
U.K	2914	0	Not reported monkeypox historically	09 August 2022 17:00 PM
United States	9491	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Uruguay	2	0	Not reported monkeypox historically	09 August 2022 17:00 PM
Venezuela	1	0	Not reported monkeypox historically	09 August 2022 17:00 PM

Table 6: Data collected by W.H.O, European CDC, U.S CDC, and Ministries of Health across the world till 12th August 2022.

Monkeypox situation update till 12TH august in EU/EEA countries

A total of 14,843 confirmed cases of monkeypox (MPX) had been reported as of August 11, 2022 from 29 EU/EEA countries since the outbreak began. With Spain and Germany leading the way, Europe saw the highest number of cases (Table 7) [28].

S. no.	Country	Reported Cases	Number of Cases Last 7 Days	Death till date
1.	Spain	5 270	90	2
2.	Germany	3 063	224	0
3.	France	2 601	97	0
4.	Netherlands	1 002	06	0
5.	Portugal	710	00	0
6.	Italy	599	16	0
7.	Belgium	546	05	0
8.	Austria	195	32	0
9.	Denmark	135	27	0
10.	Sweden	123	07	0
11.	Ireland	101	00	0
12.	Poland	85	03	0

13.	Norway	66	02	0
14.	Hungary	51	00	0
15.	Greece	48	04	0
16.	Slovenia	41	06	0
17.	Luxembourg	39	05	0
18.	Romania	31	04	0
19.	Malta	30	00	0
20.	Czechia	29	01	0
21.	Finland	22	00	0
22.	Croatia	12	00	0
23.	Iceland	11	00	0
24.	Estonia	09	01	0
25.	Slovakia	09	01	0
26.	Lithuania	05	02	0
27.	Bulgaria	04	00	0
28.	Cyprus	03	02	0
29.	Latvia	03	00	0

Table 7: Geographical distribution of confirmed monkeypox cases in the EU/EEA.

Precaution against monkeypox virus

- After each interaction with an infected patient or the care setting, wash your hands properly with suitable detergents.
- When interacting with patients wear a gown and gloves.
- Wear NIOSH-certified N95 masks or surgical masks when entering the patient room.
- Face shields or goggles should be used for eye protection.
- Disposal of contaminated wastes should be done with specific guidelines.
- Handling soiled items (such as bedding, towels, and clothing) with care to prevent coming into contact with lesion exudates.
- Maintain a proper distance between wild animals and non-primates. According to regulations, in several countries, the import of rodents and non-human primates is prohibited.
- It is important to take precautions to ensure that patient care equipment are properly cleaned and handled cautiously to avoid skin and clothing infection.

Prevention against monkeypox virus

Studies show that smallpox immunisation also provides defence against MPXV, an OPV species that is spread orally [33]. The Centers for Disease Control and Prevention (CDC) advised smallpox immunisation (ACAM2000TM) during the 2003 U.S.A. MPXV endemic, however this merely appeared to lessen symptoms. People who had previously gotten a smallpox vaccination had an 85% protection rate against MPXV, it was found [34].

Both Imvamune and ACAM2000 have been recommended as monkeypox vaccines. In Europe, Imvanex is a smallpox vaccine that is approved for adult use. The CDC recommends immunization for persons who have been exposed to monkeypox and those who may be more susceptible [35]. The vaccine JYNNEOS having 2 doses has been advised for use in preventing monkeypox. It takes 14 days for the immune protection to reach its peak following the second dose [37]. The ACAM2000 injection could take the place of the JYNNEOS immunization. ACAM2000 is a single-dose vaccine, and takes 4 weeks for the immunological response it produces to be at its peak. Although it could have worse effects and adverse outcomes than JYNNEOS it is not recommended for people with many medical conditions, such as a severely weakened immune system [36]. The FDA has authorized JYNNEOSTM, a replication-

deficient smallpox vaccine, for the treatment of monkeypox and smallpox. It is also marketed under the trade names Imvamune and Imvanex. JYNNEOSTM is an attenuated live virus vaccination, not like ACAM2000® or APSV [38].

Conclusion

The global economic, medical, and public health systems are under stress as a result of this virus pandemic. However, advances in the creation of antiviral drugs and vaccinations against other emerging diseases will hasten the creation of effective monkeypox treatment options. At such a moment, we must depend solely on a variety of control and preventative measures, the most important of which is growing public awareness of their comprehension of the facts and prevention of the disease.

Conflict of Interest

None.

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Bibliography

1. Girometti, Nicolò., *et al.* "Demographic and clinical characteristics of confirmed human monkeypox virus cases in individuals attending a sexual health centre in London, UK: an observational analysis". *The Lancet Infectious Diseases* 22.9 (2022): 1321-1328.
2. Gong Qizan., *et al.* "Monkeypox virus: a re-emergent threat to humans". *Virologica Sinica* (2022).
3. Yinka-Ogunleye Adesola., *et al.* "Outbreak of human monkeypox in Nigeria in 2017-18: a clinical and epidemiological report". *The Lancet Infectious Diseases* 19.8 (2019): 872-879.
4. Alakunle Emmanuel., *et al.* "Monkeypox virus in Nigeria: infection biology, epidemiology, and evolution". *Viruses* 12.11 (2020): 1257.
5. Ladnyj ID., *et al.* "A human infection caused by monkeypox virus in Basankusu Territory, Democratic Republic of the Congo". *Bulletin of the World Health Organization* 46.5 (1972): 593.
6. Magnus Preben von., *et al.* "A pox-like disease in cynomolgus monkeys". *Acta Pathologica Microbiologica Scandinavica* 46.2 (1959): 156-176.

