



## A REVIEW ARTICLE ON ZIKA VIRUS

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### ABSTRACT

Zika virus belonging to Flaviviridae family and commonly spread by Aedes mosquitoes, and known to be innocent pathogen while restricted to Asian and African population. It is an arthropod borne virus isolated first in Uganda in year 1947. After that many outbreak of zika virus is being reported in different countries. Symptoms of zika are very mild such as fever, rashes, joint pain, conjunctivitis, ulceration. Severe complications of zika virus include risk of microcephaly and other congenital abnormalities in pregnant women. Virus was thought to cause asymptomatic or only mild, self-limiting symptoms. Although vaccines under development, currently no medications is available to treat this virus infection but research is being carried out for making of medication to treat this infection.

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### INTRODUCTION

Zika virus is a single-stranded RNA which is described as an arthropod-borne virus, belonging to the family Flaviviridae of the genus Flavivirus. It is spread by daytime-active Aedes mosquitoes like *A. aegypti* and *A. albopictus*. It was first discovered in 1947. Zika virus closely resembles dengue, West Nile and yellow fever viruses. Few common clinical manifestations of the Zika virus infection are: frontal headache, malaise, maculopapular rash, conjunctivitis and fever. Initially Zika virus was only contained within Africa and Asia but within the past decade, Zika virus has expanded globally to the Western Pacific as well as America with the first documented case in 2015 in Brazil. There are many reported cases of Zika virus outbreaks and epidemics affecting many countries all over the world. The illness due to Zika virus cannot be prevented by vaccines or medications. While there is no specific treatment for Zika virus, use of paracetamol along with rest may help with the symptoms.<sup>[1,2]</sup>

Zika virus can spread from a pregnant mother to her baby, through sex or through mosquito bites that is if a mosquito bites an infected person and then passes the virus to other people it bites. The World Health Organization (WHO) raised the alarm for the conditions caused by Zika virus such as microcephaly and defects in new born as they were mainly noted in economically deprived countries. WHO also emphasized that the public should be properly educated and preventive measures should be taken to avoid a similar occurrence in future.<sup>[3,4]</sup>

### History

Zika virus was isolated in rhesus monkey in April 1947 placed at Zika Forest of Uganda, lake victoria by the yellow fever research institute scientists. The next isolation was done at same site in January 1948 in mosquito *A. africanus*. Researches isolate virus from monkeys serum which was named as ZIKA in 1948. Zika virus first infect human in 1952 by various outcome of serological survey done in Uganda. This virus is very similar to Spondweni virus. Researchers in 1956, reported that spondweni was found to be cause of self-expose infection. Several serological studies were done in Asian and African countries shows that virus have been widely spread in this region within human population. Spread of virus in this region was found in 1951. The first case of infection in human was spotted by Simpson in 1964, who was oneself infected while isolating the virus from Mosquitoes.<sup>[5,6]</sup>

First largest outbreak of zika virus taken place in year April 2007 at island of Yap in federated state of Micronesia. This outbreak was identified by various disorder like rash, conjunctivitis, and arthralgia which was first thought to be dengue, chikungunya, or rose river disease. Serum samples from patients in mild phase of illness contained RNA of Zika virus. There were no death and hospitalizations reported. The oceanic first outbreak in year 2013 reported and estimated 11% humans infected by virus in French Polynesia. This outbreak was presented with Guillain-Barr syndrome (GBS). The spread of virus continued in various places like New

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Caledonia, Easter island, and cook islands. There was an endemic in America in year 2015-16. In year 2016, WHO said that the virus was expected to spread throughout in most of the Americans region. The number of travel warnings were issued and the outbreak was expected to significantly impact the tourism industry.<sup>[7,8]</sup>

**Virology**

Zika virus is closely associated with the Spondweni virus. It's one amongst the 2 known virus within the Spondweni clade. Zika virus is enveloped, has icosahedral structure and encompasses a non-segmented single stranded positive-sense RNA genome (10 kilobase). A positive-sense RNA genome is in a position to directly translate into viral proteins which may be glycoprotein. The glycoprotein binds to the endosomal membrane of the host cell and initiates endocytosis.

