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"Monkeypox: A Growing Global Health Concern- A Comprehensive Review"

[1]Ulagadde Soham P. [2]Sayyed Mehraj J. [3]Kothari Nisha M. [4] Dr. Wadewale V. B.

Shivlingeshwar college of Pharmacy, Almala Dist. Latur Maharashtra, India 413520

ABSTRACT:

Mpox or monkeypox is zoonotic illness caused due to monkeypox virus (an Ortho poxvirus). Mpox is close relative of Variola(smallpox) virus. MPXV is a double-stranded DNA virus transmitted by droplet exposure via exhaled large droplets, direct contact (Sexual/Infected skin lesions, contagious materials such as towels, bedding)

MPXV was first detected in 1958 in an outbreak of a vesicular disease among captive monkeys transported from Africa to Denmark for research purposes. The largest animal reservoirs of the virus have been found in squirrels, giant pouched rats. In Aug.1970 the first case of monkeypox was identified in 9-year-old child in the village of Bukenda in the equatorial region of Zaire (now DRC). Mpox is endemic in both Central Africa and West Africa. The recent outbreaks of MPXV have now occurred in several countries on almost all components.

Symptoms of Mpox include Fever, Headache, Myalgia, Characteristics rash that develops into papules which evolve to vesicles, pustules and crusts in the genital, anal or oral regions. Diagnosis can be made through presence of Ortho poxvirus DNA in PCRs from lesion swab or body fluids.

Patients with severe manifestations and people at risk of severe disease (e.g. immunosuppressed people) could benefit from antiviral treatment which includes (e.g. tecovirimat, brincidovir, cidofovir) and vaccinia immune globulin intravenous (VIGIV). JYNEEOS™(live replication incompetent vaccinia virus) and ACAM 2000(live, replication competent vaccinia virus) are two vaccines currently available as medical counter measures for Ortho poxvirus such as monkeypox

KEYWORDS: Monkeypox, Orthopoxvirus, democratic republic of Congo, Prodromal stage, PCR kit.

INTRODUCTION:

Monkeypox was first discovered in 1958 in laboratory monkeys in Copenhagen, Denmark. The virus was identified during an outbreak among monkey Cynomolgus in a Danish laboratory. The first human case was reported in 1970 in the Democratic Republic of the Congo in a 9-month-old boy during smallpox eradication efforts.

After smallpox was eradicated and vaccination efforts stopped, monkeypox cases started increasing in Central and West Africa in the 1980s. The virus spread outside Africa for the first time in 2003 in the United States linked to imported wild animals from Ghana. In 2017, monkey pox re-emerged in Nigeria, with a significant increase in cases and person to person transmission.

A global outbreak began in May 2022, spreading rapidly across Europe, the Americas, and other regions, primarily affecting men who have sex with men.

The World Health Organization (WHO) declared the global outbreak under control in May 2023, but a new variant emerged in the Democratic Republic of the Congo, raising concerns about sustained human transmission. In 2024, the variant spread to other African countries, promoting the WHO to declare it a public health emergency of international concern in August.

ETIOLOGY:

Monkeypox is caused by the monkeypox virus (MPXV), a virus that can spread from animals to humans. Here are some key facts about the virus:

- Monkey pox virus (Fig.1.1) belongs to the orthopoxvirus genus and Poxviridae family.
- The virus has a double standard DNA genome, about 190,000 base pairs long.
- The virus is enveloped oral shaped and has a lipoprotein outer membrane.

