Ground Truth – Nipah Virus

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Pathogen type: Currently referred to as Novel Nipah Virus (NNiV). NNiV is a variant of the Nipah Virus, a zoonotic virus belonging to the genus *Henipavirus* in the family *Paramyxoviridae*.

Origin and emergence details: The Nipah Virus emerged relatively recently with the first known outbreak occurring in 1998. Since 1999, there have been regular reports of clusters of Nipah Virus cases in humans in Bangladesh and India. Like other members of the family *Paramyxoviridae*, NNiV originates from fruit bats of the genus *Pteropus*. However, what distinguishes NNiV from other strains of Nipah Virus is its abnormally high level of person-to-person transmission. Scientists have determined NNiV is prone to increased oral shedding and is thus more pathogenic compared to previous strains.

Infection spread began locally in southern villages in the country of Sormbay, located in South Asia. The largest employment sector in Sormbay is agriculture and due to high demand for agricultural products, more rural areas were developed into farms. Development encroached on wildlife habitat, including that of fruit bats. Farm crops (e.g., fruit, rice, corn) became contaminated with bat saliva or urine, subsequently infecting workers.

Workers on pig farms became infected when pigs contracted the virus from consuming contaminated fruits. As the middle-class population in Sormbay grew, more families could afford to eat pork. Therefore, farmers changed the way they raised pigs and began industrializing practices and maximizing the number of pigs reared on the farm, often confined in close quarters. This resulted in a disease-breeding factory, easily allowing the virus to spread like wildfire.

Due to widespread human transmission, the virus spread rapidly throughout the country. Outbreaks have also occurred in neighboring countries. The majority of those infected are adult males likely due to their increased level of occupational exposure and outdoor activities.

Pathogen characteristics: Transmission can occur from direct contact with infected animals, consuming food products contaminated by the body fluids of infected animals, and close contact with an infected person and/or their body fluids.

The rate of mortality is high with death occurring in 70-90% of those infected. Diagnosis is based on symptoms and confirmed with laboratory testing. The estimated incubation period is 4-14 days but can extend up to 45 days.

Symptoms range from mild to severe. Clinical presentation varies from asymptomatic to acute respiratory infection to acute encephalitis. Initial signs and symptoms are non-specific. Infected people may initially experience symptoms such as fever, headaches, muscle pain, vomiting, and

sore throat. This may be followed by dizziness, drowsiness, confusion, seizures, coma, and acute encephalitis. Treatment is limited to supportive care.

Other impacting factors: Prior to the pandemic, the level of awareness among the public of the Nipah Virus was low, particularly since Sormbay has not previously experienced an outbreak. No licensed vaccines to prevent NNiV infection or effective treatments are currently available. Given Sormbay is a developing country, pharmaceutical companies were initially reluctant to fund medication or vaccine trials due to an anticipated low-profit margin. However, there are monoclonal antibody therapies under development and evaluation for the treatment of Nipah Virus infection. These have been made available to Sormbay, but those of a higher social class can more readily access these treatments.

NNiV infection is challenging to diagnose as initial signs and symptoms are non-specific and primary diagnostic modalities require the availability of Biosafety level – 4 facilities. In Sormbay, there is limited infrastructure available for laboratory testing which presented further challenges in the pandemic response. Therefore, it was assumed anyone experiencing symptoms consistent with NNiV infection was infected.

Ecology: *Pteropus* fruit bats are found across a vast geographical area, including south and southeastern Asia, East Africa, Central and South America, and parts of Australia. They are highly mobile. Due to land development and habitat loss, the *Pteropus* fruit bats have moved closer to human dwellings and farms, contaminating crops, and leading to the subsequent infection of animals. With the growing population in Sormbay, there are increased interactions between humans and wildlife, leading to increased human exposure to a variety of diseases such as NNiV.

Economic and social issues: The Sormbay public healthcare system is not currently equipped to support and sustain the care of the growing population. The lack of infrastructure (i.e., hospitals, clinical equipment) and healthcare workers means many citizens are unable to access the care they need and are left untreated. There is a physician shortage and those who train as physicians often leave the country to seek better opportunities and pay elsewhere. Moreover, the supply of personal protective equipment is low for both healthcare workers and the general population. Although, Sormbay received shipments of personal protective equipment from the World Health Organization, lack of government accountability meant much of the supply was not distributed in a timely manner or was unaccounted for.

The low-income population experiences more challenges in accessing timely and quality healthcare. Most reside in rural areas whereas healthcare services are typically concentrated in urban areas. Private sector services are often too expensive for these citizens to afford. Many also continued to work while sick as they did not receive paid sick leave. People also fear they may lose employment if they take sick leave too often.

Lastly, Sormbay is densely populated, and it is difficult to isolate when someone is ill. Households are typically multigenerational and often, multiple family members share a room. Sanitation issues are also of concern. Due to a lack of awareness, particularly in rural areas, hygiene practices are inadequate as people do not understand the necessity of handwashing with soap and water. In addition, not all households may have clean water and soap available.

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