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ZIKA VIRUS: A REVIEW ON ORIGIN, TRANSMISSION, PATHOLOGICAL ACTIONS AND TREATMENT STRATEGIES.

Ashish A. Gawai, Anis Shah Akram Shah, Saurabh S. Joshi, Santosh S. Jaybhaye, Sayyed Nadim Sayyed Karim

Anuradha College of Pharmacy, Chikhali, Dist.-Buldana, (M.S), India 443201

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Email id: drashishgawai@gmail.com

ABSTRACT

Zika virus is a viral infection and Zika virus is primarily transmitted to humans through bites from Aedes mosquitos. Some evidence suggest it can also be transmitted to humans through blood transfusion, perinatal transmission and sexual transmission. However these modes are very rare. The incubation for these virus is typically between 2 and 7 days. There is no confirmed vaccination and particular treatment. Zika virus is positive sense of single stranded RNA molecule 10794 bases long with two non coding flanking region of known as the 5'NCR and 3'NCR.The most common symptoms of zika are fever, rash, joint pain, conjunctivitis (red eyes). The other common symptoms include headache and muscle pain.

Keywords: Zika Virus, Dengue, Epidemic

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INTRODUCTION

Zika virus is mosquito born virus that was first identified in Uganda in 1947 in monkey. In 1952 it was identified in humans. From 1960s to 1980s Human infections were found across the Asia and Africa typically accompanied, as the virus moves from the south-east Asia cross the pacific. The first large outbreak of disease caused by zika infection was reported from Island of Yap in 2007. The first reported zika virus outbreak in the Marquesas Islands and its subsequent spread to Brazil in may 2015 (Allen T, Frank V *et al*; 2016). There was an anticipation that the zika virus (ZKV) outbreak in the India was a possible due to the ubiquitous presence of a vector, *Aedesi* mosquitos and the susceptible to the host. The cases where confirm by real time reverse transcription polymerase chain reaction (RT PCR) test (Bo Zhang *et al*; 2016). Zika provides the epidemiological background and algorithm to handle the zika virus outbreak in India. With recent conformation of one more zika case from Chennai in India, and after screening of large number of febrile illness samples yielded only four positive cases. The present review addresses the current concerns with context to zika virus disease in India and why it has not been detected in large number of individuals and what may be the risk involved in the future. In India, more than 35000 serum samples of febrile illness have been tested which yielded only four cases, suggesting a very low level of transmission of the virus with in the community. There have been few cases reported in India and have no isolation of virus yet. The present scenario

suggest that these virus is distinct from the both African as well as pathogenic Asian strains, thus, it doesn't replicate profusely as the African and Asian prototype strains are known to do, and this is also the reason that there is low susceptibility in mosquitos and they do not pickup and transmittance the infection easily. This zika is capable of causing large outbreaks as recently seen in Brazil. It is difficult to confirm zika infection (out of acute phase of 4-5 days) by serology, due to a very high across reactivity with DENV. In such a situation, performing serology is not advice where high false positivety will create panic. It is difficult to ascertain whether there will be congenital disabilities in children born to zika virus infected women or with history of infection (Heymann DL *et al*; 2016). Research is required to understand the zika virus natural cycle in India. The environment in India is conducive for zika virus because of preponderance of the area. WHO guidelines are also issued for implication of public health in Americas. (WHO, 2015) Aegypti mosquitos breed throughout the year in and around the houses in potable water sources. The density is extremely high during monsoon since more number of breeding sites become available (Luplertop N, Hamel R *et al*; 2015).

MODE OF TRANSMISSION

Through mosquito bites:

Zika virus is transmitted to the peoples through the bite of an infected *Aedes* mosquito. These are the same as the Dengue and Chikungunya viruses. The mosquitos are typically lay eggs in or

standing water in buckets, bowls, animal dishes, flowers pots etc. Generally they prefer bite people and live indoor and outdoor near the peoples. The mosquitos that spread Zika, Chikungunya, and Dengue virus are bite during the day and night time. A mosquito get infected with a virus when mosquitos bites to an infected person during the period of time when the virus can found in the blood (Musso D, Gubler DJ *et al*; 2015).