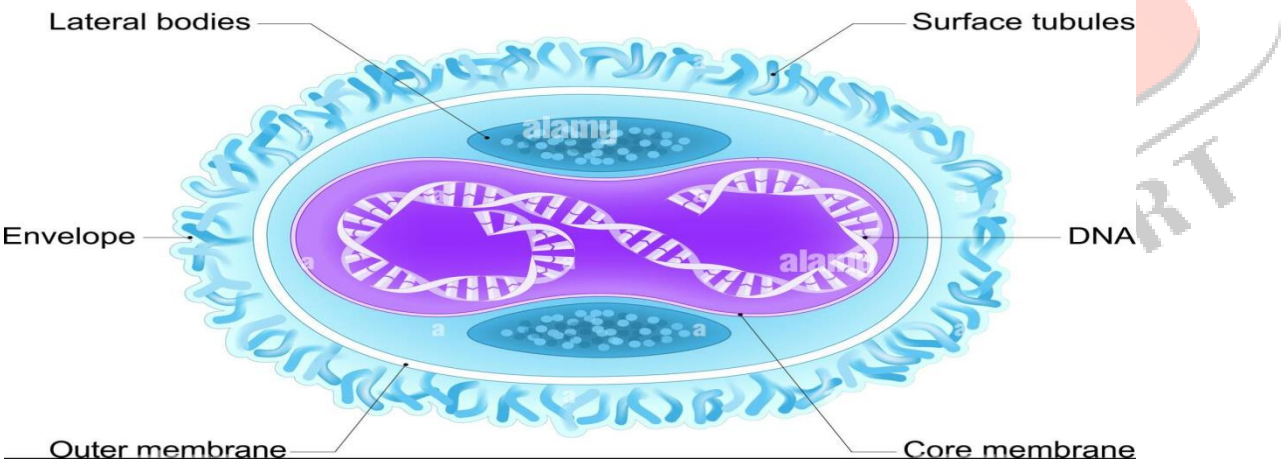

Fig. 1.1

TRANSMISSION:

It is transmitted through following ways-

1. Animal to humans: People can get infected through direct contact with infected animals, such as bites, scratches or handling infected animal tissues.
2. Human to human: The virus can spread between people through close contact with infectious legends or fluids, including-
   - sexual contact
   - respiratory droplets (Less Common)
   - formities (Less common)

EPIDEMIOLOGY:

Monkey pox has traditionally been found in certain parts of Africa, but its distribution has changed significantly in recent years. Historically, monkey pox was found mainly in central and West Africa Democratic Republic of the Congo and Nigeria

- The recent global spread in 2022- Cases were reported in over 100 countries across 6 continents. Primarily affected Europe and the Americas.
- Latest trends as of mid-2024- Over 120 countries have reported cases more than 1,00,000 laboratory confirmed cases.
- Over 220 deaths worldwide

PATHOPHYSIOLOGY:

Monkey pox infection involves a complex interaction between the virus and the body immune system. Here's a step-by-step explanation:

1. Virus entry
2. Replication
3. Spread and immune response
4. Systemic involvement

1.VIRUS ENTRY:

- The virus enters the body through mucus membranes or damaged skin.
- Special molecules called glycosaminoglycans (GAGs) helps the virus to attach the host cell.

2.REPLICATION:

- The virus replicates inside host cells but unlike most DNA viruses, it does so in the cell cytoplasm not the nucleus.
- The virus has a unique genetic structure with a double standard DNA genome and special hairpin like formation.

3. SPREAD AND IMMUNE RESPONSE:

- After replicating locally about 6 to 13 days the virus spreads to nearby lymph nodes and enters the bloodstream.
- The virus has clear ways to evade the immune system, including interfering with how the body presents antigens and responses to infection.

4.SYSTEMIC INVOLVEMENT:

- The virus can infect multiple organs including the skin spleen thymus and others.
- This can lead to a range of symptoms from mild to severe.

