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Zika: The Newly Emerging Threat to Mankind

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Abstract

Zika virus disease, first identified in Zika forest of Uganda in Africa, is a newly emerging threat that has been responsible for outbreaks in Brazil and 22 other countries and territories in America within the last few years.

The disease is caused by a Flavivirus and transmitted by *Aedes aegypti* mosquito. It may also be transmitted through vertical, sexual and parenteral routes, though these are rare. Anyone not previously exposed to the virus and who lives in an area where the mosquito is present, and where imported or local cases have been reported, may be infected. The disease is usually mild and can last for 2-7 days. Symptoms are similar to those of dengue or chikungunya. However, Zika does not have clearly characteristic features, but most patients have skin rashes and some have conjunctivitis.

The public health alarm lies in the fact that the outbreak in Brazil is associated with a steep rise of Guillain-Barre syndrome and pregnant women giving birth to babies with birth defects, most common being microcephaly, and poor pregnancy outcomes. Hence the World Health Organization has declared the recent cluster of microcephaly cases and other neurological disorders reported in Brazil, following a similar cluster in French Polynesia in 2014, a Public Health Emergency of International Concern (PHEIC) and has issued Temporary Recommendations under IHR (2005).

India is also at risk, as being a new virus the entire population is susceptible, lacking immunity to it. Also the *Aedes* mosquito is widespread in the country and the climatic conditions, temperature, and humidity of the country are favourable for transmission of the disease. Hence public health measures must be widely implemented throughout

the country to prevent an epidemic. Based on the Recommendations of WHO, the Ministry of Health & Family Welfare, Government of India has issued guidelines for prevention and control of Zika virus disease in India.

Keywords: Zika; Virus; *Aedes* Mosquito; Microcephaly; Guillain-Barre Syndrome; Brazil Outbreak.

Background

Zika is an emerging public health threat caused by a flavivirus that was first isolated in rhesus monkeys in the Zika forest of Uganda, through a monitoring network of sylvatic yellow fever. It was subsequently identified in humans in 1952 in Uganda and the United Republic of Tanzania [1]. Initially it was confined to Africa, but later outbreaks of Zika virus disease were recorded in the Americas, Asia and the Pacific also. In 2007, a major epidemic was reported on the island of Yap (Micronesia), where nearly 75% of the population was infected [2].

In 2013 Zika virus disease outbreaks were reported from French Polynesia [1]. On 3rd March 2014, Chile notified PAHO/WHO that it had confirmed a case of indigenous transmission of Zika virus on Easter Island, where the virus continued to be detected until June 2014 [2]. In May 2015, the public health authorities of Brazil confirmed the transmission of Zika virus in the northeast of the country, following which PAHO issued an alert [2,3]. Since then, the disease has spread within Brazil and to 22 other countries and territories in the region, indicating rapid geographic expansion of Zika virus. The outbreak in Brazil is associated with a steep rise of Guillain-Barre syndrome and pregnant women giving birth to babies with birth defects, most common being microcephaly, and poor pregnancy outcomes [4].

Epidemiology [1-5]

- Agent- A virus which is a member of the Flaviviridae virus family and the Flavivirus genus, also known as Zika virus as it was first isolated from the Zika forest of Uganda. Since it is transmitted by infected mosquitoes it is also under Arbovirus.
- Vector- Aedes mosquito, mainly Aedes aegypti in tropical regions. This is the same mosquito that transmits dengue, chikungunya and yellow fever.
- Host- Anyone not previously exposed to the virus and who lives in an area where the mosquito is present, and where imported or local cases have been reported, may be infected.
- Reservoir - Unknown.
- Environment- Climatic conditions, temperature and humidity of Tropical countries facilitate transmission of the disease.
- Mode of transmission- The virus is transmitted in several ways.
 - ☞ Vector borne - Through bite of Aedes aegypti mosquito.
 - ☞ Vertical - A mother already infected with Zika virus near the time of delivery can pass on the virus to her newborn around the time of birth, but this is rare. It is possible that Zika virus could be passed from mother to fetus during pregnancy. There are no reports of infants getting Zika virus through breastfeeding. Because of the benefits of breastfeeding, mothers are encouraged to breastfeed even in areas where Zika virus is found.
 - ☞ Sexual - The virus has also been isolated in semen, and one case of possible person-to-person sexual transmission has been described, but not confirmed.
 - ☞ Parenteral - Zika can be transmitted through blood, but this is an infrequent mechanism.
- Incubation period- It is not clear, but is likely to be a few days to weeks.

Clinical Features

About 1 in 4-5 people infected with Zika virus become ill i.e., develop Zika [2,3]. Among those who do, the disease is usually mild and can last for 2-7 days. Symptoms are similar to those of dengue or chikungunya, which are transmitted by the same type of mosquito. The most common symptoms of Zika virus infection are mild fever and exanthematous

rashes, usually accompanied by conjunctivitis, muscle or joint pain, headache and general malaise that begin 2-7 days after the bite of an infected mosquito. Neurological and autoimmune complications are infrequent, but have been described in the outbreaks in Polynesia and Brazil [1,2]. Severe disease requiring hospitalisation is uncommon. Deaths are rare [3]. However, in patients with preexisting diseases or conditions, sporadic cases have been reported of more serious manifestations and complications, causing death [2].