From Mother to Child:

A pregnant women can pass the Zika virus to their foetus during the days of her

pregnancy. Zika virus can cause sever fetal brain defects. Zila virus has been found in the breast milk of infected mother, but zika virus transmission through breast milk has not been confirmed. Additionally we do not yet know long term effects of Zika virus in young infants infected after the birth because the current evidences are suggested that benefits of breastfeeding outweigh the risk of Zika virus spreading through the breast milk. ([https://www.rte.ie/news/2016/0122/762119-el-salvador-zika-virus/.](https://www.rte.ie/news/2016/0122/762119-el-salvador-zika-virus/))

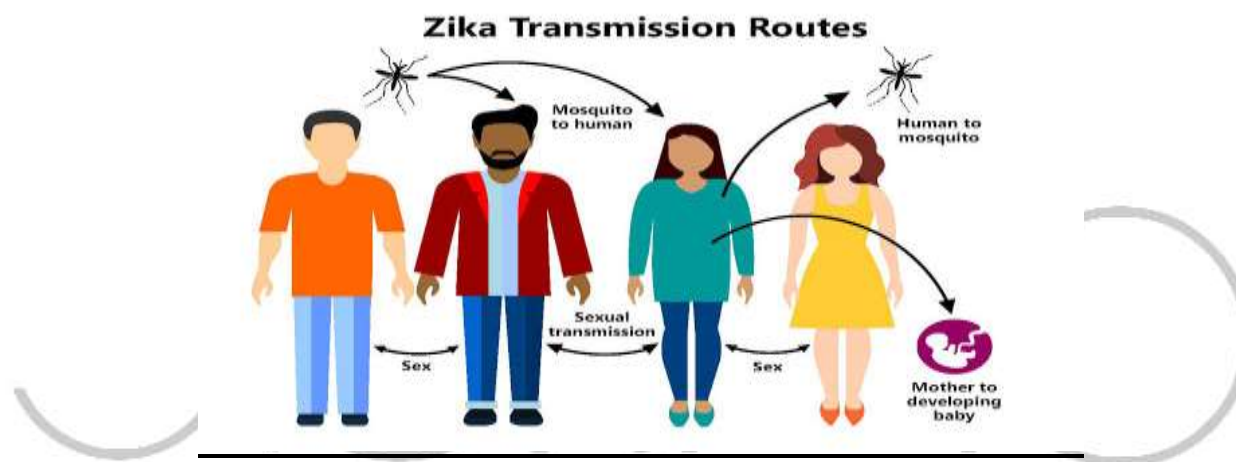


Fig 1. Mode of Transmission of Zika Virus)

Through Sex:

Zika virus can be passed through the sex if any partner is infected by this virus, even the infected person doesn't having symptoms at that time. Study is underway to find out how long zika stay in semen and vaginal fluid of peoples who are suffering from the zika virus infection and how long it can be passed through the sex. But we know that zika remain in semen longer than the other body fluids such as vaginal fluid, urine and blood (Luplertop OL, Laven JJ *et al*).

Through blood transfusion:

There are no any confirmed blood transfusion cases for transmission of zika virus in the United States but there have been many reports of the possible blood transfusion transmission cases in Brazil. During the French Polynesia outbreak 2.8% blood donor tested positive for Zika and in previous outbreak the virus has been founded in the blood donors (Allen T, Frank V *et al*).

Through Laboratory and health care setting exposure:

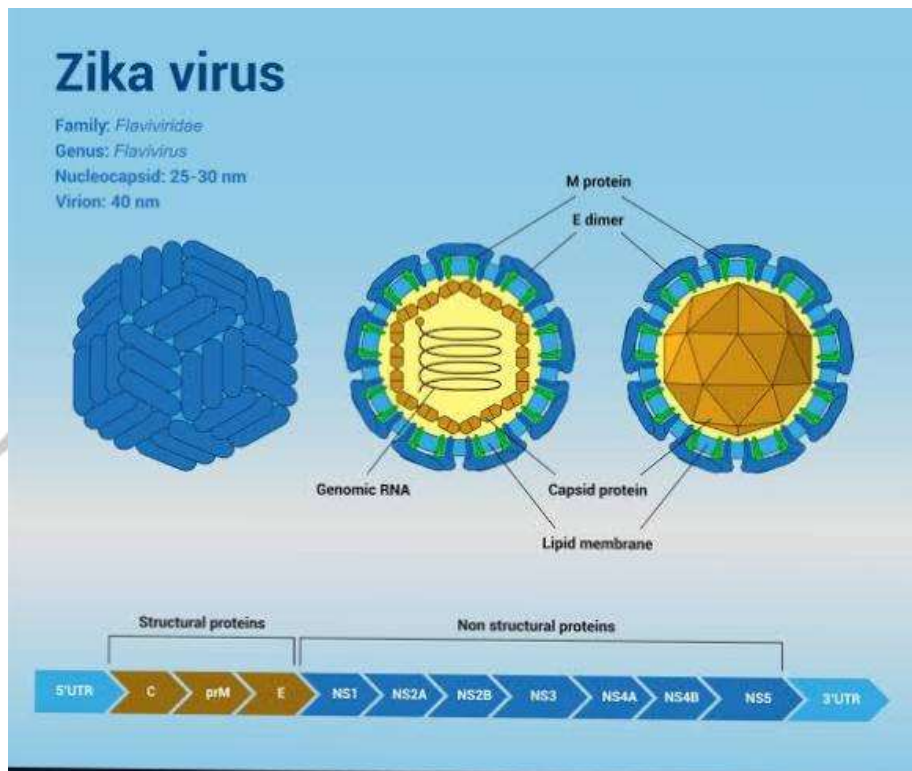
There are multiple reports of laboratory that acquired zika virus infection although the routes of transmission was not clearly established in all the cases. But to date no cases of zika virus transmission in health care setting exposure have been identified in the United States (<https://www.rte.ie/news/2016/0122/762119-el-salvador-zika-virus/>).

NCR. The frame of pen reading of ZKV read as follow: 5-C-pr-ENS1_NS2A-NS2B-NS3-

STRUCTURE OF ZIKA VIRUS

Zika virus (ZKV) is enveloped and icosahedral and has a non segmented single stranded positive sense RNA genome. It is most closely related to *Spondweni* virus. Zika virus is positive sense single stranded RNA molecule with 10794 bases long. With two non coding regions flanking region known as the 5'' NCR and 3

lipid bilayer that contain envelope proteins E or M the virion is approx. 40 nm in



NS4A-NS4B-N.S5-3-and code for polyprotein subsequently cleaved into capsid (C), precursor membrane (prM), envelope (E) and non structural protein (NS). The structure for zika virus follows as of other flavivirus. It contains a nucleocapsid approx. 25-30 nm oilin diameter surrounded by a host membrane derived

diameter with surface projection that measure roughly 5-10 nm the surface protein are arrange in an icosahedral symmetry

(https://wwwnc.cdc.gov/eid/article/20/6/et-2006_article).

EPIDEMIOLOGY OF HUMAN INFECTION

Zika virus had been known to infect the humans from the result of serology survey in Uganda and Nigeria. It was not until 1954 that the successful isolation of Zika virus from a human was published. This came as part of a 1952 outbreak investigation of jaundice suspected to be yellow fever (Kosoy OL, Laven JJ *et al*, 2008). In 2007 Zika virus was first detected outside the Asia and Africa causing the first large outbreak ever reported State of Micronesia in the Western Pacific estimated that over 72% of their resident over 3 year of age were infected with Zika (Altman LK, 2007). The origin of Zika virus that caused this epidemic remains to be clarified but it has been hypothesized that a viremic person travelling from the Phillipines could have introduced it. In October 2013 it reached to French Polynesia in the South Pacific region and until 2014 an estimate of 30,000

people were infected causing the largest Zika outbreak ever described at that time (Macnamara FN *et al*; 1954). Severe neurological manifestations and increase in Guillan Barre syndrome (GBS) were reported suggesting a possible association between Zika and GBS During and after this outbreak zika rapidly spread to other Pacific island (Watrin L *et al*; 2014), (Hayes EB *et al*, 2009). New Caledonia health authority declared zika outbreak in February 2014 and by the end of August 1400 cases had been reported. A small outbreak of Zika case confirm in the cook Islands in March 2014 with only 905 cases were reported. Local health authorities reported the first autochthonous case of Zika infection in Chile on 28 January 2014 after the confirmation of a suspected case on Easter Island. Fifty cases of zika in Chile were confirmed by end of the outbreak (Ramos DaSilva *et al*; 2016).