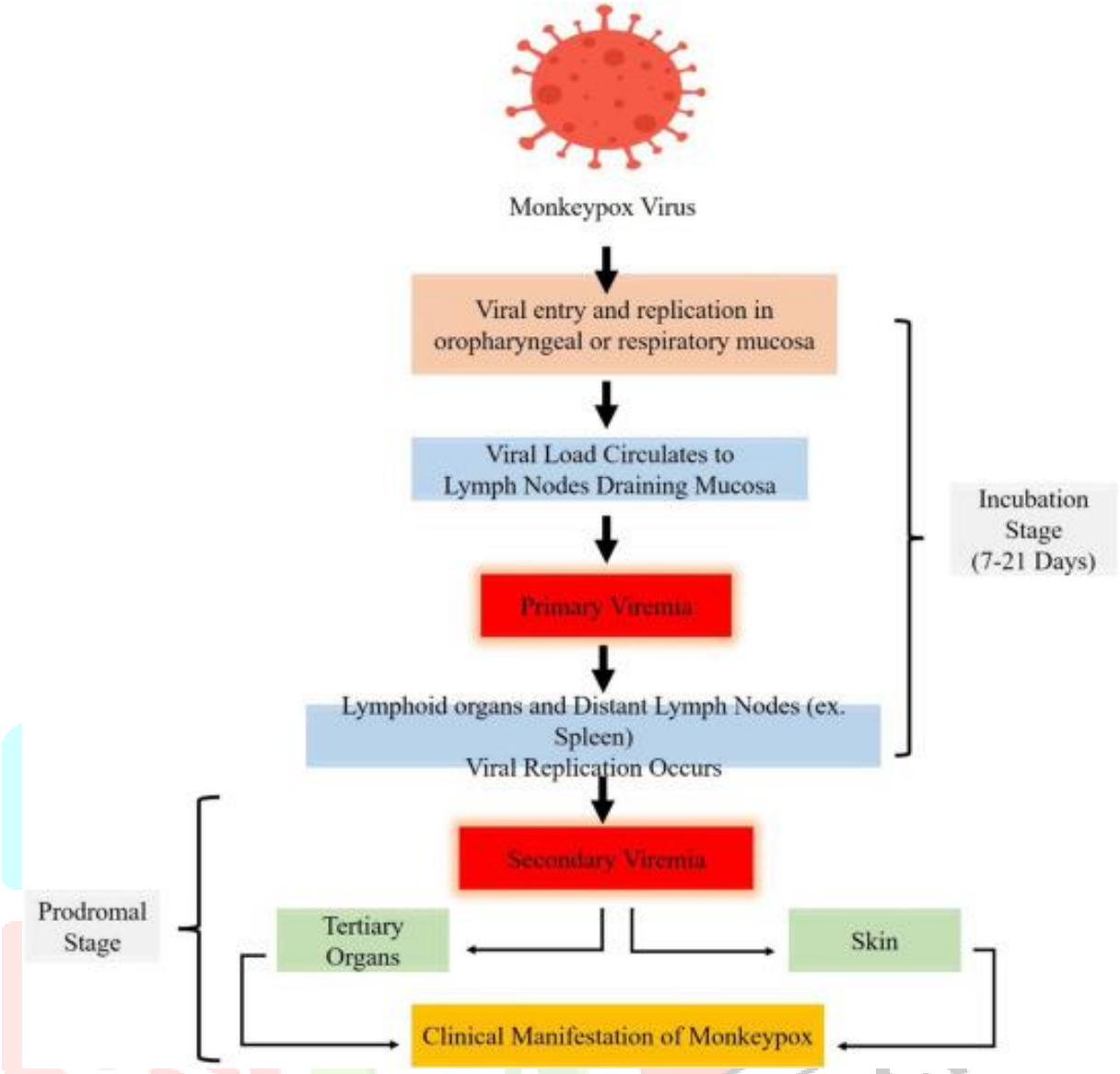

Fig. 1.2 Flowchart of pathophysiology of monkeypox

CLINICAL PRESENTATION:

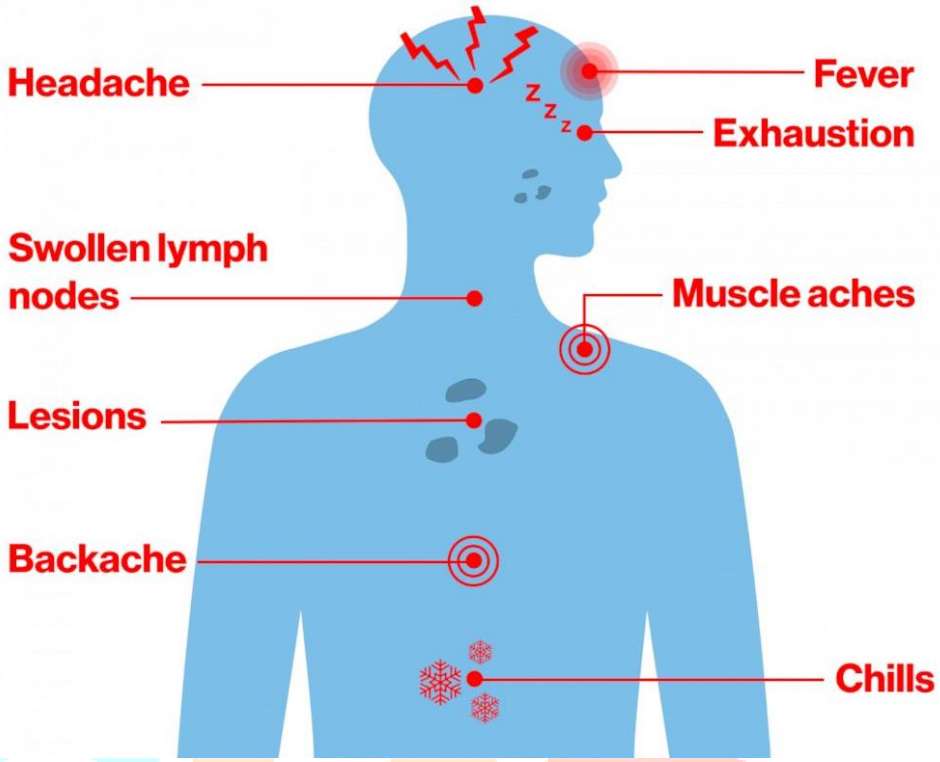

Fig.1.3 Clinical presentation of monkeypox

Monkeypox also known as mpox can cause a range of symptoms that usually start within 1-21 days after exposure. Here's what to expect:

1. Incubation period:
   - Lasts for 1-21 days with a median of 7-10 days.
   - You are not contagious during this phase, but you may become contagious during the prodromal phase.
2. Prodromal phase: Common symptoms include:
   - Fever
   - Headache
   - Sore throat
   - Cough
   - Muscle pain
   - Back pain
   - Swollen lymph nodes (lymphadenopathy)

   This phase usually lasts a few days before the rash appears

3. Rash and lesions:
   - Firm, rubbery, well-circumscribed lesions
   - Often develop umbilication
   - Progress through stages – macular, popular, vesicular, pustular, and finally crust over before healing.
   - Can appear anywhere on the body including face, palm, soles and genital areas.
   - Often occur in genital and anorectal region in recent outbreaks.
   - Lesions are typically painful at first and become itchy as they crust over.

4. Other symptoms:
   - Respiratory symptoms: Nasal congestion, sore throat, cough.
   - Gastrointestinal symptoms: Diarrhea, vomiting.
   - Neurological involvement: rarely neurological complications like encephalitis may occur.
   - Ocular involvement: conjunctivitis, keratitis, corneal ulcers
5. Disease duration:
   - The illness usually lasts 2-4 weeks
   - May persist longer in immunocompromised individuals.

DIAGNOSIS:

Diagnosing monkey pox relies on lab tests, mainly a technique called PCR (polymerase chain reaction). Here's how it works:

1. LAB DIAGNOSIS:
   - Best test: Real time PCR is the most reliable way to diagnose monkeypox. It finds viral DNA in samples.
   - Sample collection: Samples are taken directly from skin lesions (rash, fluid, or crusts) using a swab. If there are no lesions, throat or anal swabs might be used.
   - Sample handling: Samples are sent to the lab in a special medium to keep them safe for analysis.
2. CHALLENGES IN DIAGNOSIS:
   - Similar conditions: Monkeypox can be mistaken for other diseases like chicken pox, measles, or syphilis. That's why the lab confirmation is crucial.
   - False results: If samples aren't collected correctly PCR results might be wrong.
   - Blood tests: Blood tests can detect antibodies but they are not definitive for diagnosis because they can react to other viruses.
3. WHAT TO DO IF YOU SESPECT MONKEYPOX:
   - Notify authorities: Doctors should tell public health authorities if they think someone has monkeypox especially if they have recently travelled to areas where the disease is common.
   - Precautions: While waiting for test results patient should take precautions to prevent spreading the disease to others.