The RNA genome forms a nucleocapsid together with several copies of the capsid protein (12 k Da) and this nucleocapsid is enveloped within a host-derived membrane modified with two viral glycoproteins. Viral genome replication takes place by converting single-stranded positive-sense RNA to double-stranded RNA followed by transcription and translation to supply viral mRNAs and new single-stranded positive-sense RNA genomes (Figure1)<sup>[9,10]</sup>

Studies have shown that after the cells are infected with Zika virus, the vacuoles and mitochondria within the cells begin to swell so severely that it results to paraptosis i.e necrobiosis. Gene expression is required for this type of programmed necrobiosis. IFITM3 may be a transmembrane protein in an exceedingly cell which blocks the virus attachment and thus protects the cell from infection. When the amount of IFITM3 are low, cells are more liable to Zika infection.<sup>[11,6]</sup>

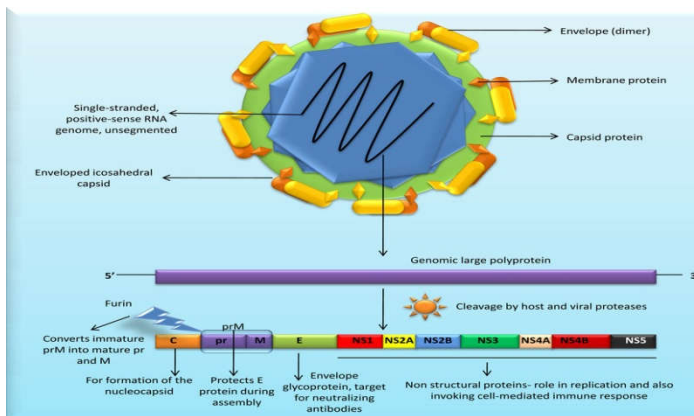


Figure 1 Structure of zika virus

**Transmission of Zika Virus**

Zika virus was primarily found within the vertebrates hosts in monkey so called enzootic mosquito-monkey-mosquito cycle and transmission to humans occur infrequently. However, like arboviruses, zika virus are now found in humans and spread in kind of mosquito-human- mosquito cycle.<sup>[12]</sup>

Zika virus is principally spread by Aedes aegypti and Aedes albopictus mosquitoes. It is transmitted through following ways:( Figure 2)

- Through mosquito bites
- Through sexual contact
- From mother to child
- Blood transfusion

**Through mosquito bites<sup>[13,14]</sup>**

Zika virus is spread by female Aedes aegypti mosquito, and arboreal mosquito species in arthropod genus. It is effective mostly in day time. Aedes mosquitoes lay on blood to lay eggs, this mosquitoes generally lays eggs in an near still water like buckets, flowerpots, bowls, allocated water etc. They live indoors as well as outdoor. When female aedes mosquito infected with zika virus bites healthy person, it transfers the virus infection to that person. Zika infection are intensified mainly due to urbanization, globalization, global trade, and travelling. When virus is pass on via mosquitoes, it is infectious for around a week, after infection but when it is transmitted by semen it is infectious for longer period of time that is for at least 2 weeks after infection.

**Through sexual contact<sup>[15,16]</sup>**

Transmission of zika virus can take place from men and women to their sexual partners. Many known cases involve transmission from symptomatic men to women. As of April 2016, zika transmission through sexual contact has been documented in six countries-Argentina, chile, France, Italy, New Zealand, and US. Transmission of zika virus has been reported from men who travelled to or resides in areas with active virus transmission to their sexual partners.

**From mother to child<sup>[17,18,19]</sup>**

Virus can be transmitted during pregnancy or at time of delivery. An infection during pregnancy may leads to changes in neuronal development of the unborn child. It may cause microcephaly in the unborn child which potentially leads to neurocognitive disorders in in adulthood. Congenital brain abnormalities have also been reported after zika outbreak.

MICROCEPAHLY are neurodevelopmental disorder and it is characterized by prominent reduction in brain size and intellectual disability. This is caused by impaired cell proliferation and death of progenitor cell in the brain cortex. Seizures, intellectual disability, movement problems, vision problem, are all the causes of Microcephaly.

**Blood transfusion<sup>[20,21]</sup>**

Transmission of zika virus through blood transfusion have been reported globally from Brazil, after which US FDA has recommended screening of blood donors before blood donations.