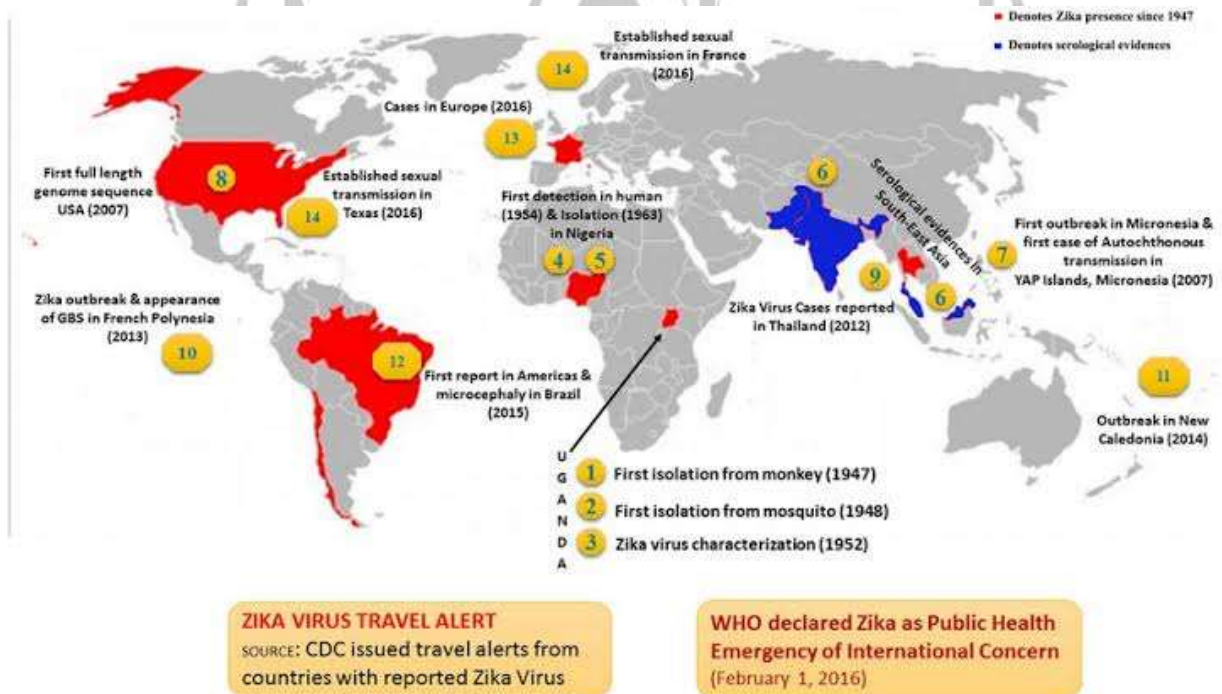


Fig.3: EPIDEMIOLOGY OF ZIKA VIRUS

In March 2015 researchers at the Federal University of Bahia, Brazil, confirmed the introduction of Zika in Brazil. It has been estimated that the number of suspected cases of Zika infection ranges from 4,40,000 to 1,300,000 by the end of 2015. Two hypotheses regarding the Zika virus introduction in Brazil had been initially raised with the first suggesting (Mutebi JP *et al*; 2014). In all potential cases Zika virus introduction was probably initially unnoticed because Zika clinical manifestations can be confused with those caused by dengue (DENV) and chikungunya (CHIKU) virus both already epidemic in the region of Brazil area. The country has notified 120-161 probable cases and 39-993 confirmation in 16th epidemiological week of 2016. The explosive Zika outbreak in Brazil has provided data on the association between microcephaly and/or neurological disorders and Zika infection. As a result 1st February 2016 the WHO declared the Zika

epidemic in Brazil a public health emergency of international concern (Heang V, Yasuda CY *et al*; 2016).

SIGNS AND SYMPTOMS OF ZIKA VIRUS INFECTION

About 1 in 5 people infected with Zika virus become ill (i.e., develop Zika) in a week. The most common symptoms of Zika are fever, rash, joint pain, or conjunctivitis (red eyes). Other common symptoms include muscle pain and headache (Westaway EG *et al*; 1985). The incubation period (the time from exposure to symptoms) for Zika virus disease is not known, but is likely to be a few days to a week. The illness is usually mild with symptoms lasting for several days to a week. People usually don't get sick enough to go to the hospital, and they very rarely die of Zika. Zika virus usually remains in the blood of an infected person for about a week but it can be found longer in some people (Huang XY *et al*; 2016).

