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Current Situation and Prevention and Control Challenges of the Monkeypox

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Abstract. Since the first case of monkeypox was reported in the UK in early May 2022, by mid-July, more than 60 countries around the world had reported more than 10,000 confirmed cases of monkeypox, with deaths occurring in countries in non-endemic areas. Monkeypox is caused by monkeypox virus, the same orthopoxvirus as smallpox virus. It is necessary to review the history of the human fight against smallpox virus and to develop measures against monkeypox virus. The eradication of smallpox might make the public feel like the orthodox virus should not be a danger to humans anymore. However, the continually increasing number of confirmed monkeypox cases is telling us that people should always be aware of those potential threats. The clinical manifestations of monkeypox cases are mild, but there is still a lack of specific treatment options. Therefore, the essential information and basic diagnosis methods are gathered in this article for people to know about monkeypox and prepare well to combat and control the spreading of monkeypox.

Keywords: monkeypox, zoonosis, epidemiology, prevention

1. Introduction

Since the first rare confirmed case of Monkeypox was reported by the British health and safety agency on May 7, 2022, many non monkeypox endemic countries have reported confirmed and suspected cases of Monkeypox.

Monkeypox virus is a DNA zoonotic infectious disease that can be spread between humans and humans and animals and humans. A DNA virus indicates it has a deoxyribonucleic acid made genome and replication happens through DNA polymerase. In most cases, DNA viruses have a lower mutation rate than RNA viruses.

Monkeypox is a virus that is similar to the variola virus. They both belong Orthopoxvirus genus and the Paxviridae family. The clinical manifestations of human monkeypox are similar to those of Dahua, mainly including fever, headache, muscle soreness, back pain, fatigue, lymph node enlargement and rash. These symptoms can usually be completely cleared by the autoimmune system after a period of time, and most patients will be relieved within a few weeks. The mortality rate is about 3% ~ 6%. Among them, the mortality rate of children, young people and immunodeficient individuals is relatively high [1]. Fortunately, smallpox caused by the variola virus has been eradicated in nature since May 8, 1980. However, monkeypox remains a dissemination status, with no animal reservoir detected and no specific proper treatment or efficient vaccination available. The first reported monkeypox case was in August 1970, in a remote village in Zaire, which is now called the Democratic

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Republic of the Congo [2]. Since then, there have been many outbreaks of monkeypox in African countries, so monkeypox is considered to be a zoonosis confined to the central and western regions of Africa. Human infection with monkeypox is mainly due to contact, bite, eating monkey meat or squirrels, etc., so it is speculated that it is transmitted by contacting the blood, body fluid, skin or mucosal wounds of infected animals. The outbreak of monkeypox in the United States in 2003 originated from Gambian giant rats imported from Ghana, which caused domestic transmission through local pet prairie dogs. The first monkeypox case in the UK is believed to be related to its previous travel history in Nigeria [3].

During Covid-19 or SARS-CoV-2 pandemic, people put much attention to it but ignored the dissemination of monkeypox is happening among people outside of the areas where the monkeypox endemic happens. Until July 30, 2022, Spain had reported two deaths among 3750 infected patients, within which 120 individuals were hospitalized. As this abnormal situation that even monkeypox virus itself rarely happens in these areas outside of Africa, the mortal cases seem to alarm the public, and the CDC has declared it a public health concern.

This paper reviews the etiology, epidemic status, clinical manifestations, prevention and control measures of monkeypox, so as to improve the diagnosis and treatment ability of clinicians and make emergency plans and technical reserves.

2. The etiology

Human monkeypox is a zoonotic disease caused by monkeypox virus (MPXV). Monkeypox virus belongs to the family poxviridae, which is similar to big flower virus and vaccinia virus, camel pox virus, mouse pox virus and cowpox virus belong to the genus orthopox virus.

Based on Nicolas Berthet's research on the genomic history of human monkeypox infections with his colleagues, their data claims the individual cases and micro-outbreaks were mostly epidemiologically unassociated even though some of them might belong to the same lineage. Thus, divergences of the monkeypox isolates are common and frequent. When the human flow increases and infected animal contacts become more frequent, the transmission becomes more usual. Their phylogenetic results illustrate that the ten isolates found in the Central African Republic are closely related, all of which come from the rainforest block.