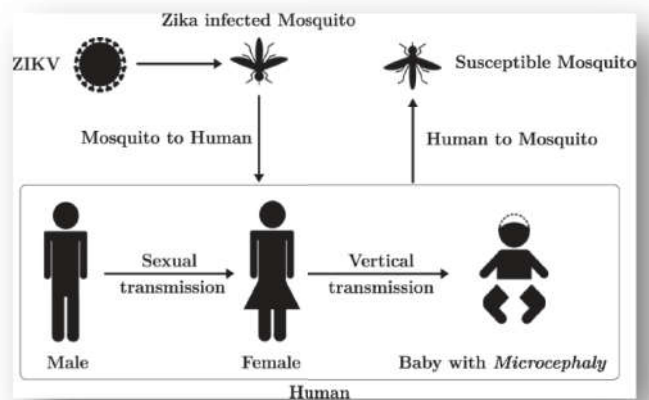


Figure 2

## Guillain -Barre Syndrome

It is an uncommon illness of nervous system in which a person own immune system damages the nerve cells which causes muscle weakness, and sometimes paralysis. GBS include weakness of arms and legs, and also it can affect muscles that control breathing. This can last for weeks or several months very few people leads death from GBS<sup>[22, 15]</sup>.

### Diagnosis

As per the centre for Disease Control and Prevention recommendation, testing for zika virus should be done in patients who have been recently exposed and presented with symptoms of zika. There are various diagnostic tests for zika virus. Such as serum and urine testing, nucleic acid testing (NTA) and zika and dengue virus immunoglobulin M (IgM) testing in serum this are some of diagnostic tests for any non-pregnant symptomatic patient. If the samples are collected within two weeks of symptoms onset then NAT can be useful. Along with NAT sample collection, zika virus and dengue virus IgM should also be tested. IgM level can also be tested after 14 days of symptoms onset.

Serum and urine NAT and zika virus IgM test in serum up to 12 weeks of symptoms onset is advisable for a symptomatic pregnant woman. A patient is considered of having an acute maternal zika virus infection if patient serum and urine NAT are positive even if the IgM is negative. If the patient is suffering from acute zika virus infection then either serum or urine NAT is positive but not both, zika IgM is positive. A plaque reduction neutralization test (PRNT) is performed if both serum and urine NAT are negative and IgM is positive. Testing of asymptomatic pregnant woman with zika virus exposure should be tested during pregnancy. NAT testing should be done during her first prenatal visit which is to be followed by two more testing during the pregnancy with non-consecutive visits. If any of the NAT test is positive then no further NAT testing should be done. If patient has previously been confirmed for zika virus infection, IgM Serology is not useful and recommended<sup>[23,24,22]</sup>.

### Signs and Symptoms

Incubated period for virus is 3-14 days. Symptoms of zika are very mild. Symptoms of zika disease is very common such as

- fever
- headache
- rashes
- joint pain
- muscle pain
- conjunctivitis
- ulceration,
- abdominal pain
- myalgia.

Complication of virus in pregnant women include microcephaly and other brain malformations. Infections in healthy adults been associated with Guillain barre syndrome. Living in infected area and unprotected sex are some risk factors involve in zika virus.<sup>[25,26]</sup>

### Treatment

No medicines, vaccines or treatment are available for zika virus or its associate diseases

People seek with zika should<sup>[27,28]</sup>

- get plenty of rest,
- drink fluids to prevent dehydration,
- take medicine to reduce fever and pain,
- NSAID and aspirin are not recommended due to increased risk of haemorrhage describe with other arboviruses as dengue.

### Prevention and Control

As virus is spread through mosquitoes, major element to disease control should be avoidance of mosquitoes. The centre for disease control have recommended that individuals should

- Cover exposed skin by wearing long sleeved shirts and pants treated with permethrin.
- Use an insectifuge containing DEET, picaridin, oil of lemon eucalyptus, or IR3535.
- Follow product directions and re-apply as directed.
- Avoid applying repellent on hands, eyes, or mouth.
- Use a bed net if the area where you are sleeping is exposed to outdoors.
- Stay in airconditioned rooms.
- Cover cribs, strollers and carriers with mosquito netting for babies under 2 months old.

Other strategies for controlling mosquitoes like eliminating standing water, repairing septic tanks and using screens on doors and windows. As zika is transmitted sexually, it should be counselled to either abstain from sex or use condoms for 6 months if their partner is pregnant or could become pregnant. Prevention of zika virus infection in underdeveloped countries must include proper education for public.<sup>[29,30,28]</sup>

## CONCLUSION

As Zika virus is spreading all over the world, the complication associated with it especially in pregnant women and children causes microcephaly and other severe birth brain defects. As many development are under clinical trials and if this trials succeed there will be many chances of getting this virus to be cured. However, if vaccination to cure virus is cost efficient it can be made available to each and every person affected by this virus. Every hospital should have the facility to provide treatment for the virus. Everybody including hospitals, schools, company should take initiative to aware people about this virus, their symptoms and prevention.

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