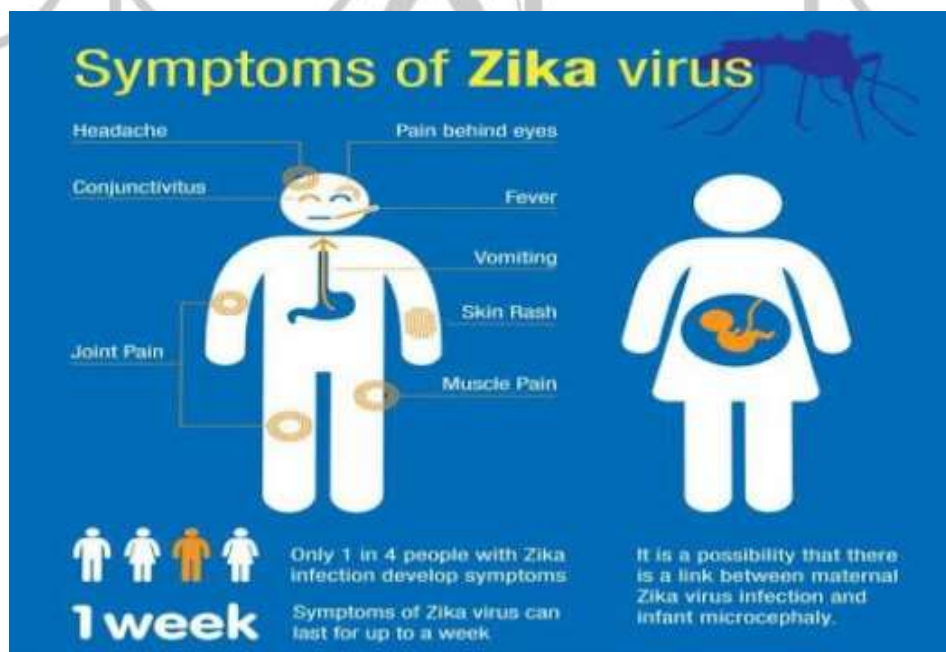


Fig 4: Symptoms of Zika Virus

DIAGNOSIS

Diagnosis for ZIKV infection include PCR tests to detect viral RNA as well as additional tests to detect ZIKV antibody (IgM) in serum. IgM for ZIKV is typically detectable around 3-5 days after infection, but cross-reactivity with closely related dengue, yellow fever, Japanese encephalitis, and West Nile viruses are possible (Qian X, Nguyen HN *et al*; 2016). These cross-reactive results were more common in patients that denoted signs of previous flavivirus infection than patients with primary ZIKV infection. PCR tests should be conducted within 10 days of onset of illness. For best diagnosis practices, serum samples should be analyzed as early as possible with a second test 2 to 3 weeks after that. Several methods can be used for diagnosis, such as viral nucleic acid detection, virus isolation and serological testing (Willison HJ *et al*; 2016). Nucleic acid detection by reverse transcriptase-polymerase chain reaction targeting the non-structural protein 5 genomic region is the primary means of diagnosis, while virus isolation is largely for research purposes (Kosoy OL *et al*; 2008). Saliva or urine samples collected during the first 3 to 5 days after symptom onset, or serum collected in the first 1 to 3 days, are suitable for detection of Zika virus by these methods. Serological tests, including immunofluorescence assays and enzyme-linked immunosorbent assays may indicate the presence of anti-Zika virus IgM and IgG antibodies. Caution should be taken with serological results as IgM cross (Heymann DL *et al*; 2016) .

PREVENTION

The zika virus infection can be prevented by avoiding mosquito bites during the day and early evening. Personal protection measures including wearing light clothing that covers the body. The use of physical barrier such as windows screens and closed doors and windows and can apply insects repellents to the skins or clotting that contains DEET, IR3535 Or Ilcaridin (Mali A *et al*; 2016). Young children and pregnant women should sleep under mosquito net if sleeping during the day or early evening (<https://www.bbc.com/news/world-latin-america-35388842>). Travellers and those living in affected areas should take the same basic precaution to protect themselves from mosquito bites (Musso D, Gubler DJ *et al*; 2015).

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