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MONKEYPOX

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INTRODUCTION

Monkeypox is a rare zoonotic disease that occurs sporadically in Sub Saharan Africa and known to cause clinically indistinguishable disease from other pox diseases especially smallpox.[1,2]

The disease was first discovered in 1958 among sick monkeys (*Macaca cynomolgus*) originating from Singapore and isolated at the State Serum Institute in Copenhagen, Denmark; however, the first human case was discovered in 1970 in a child in Equateur region of Republic of Congo (formerly Zaire).[3-7] It has largely been believed its epidemiology was masked by smallpox transmission and the eradication of smallpox in 1977 brought the disease to prominence.[1,8] It is also expected that as the immunity for small pox virus wane in the population, the risk for monkeypox virus will increase.[9] The virus has potential of being used as a bioterrorism agent.

Epidemiology

The disease's burden is largely concentrated in rural & near tropical rain forest of Central and Western Africa, although outbreaks have been reported in other part of the world especially United States.[5] The affected communities are also noted to be impoverished and generally have a high prevalence background of parasitic infections, malnutrition, and other significant heath-compromising conditions.[10] There is no racial or gender predilection.

The disease is endemic in Democratic Republic of the Congo (DRC) (also Zaire) while it occurs sporadically in other part.[5] Crude incidence rate of 5.53 per 10,000 people have been reported in DRC with most of the affected people below 15years.[5,11] Some other countries where the disease has been reported include Cameroon, Central African Republic, Liberia, Nigeria, and Sierra Leone.[5,10]

The most likely reservoir of the disease is the rodent.[1,9] Other possible sources of the infection include squirrels - *Funiscuirus spp.,* sooty mangabey - *Cercocebus spp.,* sun squirrels - *Heliosciurus spp.,* giant pouched rats - *Cricetomys spp.,* brush-tailed porcupines - *Atherurus spp.,* African dormice - *Graphiurus spp., and* West African Hybomys or temminck's striped Mouse-*Hybomys spp.,* rope squirrels, tree squirrels, Gambian rats, striped mice and pet prairie dogs (*Cynomys species*).[5]

The minority of cases occur through human-to-human transmission and rarely beyond two generations. As much as 80% of cases occur through animal to human transmission.[5,12]

Virology

Monkeypox virus (MPV) belong to genus orthopoxvirus of Poxviridae family (subfamily-Chordopoxvirinae).[6] Other members of orthopox-virus include Cowpox virus and Variola virus which causes cowpox and small pox diseases respectively. Monkeypox virus (MPV) is closely related to Variola virus (about 90% genome homology).[11]

It is a single molecule of double stranded DNA and have two major genetic clades of the virus; the lesser virulent clade occurring in West Africa and the other in Central Africa.[10]

Transmission

It primarily infects animals and from animals can be transmitted to humans through: direct contact from the bite or scratch of an infected animal; direct contact with muco-cutaneous lesions of infected animals; direct contact with the infected animals' blood, body fluids or secretions (when these comes in contact with the blood of humans through exposed wounds or injuries or direct transfusion) or indirect contact with materials contaminated with the blood and body secretions of the infected animals.[5,13]

It can also be transmitted from humans to humans i.e. secondary infection through inhaling the respiratory droplets (close contact is needed) of an infected person, direct contact with the blood or body fluids of infected person or indirect contact with materials contaminated with the blood or body fluids of infected person.[5,13]

Pathogenesis and Pathology

MPV gains entrance through a break in the muco-cutaneous layer or the respiratory linings and migrate through the lymphatic system during primary viraemia, subsequently proliferating in the lymphoid tissue i.e. spleen, bone marrow, and lymph nodes. [14,15] The invasion prompts cytotoxic T cell immune activation. MPV proliferates in the macrophages where it disseminates through the vessels to other parts of the

body during secondary viraemia. [14] It localizes within the vessels in the dermis and subsequently invade the epidermis.[14] It initiates necrosis and oedema of the skin layer.

