Zika Virus Infection, the Recent Menace of the Aedes Mosquito

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Abstract
Mosquito-borne infections and viral outbreaks have bewildered physicians and population at large from time to time, there seems to be a constant cat and mouse race between the medical fraternity and these mosquito menaces. Zika virus and its vector Aedes aegyti are currently bothering the world population, this infection has affected pregnant women causing microcephaly in their new-borns and also has caused GBS-like manifestations in affected individuals. Currently the outbreak is concentrated in the countries of South American continent, but the omnipresence of its vector has made the world community cautious about the potential of its spread; thus the great emphasis is on prevention and vector control strategies to counter Zika virus attack. Consequently, Ministry of Health, Government of India has also taken cognizance of this and issued guidelines to tackle this problem.

Introduction
Zika virus (ZIKV) infection has been a source of concern in the recent few months due to increase in the number of patients being affected by it with epidemic proportions in Brazil and its potential of spread to other countries. The association of microcephaly in new-borns due to Zika virus has further created panic and worry among the people. It is thus essential to clarify the doubts and confusion in the minds of physicians and people at large. This article intends to achieve the same with the best known information on Zika till date. The fortunate part is the absence of any cases of Zika infection in India till date of printing of this article.

Epidemiology
Zika virus was first discovered in 1947 in the Zika forest of Uganda in rhesus monkeys.¹ It was later identified in humans in 1968 for the first time in Nigeria. There were only about 14 or 15 cases documented until 2007. In 2007 the first big Zika outbreak was reported, in the Yap Island in Micronesia.² Other Pacific islands — Fiji, Vanuatu have had periodic outbreaks since then. In May 2015, the Pan American Health Organization (PAHO) issued an alert regarding the first confirmed Zika virus infections in Brazil.³ The current outbreak has now spread to other countries in South America, Central America, and the Caribbean. WHO has reported 23 countries and territories in Americas from where local transmission of Zika virus has been reported.⁴

Brazilian researchers have suggested that the Zika virus arrived in Brazil from French Polynesia during the 2014 FIFA World Cup tournament.⁵ Maximum numbers of cases have been reported till date from Brazil, Colombia, Venezuela, Honduras and El Salvador. The current outbreak has affected almost 1.3 million people in the world with the majority of them in Brazil which is battling with its worst outbreak of Zika. There have been around 35 cases of travel-acquired Zika infections reported from US. On 1st February, 2016 World Health Organization declared Zika virus disease to be a Public Health Emergency of International Concern (PHEIC).

In the ⁵th February Epidemiological Update of European Centre for Diseases Prevention and Control, 36 countries or territories have reported autochthonous cases of Zika virus infection in the past nine months. These countries are all of South American continent. In Brazil, the most affected country, the latest data regarding Zika virus according to the Ministry of Health weekly epidemiological update on the monitoring of microcephaly published on 2nd February, 4,783 suspected cases of microcephaly have been reported since week 43-2015, of which 1,132 (24%) were investigated and classified. Of these cases, 404 (36%) have confirmed microcephaly and/or central nervous system malformations,
17/404 (4%) were positive for Zika virus infection.

Of 76 suspected deaths from microcephaly and congenital central nervous system malformations, 15 were investigated and confirmed to have microcephaly and/or central nervous system malformations. Zika virus was detected in tissues from five of them.6

Currently till our article went on for printing there have been no cases of Zika reported from India or the subcontinent.

Virology and Pathogenesis

Zika virus is a virus of flavivirus category of arbovirus type. These are RNA viruses which are enveloped viruses and are transmitted by arthropod bites. Zika virus falls into the same category of virus as of the virus causing Dengue, Chikungunya, West Nile Fever and Yellow fever.7

Zika virus has a single-stranded nonsegmented positive sense RNA genome. Arthropod vectors feed themselves on viremic hosts. Arthropods maintain the viruses via transovarian transmission. Zika virus is primarily transmitted by the bite of Aedes aegypti mosquito from infected patient to others. This is the same mosquito which also transmits Dengue and Chikungunya infections. Zika virus can also be transmitted from pregnant patients to the foetus intrapartum and during time of delivery.

Some observational evidence from a couple of small studies have reported that infection with Zika can pass on the virus to others through sexual intercourse as the virus has been found in the semen of the patients and can also be transmitted through blood. But to further clarify there have been no reports of transmission of Zika through breast milk currently.8

Aedes aegypti which is the vector for this virus has a wide presence throughout the world. Zika virus disease has thus the potential for further international spread given the wide geographical distribution of the mosquito vector. Hence countries like India need to be vigilant.

The incubation period of Zika virus has been reported to be around 7-10 days.

The hosts of the virus are primarily monkeys and humans.

The pathogenesis of the virus is hypothesized to start with an infection of dendritic cells near the site of inoculation, followed by a spread to lymph nodes and the bloodstream. Flaviviruses generally replicate in the cytoplasm, but Zika virus antigens have been found in infected cell nuclei.

Infection with the virus appears to be linked to the development of unusually small heads and brain damage in newborns (microcephaly).

