Rapid Risk Assessment:
Nipah Virus Outbreak in Kerala, India

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This document has been developed by the Gulf Center for Disease Prevention and Control (Gulf CDC) for the awareness of public health authorities within countries of the Gulf Cooperation Council. The rapid risk assessment provides guidance based on the information available to the Gulf Public Health Emergencies Network as of 2 October 2023.

I. Background

(a) The Event (detected by Gulf CDC on 12th September 2023)

On 11th of September 2023, the media reported six suspected human cases of Nipah virus infection, including two deaths, in the city of Kozhikode, Kerala state in India. The deaths occurred on 30 Aug and 11 Sep of patients aged 44 and 40 years respectively. On 12th of Sep 2023, these cases were confirmed by the National Institute of Virology (in Pune) to be Nipah virus infections and were announced by the Indian national and Kerala state governments. On 15th of September 2023, two additional potentially linked cases (including a 24-year-old healthcare worker) were confirmed to be infected with the Nipah virus in the same district. One of the cases is a 9-year-old child currently in critical condition (presumed method of treatment is experimental monoclonal antibodies based on media reports). At least 20 people presenting symptoms compatible with Nipah have been admitted at Kozhikode hospital and samples from these patients have been sent to NIV for testing. The strain of the virus detected thus far has been the "Bangladesh strain"(1), which has been associated with high mortality rates (80-90%) and human-to-human transmission potential.

On 18th September 2023, India IHR NFP informed UAE IHR of two high-risk contacts that travelled to Dubai International Airport, while being asymptomatic in India. UAE were able to track those contacts who completed the incubation period without showing symptoms.

(b) The Hazard

Nipah viral disease is a zoonotic infection caused by Nipah virus (NiV), a paramyxovirus belonging to the family *Paramyxoviridae*. The natural reservoir hosts are fruit bats, mainly *Pteropus spp* that are known as flying foxes (2). NiV transmission occurs via the consumption of virus-contaminated

foods, such as raw date sap, and contact with infected animals or human body fluids. Some experimental studies (3) revealed that NiV droplets (aerosol exposure) might play a role in transmitting NiV during close contact, especially in healthcare settings, from patients having laboured breathing than those having no respiratory problems (4).

The signs and symptoms of the disease appear 3–14 days post NiV exposure. Initially, there is a high rise of temperature along with drowsiness and headache, followed by mental confusion as well as disorientation, ultimately progressing towards coma within 1–2 days. A critical complication of the NiV infection is encephalitis (5). NiV is associated with high fatality rates of 40–75%. Long-term side effects in survivors of Nipah virus infection have been noted, including persistent seizures and personality changes (6).

No specific anti-viral drug has been yet approved for the treatment or vaccine of this disease (5). Depending on the stage of the disease, NiV infection can be confirmed by RT-PCR testing, or by immunoassays (7).

Regarding Nipah virus stability, the virus can survive for days in sugar-rich solutions (8,9): up to 3 days in some fruit juices or mango fruit, and at least 7 days in artificial date palm sap. It has a half-life of 18 hours in the urine of fruit bats. The virus is relatively stable in the environment and remains viable at 70 C for 1 h (only the viral concentration will be reduced). However, the viability of the virus in its natural environment may vary be different to the viability of the virus isolated and tested in experimentally controlled conditions. The virus can be completely inactivated by heating at 100 C for more than 15 min (10), as well as soaps, detergents, and commercially available disinfectants (11).

II. Epidemiological Situation

The Nipah virus was discovered in 1999 during a disease outbreak in pigs and humans in Malaysia and Singapore. While no further confirmed NiV outbreaks have occurred in Malaysia or Singapore since 1999, outbreaks have occurred annually in other regions of Asia since then (12), especially in Bangladesh and India. In these outbreaks, the virus has been found to be transmitted from person to person, increasing fears about the virus's ability to cause a global pandemic. Notably, in the last two decades since 2001, five Nipah outbreaks were reported in India, particularly in in West Bengal and Kerala (13–16). The latest large outbreak in Kerala in 2018 reached a case fatality rate of 89% (14).

Pteropus bats, the primary reservoirs of NiV, are found in South Asia, Southeast Asia, Australia, East Africa, and some oceanic islands in the Indian and Pacific Oceans (17); Anti-NiV or cross-reacting anti-NiV antibodies have been detected in bats from Bangladesh, Cambodia, China, Indonesia, India, Madagascar, Malaysia, New Caledonia, Papua New Guinea, Thailand and Vietnam. NiV RNA was also detected in bats in Timor-Leste, Bangladesh, India, and Thailand (18,19).

III. Risk Assessment

(a) RRA Risk Question(s)

What is the risk of the introduction of the Nipah virus into the GCC countries?

(b) Likelihood

1. Likelihood of Introduction of Nipah virus Cases in GCC countries

- ***Travel-related cases of NiV Returning from Affected Areas***

Using a modelling algorithm developed by BlueDot (2023), the estimated probability of Nipah-infected air travellers from India (the outbreak region) to the GCC countries is 0, except for the UAE, where the probability is 0.0001. While, globally, Nipah virus infection has never been documented in a traveller (20), it is important to consider that the outbreak extent in Kerala could be more than the confirmed/reported cases, as several asymptomatic cases have been documented in previous global outbreaks.

- ***The presence of NiV reservoirs in the Gulf region***

There are no known species of Pteropus bats in any of the Gulf countries, or the neighboring countries (21). The bat's immigration from Asian countries to the GCC countries is unlikely due to the far distance from regions with high bat prevalence (which does not include the Arabian peninsula). However, migration in the future remains a possibility (21).