The commonest histologic features of monkey pox are cellular proliferation causing thickening of skin (acanthosis), necrosis, degeneration, blister generation and inflammation in the lesion.[15,16] There is intracellular oedema (spongiosis) arising from inflammatory processes in the lesion too.[16]

Clinical features

The incubation period is 10–14 days.[1] The disease is usually infectious within first one week of its onset.[1] It is characterized by rash which is preceded by 2 days prodrome of fever and severe lymphadenopathy.[1] The rash initially start as maculo-papular of 2–5 mm in diameter then progresses through papular, vesicular, pustular, and crust phases over a period of 14–21 days.[1](See figure 1&2) The rashes are in most cases monomorphic but in other cases pleomorphic with number of lesion reaching as much as 500 and average lesion being 100. [10] In an article by Reynolds et al, the spectrum of rash using lesions' count was graded to be:

(i) Benign: 5 – 25 lesions with ocular involvement.
(ii) Moderate: 26 – 100 lesions with ocular involvement.
(iii) Grave: 101 – 250 lesions with lymphadenopathy.
(iv) Plus grave: above 250 lesions. [10]

The rashes are mainly on the face, sole of feet and palm of the hands.[5] The rashes subsequently slough off and heal as depigmented scar.[1] Other manifestations include intense headache, chills, lack of appetite and back pain.[2] In addition, there are respiratory symptoms and conjunctivitis. [4,10]

In the early phase of the disease there is intense asthenia and myalgia. The lymphadenopathy which is a prominent feature can affect the submandibular, cervical, postauricular, axillary, or inguinal lymph nodes.[1] It is difficult to clinically distinguish from other pox like diseases such as smallpox and chicken pox. The disease can be fatal in 1-10% of cases.[5]
Furthermore the disease can be asymptomatic.

Diagnosis

The virus can be detected through enzyme-linked immunosorbent assay (ELISA), antigen detection tests, polymerase chain reaction (PCR) assay and virus isolation by cell culture.[5]

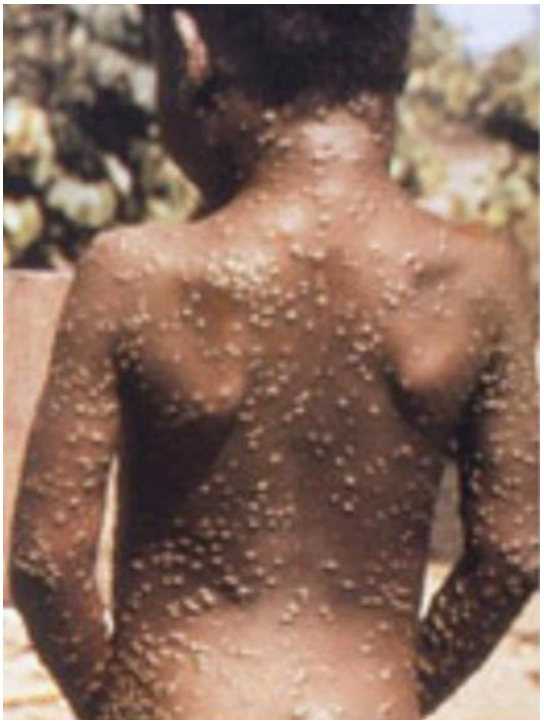

Figure 1: Clinical picture of Monkeypox rash.
Image credit: CDC https://www.cdc.gov/poxvirus/monkeypox/index.html

Differential diagnosis

The infection is similar, but milder than, human smallpox or chickenpox. The differential diagnoses include smallpox, chickenpox, drug eruptions, herpetiformis, rickettsial pox, eczema herpeticum, dermatitis and molluscum contagiosum, bacterial skin