The most dangerous time is thought to be during the first trimester of pregnancy when some women do not realize they are pregnant. Experts still do not know how the virus enters the placenta and damages the growing brain of the fetus. The pathogenesis of the virus has been the major cause of concern in Brazil where maximum number such cases have been reported. Some other congenital CNS abnormalities with adverse fetal outcomes and fetal deaths have also been reported.

Brazilian researchers have studied the amniotic fluid in pregnant women diagnosed to have microcephaly in the fetuses. They found Zika virus in it. In January, scientists at the CDC found Zika virus in the brains of two babies with microcephaly who died within 24 hours of being born. They also found evidence of Zika infection in two pregnancies that ended in miscarriage.

There has also been reports of a sporadic increase in cases of Guillain Barre syndrome in areas affected with Zika virus infection thus pointing towards its occurrence due to Zika virus. 62% cases of GBS in Brazil in recent times have shown symptoms of Zika virus infection prior to neurological symptoms.9

Diagnostic Tests

The patients who develop symptoms consistent with Zika virus infection and have history of travel to Zika affected areas in last two weeks should report to the health care facilities where they would be tested to confirm the diagnosis.

Zika virus can be tested in following samples; blood, saliva and urine. Mostly blood tests are performed. Following tests can be used for detection:

a. PCR test: It is useful in the first 3-5 days after the onset of symptoms. It helps in the direct detection of Zika virus RNA or specific viral antigens in clinical specimens.

b. Serology Test: It detects the presence of antibodies but are useful only after five days.

The clinicians should keep a high degree of suspicion of Zika infection in those people who
present with its symptoms and have history of travel in the areas which have reported to be effected with Zika virus in the last two weeks.

As per the directives of Health Ministry of India, NCDC, Delhi and National Institute of Virology (NIV), Pune, have the capacity to provide laboratory diagnosis of Zika virus disease in acute febrile stage.

These two institutions would be the apex laboratories to support the outbreak investigation and for confirmation of laboratory diagnosis. Ten additional laboratories would be strengthened by ICMR to expand the scope of laboratory diagnosis. RT-PCR test would remain the standard test. As of now there is no commercially available test for Zika virus disease. Serological tests are not recommended by them for the detection.¹⁰

Management

Currently there is no drugs or vaccines available for Zika virus Infection.

The management of affected individuals is symptomatic in nature, following things should be undertaken:

1. Adequate fluid intake
2. Rest
3. Antipyretics in the form paracetamol to treat fever, avoiding aspirin and NSAIDs
4. Preventing mosquito bites during infected stage to prevent spread of the disease
5. If the patient is pregnant extra care has to be taken to monitor for birth defects and adverse pregnancy outcomes, and termination of pregnancy should be considered in case of documented birth defects during pregnancy

Prevention Strategies

There are reports of an Indian biotech company which is ready with two candidate vaccines for ZIKV infection to be tested in preclinical stages.

Hence prevention of this disease becomes the most crucial method to control the outbreak and its spread.

People should take care to prevent themselves from getting infected with ZIKV which could be undertaken through following routes:

1. Preventing mosquito bites by (a) staying indoors, wearing long-sleeved shirts and long pants. (b) Using Environmental Protection agency registered insect repellants. (c) Use mosquito nets.¹¹
2. Avoiding nonessential travel to countries currently facing the wrath of ZIKV infection.
3. Pregnant women should specifically avoid travel to affected countries.
4. Women of reproductive age residing in affected countries have been advised to avoid getting pregnant currently due to surge of microcephaly cases.
5. Travel precautions which should be followed include; travelers to affected areas should take extra care to avoid mosquito bites by personal protective measures. Travelers should monitor themselves after return and in case of development of any symptoms suggestive of ZIKV infection should immediately report to healthcare facilities.
6. Vector control by vector surveillance, environmental manipulation and modification, biological and chemical control, and use of personal protective measures has to be strengthened.
7. Information dissemination to the people by various methods like for example; use of billboards at airports, hospitals, educating healthcare professionals and population at large is essential to create awareness about ZIKV and remove panic.
8. Surveillance at various stages is very essential to prevent the spread of this outbreak and also to control the infection. Thus pediatricians, obstetricians and physicians should be sensitized towards monitoring cases and keeping a tab on numbers. In cases of GBS, atypical unexplained neurological manifestations, new-borns with birth defects and microcephaly, the health-care providers should keep a high degree of suspicion and elicit histories of travel and report accordingly.
9. An international and national collaboration at various levels is equally essential element to prevent the control of this outbreak.

Conclusion

The increase in number of cases in ZIKV infection and its association with microcephaly and GBS as reported currently should not create a sense of panic among the population at large. Sensitisation and spread of correct information to all stake holders including physicians, obstetricians and pediatricians is very essential. Such virus outbreaks have become very common in recent times, people have blamed environmental tampering and enhanced international travel for the same. Hence a systematic approach in such cases at various levels needs to be formulated by regulatory and executive authorities. This would prevent panic among the population and would also lead to better handling in future of any such threats. This article is one such tiny attempt to create a timely awareness in the medical fraternity.

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