Other fruit bats in the Arabian Peninsula, such as the Egyptian fruit bat (Rousettus aegyptiacus), do not support NiV replication experimentally (22). However, if a mutation or recombination of the virus occurs, there is a chance that they could.

- ***Contaminated Products Imported to the Gulf Region***

The virus can be transmitted through contaminated food. Previous human infections have mostly been associated with consumption of raw date palm sap.

Imported Products Possibly Contaminated	Considerations
Date palm sap	GCC national populations generally prefer locally produced date palm sap. However, there is a possible for it to be available through Indian stores targeting the Indian expatriate populations in the GCC. Particular care should be taken with raw date palm sap or fruit.
Processed produce (i.e. sweets)	The virus could be denatured during the boiling stage of processing; however, a period of continuous 15 minutes (at least) of boiling at 100C is required to denature the virus. It is possible that throughout the boiling, other ingredients are added as well and the effect of this on the virus denaturation is uncertain.
Frozen produce	Care should be taken for imported frozen product from the affected areas with awareness about product testing where needed.
Fresh products (i.e. fruits, juice, and vegetables)	Encouraging public awareness and education regarding the Nipah virus is essential. It is advised to avoid consuming unpasteurized fruit juices that have been exported from Kerala or its neighbouring regions. Additionally, it is crucial to educate the public about the risks associated with consuming freshly harvested date palm juice.

Indian authorities are taking measures to prevent the spread of the Nipah virus by increasing surveillance at Kerala borders (23). Several sources have also suggested that food exports from Kerala have been temporarily suspended.

Therefore, the likelihood of the introduction of the virus Nipah into the GCC is **unlikely.**

2. *Impact of the virus introduction in the GCC*

If Nipah virus is introduced into the GCC, the severity of infections could be high and fatal since the virus is associated with high fatality rates. No approved vaccines or antivirals exist to date. Human to human transmission can occur, as documented in previous outbreaks.

GCC countries have high reporting capacities for detecting and responding to epidemic-prone diseases. The countries also have strong infection prevention and control capacities in healthcare facilities, reducing the impact of virus transmission in those settings. Food and import authorities are at high capacity at the GCC countries. However, Nipah virus disease has not been detected in the GCC countries previously, as such, there may be low familiarity with the disease presentation and its specific control measures.

In 2018, the national Kuwait IHR Center, under the supervision of His Excellency the Undersecretary, took all necessary health measures as soon as an outbreak of the Nipah virus was detected in Kerala through media. Accordingly, concurrent shipment of mangoes had been imported from Kerala was banned as a preventive measure, in addition, KIHR center circulated and communicated with all relevant authorities and sectors notices to take the necessary precautionary measures for the event according to international recommendations.

In current outbreak of 2023, the national Kuwait IHR center communicated directly with national focal point of India, WHO South East Asia Regional Office, and WHO Eastern Mediterranean Regional Office to rapidly verify the health event and share with PHEN the latest epidemiological situation and recommendations. In addition, at the national level, KIHR communicated with all relevant sectors to raise awareness regarding the health event and apply all preventive measures, ensuring from availability of diagnostic tests of the virus from public health laboratory sector. The center continues to follow up on any updates related to this emergency health event and take the necessary measures.

Other GCC countries started taking proactive measures as well to enhance surveillance to timely detect suspected travel related cases since the outbreak in Kerala was announced. Measures also include risk communication, travel advisories, laboratory capacity reviews. The UAE also conducted a comprehensive risk assessment following the IHR notification from India and implemented appropriate measures.

Importation of cases to GCC countries is not likely to result in community wide outbreaks, although localized clusters of cases could be expected among close contacts and in healthcare settings (if appropriate precautions are not followed). Therefore, if an outbreak of Nipah virus disease occurs in the GCC region, it would have a **minor impact**.

(d) Level of Confidence

This risk assessment is associated with a high level of confidence.

(e) Overall Risk level and statement

Risk assessed					
Negligible	Very Low	Low	Moderate	High	Critical

V. Recommendations

1. Enhance early detection and notification of suspected cases that fulfil the case definition, by:
    a. Reviewing and disseminating Nipah guidance (guidelines, case definitions and investigation forms) to all stakeholders involved in surveillance and contact tracing.
    b. Disseminating Nipah case definition to relevant surveillance and clinician staff (especially emergency rooms and neurologists) and sending an alert to clinicians and points of entry (PoE) staff to maintain a high vigilance for patients with travel history to Kerala, India.
    c. Designating at least one hospital/facility with adequate supplies and isolation rooms to provide care for up to 5 potential cases with suspected Nipah and disseminating the referral procedures to other health facilities and PoE.
2. Assure laboratory capacity to timely confirm cases while applying the required IPC standards, by:
    a. Ensuring the national reference laboratory is equipped to test specimens of suspect Nipah,
    b. Ensuring the necessary arrangements are made for receiving the specimens.
    c. Establishing stand-by arrangements and ensuring agreements are in place with reference laboratories across the GCC and internationally for confirmatory testing and sequencing.
3. Enhancing infection prevention and control in healthcare settings;
4. Raise community awareness and providing relevant health travel advice for passengers to Kerala;
5. Coordinating with One Health partners to review importation of potential sources of virus importation into the country; this includes engaging the food authority for awareness and testing and enhance communication between food/importation sector and heath sector.

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