Complications [3,4]

- During the Brazil outbreak microcephaly and other poor pregnancy outcomes were observed in babies of mothers who were infected with Zika virus while pregnant.
- An increase in Guillain-Barré syndrome (GBS) has been observed in areas where a Zika virus epidemic has been documented e.g., in French Polynesia and Brazil. GBS is a condition in which the immune system attacks the nervous system, sometimes resulting in paralysis.

However, a causal relationship between Zika virus infection and birth defects and neurological syndromes has not been established, though strongly suspected.

Difference between Zika, Dengue, and Chikungunya [2]

- Zika does not have clearly characteristic features, but most patients have skin rashes and some have conjunctivitis.
- Dengue usually presents with higher fever and more severe muscle pain. There can be haemorrhagic manifestations when the fever breaks.
- Chikungunya presents with higher fever and more intense joint pain, affecting the hands, feet, knees, and back. It can disable people, bending them over so that they cannot walk or perform simple activities of daily living.

Diagnosis [1,2]

In most people, diagnosis is based on clinical symptoms and epidemiological circumstances such as Zika outbreak in the patient's area or visit to areas where the virus is circulating.

Blood tests can help to confirm the diagnosis. Some tests like virological PCR tests, are useful in the first 3-5 days after the onset of symptoms, while

serological tests that detect the presence of antibodies are useful only after five days [2]. Diagnosis by serology can be difficult as the virus can cross-react with other flaviviruses such as dengue, West Nile and yellow fever. Virus isolation can also be done from blood samples [1]. Zika virus usually remains in the blood of an infected person for a few days but it can be found longer in some people [2].

Once it has been demonstrated that the virus is present in a given area or territory, confirmation of all cases is not necessary, and laboratory testing will be adjusted to routine virological surveillance of the disease [2].

Management [1,3]

Zika virus disease is usually relatively mild and requires no specific treatment other than symptomatic. People sick with Zika virus should get plenty of rest, drink enough fluids to prevent dehydration, and treat pain and fever with common medicines such as acetaminophen. Aspirin and other non-steroidal anti-inflammatory drugs (NSAIDs), like ibuprofen and naproxen should be avoided until dengue can be ruled out, to reduce the risk of hemorrhage.

Prevention [1-5]

Prevention involves reducing mosquito populations through source reduction and reducing contact between mosquitoes and people, thus avoiding bites which occur mainly during the day. Eliminating and controlling *Aedes aegypti* mosquito breeding sites reduces transmission of three diseases i.e. Zika, chikungunya, and dengue. An integrated response is required, involving action in several areas, including health, education, and the environment.

♦ *Source Reduction*

This can be done by removal and modification of breeding sites. Collection of water in outdoor containers like flower pots, bottles, and vessels should be avoided so that they do not become mosquito breeding sites. Domestic water tanks should be covered so that mosquitoes cannot get in. Garbage should be placed in closed plastic bags and kept in covered containers. Drains should be unblocked to allow free flow of water.

♦ *Reduction of Contact between Mosquitoes and People*

This can be done by using insect repellent; wearing

clothes that cover as much of the body as possible and preferably light-coloured; using physical barriers such as screens, closed doors and windows; using mosquito repellents and sleeping under mosquito nets which may be treated with insecticides. Special attention and help should be given to those who may not be able to protect themselves adequately, such as young children, the sick or elderly people.

♦ *Prevention of Transmission from Cases*

People suffering from Zika should avoid mosquito bites during the first week of illness by restricting movement and sleeping under nets, so as to stop transmission of the disease to the healthy population, through vectors.

♦ *Outbreak Response*

Spraying of insecticides should be carried out during outbreaks. Insecticides recommended by the WHO Pesticide Evaluation Scheme may also be used as larvicides to treat relatively large water containers.

♦ *Travel Precaution*

Travellers should take the basic precautions to protect themselves from mosquito bites.

♦ *Prophylaxis*

There is no vaccine or medicines to prevent Zika infection. However, developing a vaccine is currently considered.

WHO Response

WHO is supporting countries to control Zika virus disease through [1]:

- strengthening surveillance;
- building capacity of laboratories to detect the virus;
- working with countries to eliminate mosquito populations;
- preparing recommendations for the clinical care and monitoring of persons with Zika virus infection; and
- defining and supporting priority areas of research into Zika virus disease and possible complications.

An International Health Regulations Emergency Committee was convened by the WHO on Zika virus

and increase in neurological disorders and neonatal malformations was observed. Based on the advice of this Committee, the Director-General, on 1st February 2016, declared the recent cluster of microcephaly cases and other neurological disorders reported in Brazil, following a similar cluster in French Polynesia in 2014, a Public Health Emergency of International Concern (PHEIC). The Director-General endorsed the Committee's advice and issued them as Temporary Recommendations under IHR (2005) [4].