MPXV has two recognized branches: West Africa branch and Congo Basin (Central Africa) branch. These two branches have different genomic lineages. Though the West African clade of monkeypox infection typically ends up in severe unhealthiness in some individuals, sickness is sometimes self-limiting. The case fatality magnitude relation for the West African clade has been documented to be around 1%, whereas it should be as high as 10% for the Congo Basin clade. Kids are at higher risk, and monkeypox throughout maternity may result in complications, congenital monkeypox, or stillbirth. Relevant experimental animal studies have further proved that the difference in mortality between the two regions in Africa is related to the difference in virus strains infected. So far, the geographical division between these two clades has been in Cameroon, which is the only country where these two clades of viruses have been found at the same time [4,5].

3. The epidemic status

At the end of 2019, the world encountered the SARS-CoV-2 or COVID-19 together. One and more than half years had been spent dealing with the virus. It reminded the people about the current environmental or health concerns we should focus on. Until Aug.1, 2022, 577 million cases were confirmed, and 6.4 million deaths were recorded. The idea of infectious disease had come into our minds. However, while we are focusing on dealing with this knotty problem, another potential contagious virus is catching health professionals' attention. It is named monkeypox.

On May 13, 2022, World Health Organization (WHO) got the report from the England health administration of two laboratory-confirmed monkeypox cases. The two cases were admitted to the local hospital on May 12 and 13. Both patients are showing the symptoms of body rash. These two individuals had a travel history of landing or transferring at Nigeria's capital Abuja and then flying

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toward England as the destination. Afterward, the public health administration of England announced relatively serious strategies to track the potentially infected population and isolate the confirmed cases by ensuring the transmission would not happen domestically.

Until now, since monkeypox had emerged in England. Three confirmed fatalities had been reported from Spain and Brazil. The total number of confirmed cases for Spain is 4298 and For Brazil is 978. The first fatal case was reported in Spain on July 29, 2022. The second death case from Spain was confirmed on July 30 as the same day as the first fatality from Brazil. These three individuals are all males.

Around the 1980s, the critical population of monkeypox infection was children aged from 5 to 9 years old or much younger[2]. Between 2000 and 2019, monkeypox infection cases were mainly found in African countries, especially the Democratic Republic of Congo (DRC) and Nigeria. The first two confirmed cases found in England in 2022 have a travel history of being in Nigeria. After the two cases found in England, the dissemination of the monkeypox virus started to increase and expanded to many other countries[6,7]. According to NYC Health's 2022 monkeypox surveillance data [8], we can find that the critical age groups shift from nine years old to older than 20. The 30 to 39 years old are the crucial group for this pandemic in NYC. Based on gender and sexual orientation, males and LGBQ+ groups are the vulnerable to the infection, responsible for 97.7% and 52.4% of new cumulative cases separately. Demographically, most infection cases happen among men who have sex (MSM) and men or men who are working as sex workers aged around 30 to 39. The CDC has shared the information with local health administration for tracking the cases and determined the vulnerable groups for further reactions.

4. The clinical manifestations

Monkeypox is less contagious than smallpox. Generally, the symptoms of monkeypox are similar to smallpox, but they differ according to mortality. The incubation period of monkeypox can be one week up to three weeks. Fever, malaise, headache, prostration, and more similar symptoms indicate a possible monkeypox infection. Different severity of the diseases may cause more or less severe symptoms. The peripheral rash is a sign of disease progression shown by the appearance of papules, vesicles, and pustules. These rashes might cause different levels of lesions before they umbilicate, dry, and desquamate. The coverage of rash indicates the severity of the disease progression that sometimes can cover the entire body, even the palms, and soles. The size of these skin lesions ranges from 0.5 cm, and some range up to 1 cm in diameter. Skin lesions are diagnosed through the peripheral changes surrounding the mucous membranes, genitalia, and tongue. Besides the rash, lymphadenopathy is another symptom in the neck and is a potential concern for monkeypox infection. J.G. Breman and his colleagues found that from 1970 to 1979, 23 cases among 47 confirmed cases were reported as a severe disease, meaning more than 100 lesions happened on the people, and the individuals required immediate medical care [2].