7. Jezek Z., et al. "Human monkeypox". *Journal of Hygiene, Epidemiology, Microbiology, and Immunology* 27.1 (1983): 13-28.
8. Sejvar James J., et al. "Human monkeypox infection: a family cluster in the midwestern United States". *The Journal of Infectious Diseases* 190.10 (2004): 1833-1840.
9. Foster Stanley O., et al. "Human monkeypox". *Bulletin of the World Health Organization* 46.5 (1972): 569.
10. Xuan Do Thi Minh., et al. "Comparison of Transcriptomic Signatures between Monkeypox-Infected Monkey and Human Cell Lines". *Journal of Immunology Research* 2022 (2022).
11. Youssef Dalal., et al. "When a neglected tropical zoonotic disease emerges in non-endemic countries: Need to proactively fill the unveiled knowledge gaps towards human monkeypox among the Lebanese population". (2022).
12. World Health Organization (WHO). Monkeypox fact sheet. Geneva: WHO; (2022).
13. Kaler Jasdeep., et al. "Monkeypox: a comprehensive review of transmission, pathogenesis, and manifestation". *Cureus* 14.7 (2022).
14. Gomes Juliana Assis Silva., et al. "Immune modulation in primary vaccinia virus zoonotic human infections". *Clinical and Developmental Immunology* 2012 (2012).
15. International Committee on Taxonomy of Viruses (ICTV) (2020).
16. Formenty Pierre., et al. "Human monkeypox outbreak caused by novel virus belonging to Congo Basin clade, Sudan, 2005". *Emerging infectious diseases* 16.10 (2010): 1539.
17. Adebayo O and D Owoeye. "1. Department of Medicine, University College Hospital, Ibadan, Nigeria 2. Infection Prevention and Control Directorate, Jazan, Kingdom of Saudi Arabia". *Annals of Ibadan Postgraduate Medicine* 15.2 (2017): 145.
18. Centers for Disease Control and Prevention. Monkeypox.
19. Damon Inger K. "Status of human monkeypox: clinical disease, epidemiology and research". *Vaccine* 29 (2011): D54-D59.
20. Fuller Trevon., et al. "Using remote sensing to map the risk of human monkeypox virus in the Congo Basin". *EcoHealth* 8.1 (2011): 14-25.
21. Hutin Y J., et al. "Outbreak of human monkeypox, Democratic Republic of Congo, 1996 to 1997". *Emerging Infectious Diseases* 7.3 (2001): 434.
22. <https://www.cdc.gov/>
23. Parker Scott., et al. "Human monkeypox: an emerging zoonotic disease". (2007): 17-34.
24. Hutson Christina L., et al. "Monkeypox zoonotic associations: insights from laboratory evaluation of animals associated with the multi-state US outbreak". *The American Journal of Tropical Medicine and Hygiene* 76.4 (2007): 757-768.
25. Vaughan Aisling., et al. "Human-to-human transmission of monkeypox virus, United Kingdom, October 2018". *Emerging Infectious Diseases* 26.4 (2020): 782.
26. World Health Organization (WHO). "Monkeypox" (2022).
27. Li Daniel., et al. "Evaluation of the GeneXpert for human monkeypox diagnosis". *The American Journal of Tropical Medicine and Hygiene* 96.2 (2017): 405.
28. WHO, European CDC, US CDC, and Ministries of Health Monkeypox Outbreak Global Map. 2022 U.S. Map and Case Count | Monkeypox | Poxvirus | CDC.
29. Guarner Jeannette., et al. "Monkeypox in 2022—what clinicians need to know". *Jama* 328.2 (2022): 139-140.
30. Bunge Eveline M., et al. "The changing epidemiology of human monkeypox—A potential threat? A systematic review". *PLoS Neglected Tropical Diseases* 16.2 (2022): e0010141.
31. World Health Organization. Monkeypox—United Kingdom of Great Britain and Northern Ireland (2022).
32. Centers for disease control and Prevention.
33. World Health Organization. Monkeypox (2019).
34. Petersen Brett W., et al. "Use of vaccinia virus smallpox vaccine in laboratory and health care personnel at risk for occupational exposure to orthopoxviruses—recommendations of the Advisory Committee on Immunization Practices (ACIP), 2015". *Morbidity and Mortality Weekly Report* 65.10 (2016): 257-262.
35. Collister Kristen and Sam S Dahr. "Frosted branch angitis after smallpox vaccination". *American Journal of Ophthalmology Case Reports* 27 (2022): 101622.

36. Greenberg Richard N and Jeffrey S Kennedy. "ACAM2000: a newly licensed cell culture-based live vaccinia smallpox vaccine". *Expert Opinion on Investigational Drugs* 17.4 (2008): 555-564.
37. JYNNEOS™ Package Insert .World Health Organization. Monkeypox (2019).
38. Ullah Asad, *et al.* "An integrative reverse vaccinology, immunoinformatic, docking and simulation approaches towards designing of multi-epitopes based vaccine against monkeypox virus". *Journal of Biomolecular Structure and Dynamics* (2022): 1-14.