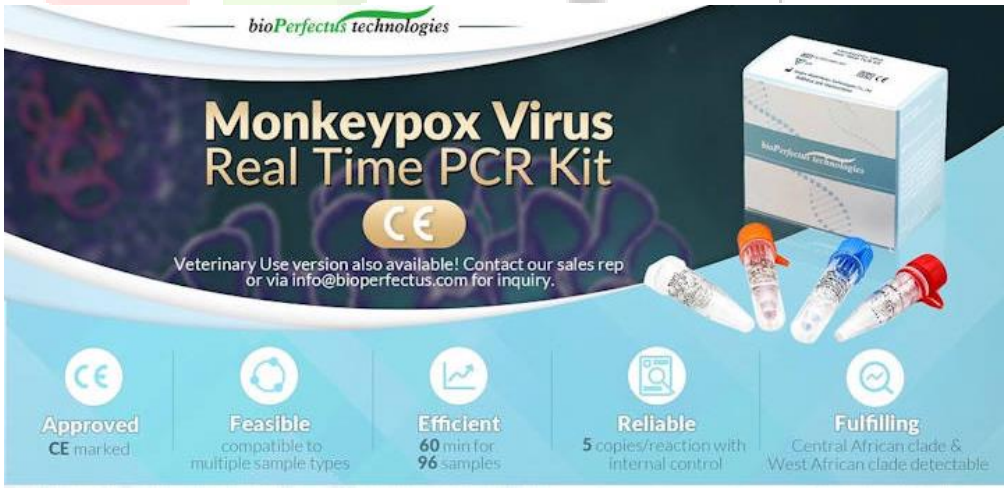

Fig. 1.4 Monkeypox virus kit.

RISK AND COMPLICATION:

Monkeypox poses significant risks and complications, especially for certain groups. Here's a breakdown of the risk and complications:

1. TRANSMISSION RISK:
   - Close contact: The virus spreads through skin-to-skin contact, sexual contact, and respiratory droplets.
   - High risk groups: Men who have sex with men (MSM), individuals with multiple sexual partners, and those living in close quarters with the infected person are more vulnerable.
   - Animals-to-human transmission: People can get infected through bike or scratches from infected animals especially during hurting or handling animal tissues.
   - Nosocomial infection: Healthcare workers at risk of getting infected through contaminated materials or patients in healthcare settings.
2. COMPLICATION:
   - Severe illness: young children, pregnant women, and immunocompromised individuals are more likely to experience severe illness and complications.
   - Secondary infection: Bacterial infection of skin lesions can lead to Abscesses or severe skin damage.
   - Systemic complications: In rare cases monkeypox can cause severe systemic complications like pneumonia, sepsis, encephalitis, or myocarditis.
   - Long term effects: some individuals may experience prolonged recovery times or potential infection but more research is needed to understand the long-term effect.

TREATMENT:

Treatment for monkey pox focuses on relieving symptoms and providing supportive care as there is no specific treatment approved for the disease. However certain antiviral medications and vaccines may be used in specific situations.

1. SUPPORTIVE CARE:

Symptom management: Most patients recover with supportive care including- pain management, hydration, nutrition support.

Skin care: Proper wound care is crucial to prevent secondary infections and promote healing.

2. ANTI-VIRAL MEDICATIONS:

Tecovirimat (TPOXX): This antiviral is often used for severe cases or those at risk of severe diseases, although it's approved for smallpox not specifically for monkeypox.

Brincidofovir and vaccinia immune globulin (VIGIV): this may be considered for combination therapy or as alternatives of tecovirimat.

Cidofovir: A commercially available antiviral that may be used in certain cases.

3. VACCINATION:

Preventive measure: Vaccination with smallpox vaccine (like modified vaccinia Ankara) is recommended for individuals at high risk and post exposure prophylaxis.

CONCLUSION:

Monkeypox an zoonotic infection has become a global concern and has led to lots of deaths worldwide. It is at high risk as it is not easy to diagnose and can spread easily and no specific treatment regimen has concluded for it. For, future security prospective we should run awareness campaigns and make people aware about its transmission, steps to follow if anyone is infected, precautions and so on. This upgrowing health concern can lead to a pandemic situation worldwide. It has high death ratio, hence further studies are required for:

- Studying long term side effects related to the complications.
- Studying the vaccines formulation
- Finding a treatment regimen to effectively control the disease progression.

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