In this outbreak, many patients had local rashes distributed around the mouth, genitals and / or anus, sometimes accompanied by local lymph node swelling and pain due to secondary infection. Patients may go to various departments for treatment, such as fever clinic, dermatology department, infectious disease department, etc. Medical workers should be alert to the situation that the symptoms of patients may be very mild and neglected in this round of epidemic

5. Treatment

There are no specific anti-monkeypox drugs in China, mainly symptomatic support and treatment of complications. The primary diagnosis method is checking the onset of high-temperature fever and the presence of skin lesions. China had no confirmed cases reported yet, but the country already released the treatment guideline on June 15, 2022. Most cases happening during this period had been recovered without treatment. Compared with COVID-19, which is fatal at the onset of the pandemic, the monkeypox virus is giving humans time to find solutions and treatments to stop it.

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Medical and health recommendations in the U.S. are figured out by the department for the whole community to understand better the situation they are currently involved in. In the report, the key populations are illustrated as the people living with HIV and immunocompromising conditions, so the antiviral treatment are mentioned. Pregnant or breastfeeding populations are also targeted since the virus has been found to attack young folks. People with skin diseases will also need to be highly monitored since one of the symptoms of monkeypox is skin lesions. Other than these antiviral drugs, supportive care also has been proposed by the New York Health Department.

Maintaining sufficient fluid balance, pain management, and treatment of bacterial superinfections or co-occurring sexually transmitted or superimposed bacterial skin diseases are all examples of supportive care. To avoid hospitalizations, providers should provide anticipatory counselling and manage these symptoms effectively and early. For example, when patients are found to have the appearance of skin lesions, they should not take a shower or keep the skin lesion from touching anything as much as possible to prevent any potential bacterial infections. Some strategies such as cooling lotions or petroleum jelly and warm oatmeal baths are highly recommended for relieving itch or pruritus. For oral lesions, alcohol-free oral antiseptics, salt water, and sucking ice are recommended supportive care. For genital and anorectal lesions, topical benzocaine or lidocaine gels are recommended for mild cases. All types of lesions are required to be clean and dry enough to prevent possible infections from the environment. Supportive care is proposed for mild cases, but when patients think their situations are getting worse, such as the appearance of blood urine, further medical diagnoses are required. Other than pustules, nausea, vomiting, and diarrhea symptoms are recommended to be treated with proper anti-emetics and hydration and electrolyte replacement for controlling the loss of energy and balancing inside of our body cells so that our body can have enough energy to recover and be healed soon.

The current dissemination situation of monkeypox is still controllably compared with the fast spreading of COVID-19 in early 2020. There should have more further experiments on specific treatments for monkeypox should be needed. The current efficient methods are supportive care and preventing further transmission as early as possible [9].

6. Prevention measures

At present, many countries and regions have successively issued relevant policies to carry out public health investigation, report cases, implement isolation, clinical management, contact tracking, laboratory investigation, etc. Public health organizations and community organizations should actively publicize and raise the awareness of medical workers and the general public about monkeypox.

After the outbreaks had started in several countries, WHO and local health administration had immediate reactions to deal with the situation. Since the eradication of smallpox, the pox virus has been ignored by humans. Limited research and fund had been introduced to the monkeypox program. During the CDC's second meeting on the monkeypox outbreaks in several countries in 2022, the Director-General suggested the intensity of the current epidemiological surveillance system for monkeypox. The spreading of monkeypox does not arrive at the speed of COVID-19 transmission. But as we learned from COVID-19 prevention, people thought it was a normal fever or flu, and most countries responded too late and missed the best time to stop the spreading. The reaction to controlling the spreading of monkeypox was much more immediate than the reaction to COVID-19. Countries are sharing information more quickly and tracing the cases as soon as possible. By isolating the confirmed cases and tracking the potentially infected population, the goal of stopping the spreading will be much more efficient.

MSM group has been reported as the critical population of the monkeypox virus infection from several countries in the 2022 pandemic. The CDC announced strategies for having safer sex to reduce the risk of monkeypox infection. Reducing intimate contact and the number of sexual partners is the main idea for controlling the dissemination of most diseases. For monkeypox virus prevention specifically, being out of touch with unknown body rash is another essential strategy for the public. For people who might not be infected with the virus, the CDC suggests that monkeypox can be spread

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through those body rash fluids, and similar tetters can spread other diseases. Unlike COVID-19, which can be distributed in an enclosed room with limited airflow, the monkeypox virus is not easily transmitted when people are fully closed in space. Cleanliness and socializing at a distance are essential requirements for self-protection[10].