Temporary Recommendations under IHR (2005) [4]

The Committee highlighted the importance of aggressive measures to reduce infection with Zika virus, particularly among pregnant women and women of childbearing age, and gave the following recommendations.

- ◆ *Zika Virus Transmission*
 - Surveillance for Zika virus infection should be enhanced, with the dissemination of standard case definitions and diagnostics to at-risk areas.
 - The development of new diagnostics for Zika virus infection should be prioritized to facilitate surveillance and control measures.
 - Risk communications should be enhanced in countries with Zika virus transmission to address population concerns, enhance community engagement, improve reporting, and ensure application of vector control and personal protective measures.
 - Vector control measures and appropriate personal protective measures should be aggressively promoted and implemented to reduce the risk of exposure to Zika virus.
 - Attention should be given to ensuring women of childbearing age and particularly pregnant women should have the necessary information and materials to reduce risk of exposure.
 - Pregnant women who have been exposed to Zika virus should be counselled and followed for birth outcomes based on the best available information and national practice and policies.
- ◆ *Longer-Term Measures*
 - Appropriate research and development efforts should be intensified for Zika virus vaccines, therapeutics and diagnostics.
 - In areas of known Zika virus transmission health services should be prepared for potential

increases in neurological syndromes and/or congenital malformations.

- ◆ *Travel Measures*

- There should be no restrictions on travel or trade with countries, areas and/or territories with Zika virus transmission.
- Travellers to areas with Zika virus transmission should be provided with up to date advice on potential risks and appropriate measures to reduce the possibility of exposure to mosquito bites.
- Standard WHO recommendations regarding disinfection of aircraft and airports should be implemented.

- ◆ *Data Sharing*

- National authorities should ensure the rapid and timely reporting and sharing of information of public health importance relevant to this PHEIC.
- Clinical, virologic and epidemiologic data related to the increased rates of microcephaly and/or GBS, and Zika virus transmission, should be rapidly shared with WHO to facilitate international understanding of these events, to guide international support for control efforts, and to prioritise further research and product development.

In the coming weeks, WHO will convene experts to address critical gaps in scientific knowledge about the virus and its potential effects on fetuses, children and adults. WHO will also prioritise the development of vaccines and new tools to control mosquito populations, as well as improving diagnostic tests [4].

Threat to India

The disease has not yet been reported in India. However, there are several factors for rapid transmission of Zika virus that have been documented in other countries, which are applicable to India also. These are:

1. Since this is a new virus, the entire population is susceptible, lacking immunity to Zika virus.
2. The Aedes mosquito is widespread in the country.
3. The climatic conditions, temperature, and humidity of the country are favourable for transmission of the disease.

Hence the entire population of India is vulnerable to developing Zika disease. The Zika virus can get imported into India in two ways:

- i. Through infected travelers i.e. clinical and subclinical cases
- ii. Through infected mosquitoes.

There is currently no international guideline regarding isolation of travellers from Zika affected countries. But, import of mosquitoes is not likely to happen because of India's policy to keep the *Aedes aegypti* index at international airports and seaports at less than 1, along with aerosol spray of aircrafts and ships, as preventive measures for Yellow Fever. There is no vaccine or drug available to prevent or treat Zika virus disease at present. However research is going on for the same.

Guidelines for India on Zika Virus Disease following Epidemic in Brazil and other countries of America [5]

Based on the Recommendations of WHO, the Ministry of Health & Family welfare, Government of India has issued guidelines for prevention and control of Zika virus disease in India. These guidelines are available on the Ministry's website <http://www.mohfw.nic.in>.

Travel Advisory for Zika Virus Disease in India [5]

- Non-essential travel to the affected countries to be deferred/ cancelled.
- Pregnant women or women who are trying to become pregnant should defer/ cancel their travel to the affected areas.
- All travelers to the affected countries/ areas should strictly follow individual protective measures, especially during day time, to prevent mosquito bites (use of mosquito repellent cream, electronic mosquito repellents, use of bed nets, and dress that appropriately covers most of the body parts).
- Persons with co-morbid conditions (diabetes, hypertension, chronic respiratory illness, immune disorders etc) should seek advice from the nearest health facility, prior to travel to an affected country.
- Travelers having febrile illness within two weeks of return from an affected country should report to the nearest health facility.
- Pregnant women who have travelled to areas with Zika virus transmission should mention about their travel during ante-natal visits in order to be assessed and monitored appropriately.

Conclusion

Zika virus disease, first identified in Zika forest of Uganda in Africa, is a newly emerging threat that has been responsible for outbreaks in Brazil and 22 other countries and territories in America within the last few years. Though the disease is mild, the public health alarm lies in the fact that the outbreak in Brazil is associated with a steep rise of Guillain-Barre syndrome and pregnant women giving birth to babies with birth defects, most common being microcephaly, and poor pregnancy outcomes.

India is also at risk of the disease as being a new virus the entire population is susceptible, lacking immunity to it. Also the *Aedes aegypti* mosquito, which is the vector responsible for transmission of Zika virus, is widespread in the country and the climatic conditions, temperature, and humidity of the country are favourable for transmission of the disease. Hence public health measures must be widely implemented throughout the country to prevent an epidemic.

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