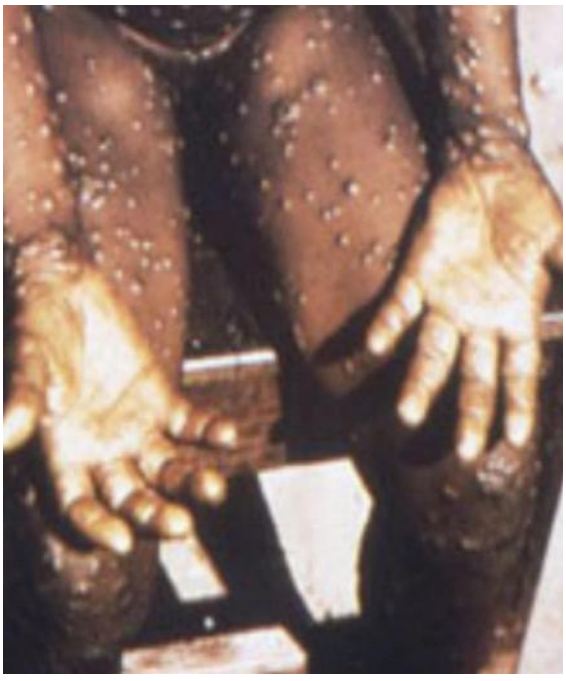

Figure 2: Clinical picture of Monkeypox rash.
Image credit: CDC https://www.cdc.gov/poxvirus/monkeypox/index.html

infections, scabies, syphilis, and drug-associated allergies.[5,17] Smallpox does not produce marked lymphadenopathy as seen in monkeypox while the rash distribution in chicken pox is mainly on the trunk and in different stages of development in contrast to monkeypox.[1,4]

Treatment

There is no licensed specific cure for monkeypox.

Prognosis

It is a self-limiting disease with severe disease usually in children.[5]

Control and prevention

The wide number of hosts of MPV has made its eradication difficult.[1] There is no vaccine against monkeypox although smallpox vaccine was found to be 85% effective.[5] Though the vaccine is not publically available, Center for Disease Control and Prevention (CDC) recommends its use two weeks of exposure to source of infection.

There are two aspects to preventing this disease which includes curtailing animal to human transmission and human to human transmission. Ensuring standard precaution plays a very important role in prevention and control of monkeypox transmission.[13]

Specifically the prevention and control entail avoiding contact with the infected hosts (animals and humans) and consumption of the identified animals, ensuring meats of reservoirs are well cooked, performing hand hygiene routinely with either soap and clean flowing water or alcohol gel, perform it before and after contact with any suspected ill person or when in hospital environment and in the community, ensure performing other safety precautions like respiratory hygiene, using appropriate personal protective equipment when in presence of suspected or infected people coughing, talking or sneezing and operating an adequate disease surveillance system.[5,13]

The use of airborne precaution is recommended for examining and admission of patient due to the risk of airborne transmission of the disease.[18] Patients, at the point of entry to the health facility, are identified as suspected cases through respiratory visual triage (a visual triage to identify people with infectious respiratory illnesses by their clinical features) and face mask is given to patient and accompanying person (family, friends or others) while patients waiting room for all respiratory infections should have seats separated 1m apart.[19] Ideally, patient should be examined and admitted in an air negative pressure isolation room with adherence to airborne precautions; fully protective covering with gloves, gown, air respirator (mostly N95), face shield is used, notice of airborne precaution with necessary informative infection control measures fixed on the door of the isolation room. When an air negative pressure room is not available, single isolation room can be a substitute.[18] The movement of patient from the point of reception to the admission room should be limited to less contact and areas with no crowding to control MPV spread. Minimal number of care givers trained on infection control should be assigned to patient and family members or friends visiting patient should be reduced to only those needed to offer care and support. A log book of inflow and outflow of people into the isolation room with presence of symptoms peculiar to monkey pox disease should be kept for tracking secondary infections among all contacts.[19]

Health education of animal handlers and continuous training of health workers to help raise clinical high index of suspicion is very important.

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Answers to Questions on Page.....

1. D	2. C	3. D
4. B	5. C	6. C
7. B	8. C	9. C