Monkeypox is a milder DNA virus than COVID-19, and the fatality has been low until now. The whole world spent much time dealing with the SARS-CoV-2. We should have learned many lessons from it. The public health administration suggestion should be considered an efficient way to protect ourselves from infection. Avoiding close, skin-to-skin contact with monkeypox tetters as we know that direct contact with body fluids is the transmission route of the monkeypox virus. Do not touch anything used or handled by the monkeypox-infected person. Wash your hand with hand lotion or clean hands, usually with an alcohol-based sanitizer. These strategies resemble the health recommendations given for COVID-19. They should be more helpful in controlling the dissemination of monkeypox since this virus has not been proved as respiratory transmissible.

Vaccination is a fundamental measure to protect susceptible populations. Unfortunately, there have not many records of specific helpful treatment or efficient vaccination available for monkeypox. According to WHO suggestion, antiviral drugs and vaccines for smallpox can be considered for monkeypox virus infection prevention. For example, Tecovirimat (TPOXX) which an antiviral medication and has been proven to combat the infection of orthopoxviruses. TPOXX has been established as the possible efficient prevention medication for treating the monkeypox virus. Other assumed drugs, such as vaccinia immune globulin intravenous (VIGIV), Cidofovir, and Brincidofovir, have no records about if they are helpful for monkeypox virus infection. Jynneos, a vaccine developed for preventing smallpox, have been confirmed that have 85% effectiveness in preventing monkeypox infection at some level. People vaccinated with smallpox seem to have a much lower infection rate than those unvaccinated individuals. According to Anne W. Rimoin and her fellows' study, the lasting smallpox vaccine efficacy is still active for induced immunity even though the patients were vaccinated 25 years ago. Both smallpox and monkeypox belong to the same genus and family, and we should find associations between them. As the course we learned from the smallpox eradication, we should assume we can suppress the dissemination more quickly and efficiently [13].

MVA-BN was first approved by the European Drug Administration in 2013 to prevent smallpox. It was approved by the FDA in 2019 for the prevention of monkeypox. Although there is no special license for the prevention of monkeypox in Europe, this vaccine has been used for the prevention of monkeypox in the United Kingdom. It is a two dose vaccine, and the vaccination interval is recommended to be more than 28 days. Compared with the first and second generation smallpox vaccines, the third generation smallpox vaccine has less side effects, is safer, and has a wider population, but its accessibility is limited. There is limited evidence on whether the third generation smallpox vaccine can prevent or improve the prognosis after exposure to the environment and articles contaminated by confirmed or suspected monkeypox cases. Since the whole vaccination course includes two doses, it is unlikely that vaccination after exposure can completely prevent disease. However, since some immune responses to the first dose of vaccine can be detected within the first two weeks, rapid vaccination may change the disease severity of cases with a long incubation period. Experts suggest that smallpox vaccination within 4 days (preferably no more than 14 days) after exposure can prevent or reduce the severity of the disease [14].

7. Conclusion

Monkeypox is a new issue that has piqued our interest. Scholars discovered limited scientific studies on monkeypox throughout their investigation, but they compared it with previous results on smallpox to determine viable treatments. The first confirmed case in England, which has a travel history to Africa, could represent a misunderstanding of where, when, and how the monkeypox virus begins. We would believe that the spread of monkeypox is directly related to Africa travel history, as this illness is still regarded prevalent in various African nations. However, as the number of cases surged in most nations throughout the world, the CDC realized the possibility of another pandemic and announced the

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need of being alert of monkeypox. COVID-19 enters our lives unexpectedly and without warning, and the entire world is unprepared to handle it as soon as possible, inflicting catastrophic harm and loss of life.

Because of experience with COVID-19, most nations already have a thorough framework in place to deal with the problem, as well as specific therapies to treat mild cases efficiently. Complication treatments is being prioritized right now because a detailed comprehension of monkeypox is required to treat it more effectively and accurately. The emergence of skin lesions, oral lesions, vaginal lesions, and other symptoms necessitates that the health department pay closer attention to and record such symptoms. Prevention and self-care are strongly suggested right now. However, the fatality cases indicate that the virus's evolution is accelerating, raising the likelihood of a more severe pandemic in the future.

The emergence of monkeypox during this COVID-19 pandemic might be both beneficial and detrimental. Countries have already maturely established communications and shared information as a result of COVID-19. The previous advanced pandemic control strategy for dealing with the ravages of COVID-19 can be utilized as a model for limiting the spread of monkeypox. COVID-19 warns us that even if we live in a healthy environment, we should be cautious of the pandemic. We must constantly be ready to fight the next illness outbreak.

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