A brief review on ZIKA virus infection (ZIKV) with additional notes on first record from India

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Abstract

The present review work is an effort to provide enhanced knowledge on ZIKA virus and its new variant of disease epidemics reported from different continents across the World. This review work covers several aspects of ZIKA virus including its history & origin, economic importance, distribution & recent epidemics, modes of ZIKV disease transmission, symptoms & diagnosis, management and prevention. The present work also includes recent case reports of ZIKV occurrence in human along with its first instance from India, confirmed from reports of World Health Organization (WHO). The review work also suggests continuous monitoring of the recent disease cases for improving better insights into the management of this emerging pathogen.

Keyword: ZIKA virus; review; WHO report; first record; India.

1. Introduction

1.1 History and Origin:
Zika virus was isolated for the first time from the serum of a pyrexial rhesus monkey gaoled in the canopy of Zika Forest. The virus was isolated for the second time from a lot of A. africanus again in the same forest. The virus has been named ‘Zika’ after the locality from where it was isolated and discovered [⁴].

1.2 Economic importance:
The ZIKA virus (ZIKV) is related to several other viruses i.e. Yellow fever, Dengue, West Nile, and Japanese encephalitis viruses. ZIKV is an emergent mosquito borne pathogen, a type of flavivirus (family flaviviridae) which caused an outbreak of comparatively mild disease characterized by rash, arthralgia, and conjunctivitis on Yap Island, federated states of Micronesia in the south western Pacific Ocean in the year 2007 [⁹, 12]. It is basically a single stranded RNA virus, of clinical importance and its closest relative is Spondweni virus, the other member of its clade [¹⁴, ¹⁶].

1.3 Distribution and recent epidemics:
The disease of ZIKV is mainly restricted to Africa and South Asia before its epidemic emergence in Pacific region in 2007. So, overall Zika virus is reported to distribute in Africa, South America, South Asia and Pacific region. Phylogenetic analysis showed that Zika virus can be allocated into separate African and Asian lineages; both emerged from East Africa during the late 1800s or early 1900s [⁸]. The Asian lineage originated during its migration from Africa to Southeast Asia, where it was first detected in Malaysia. From there, Zika virus spread to the Pacific Islands, distinctly to Yap and French Polynesia, then gradually to New Caledonia, Cook Islands, Easter Island, and the USA [⁸].
1.4 Transmission
Zika virus, like other flaviviruses, is transmitted by mosquitoes, primarily of the *Aedes* (*Stegomyia*) genus. Besides that several other *Aedes* spp. have been involved in disease transmission, including *Aedes aegypti*, *Aedes africanus*, *Aedes hensilli*, and *Aedes albopictus* [4, 10, 12, 19]. The *Aedes aegypti* mosquito seems to be the major vector in Asia [24] and was suspected as the primary vector for the outbreak in French Polynesia [22]. Zika virus has been identified in wild-caught *Aedes aegypti* mosquitoes, which have shown to be capable of transmitting Zika virus in laboratory experiments [2, 3]. Though *Aedes hensilli* mosquitoes were implicated in the Yap outbreak, Zika virus has never been isolated from these mosquitoes as yet [17, 20]. In Africa, the predominant *Aedes* vector species has not been identified, although viral isolation studies suggested that *Aedes albopictus* was the likely vector in a Zika virus outbreak in Gabon [10].

Mosquito acquisition of the virus likely to occur during a blood meal; after uptake of the virus replicates and probable transmission to a reservoir animal at the next blood meal [13]. Isolation of the virus or of anti-Zika virus antibodies from various nonhuman primates and other wild and domestic animals confirms multiple animal reservoirs [11]. One study evaluated the kinetics of Zika virus infectivity in *Aedes aegypti* mosquitoes by using blood-feeding membranes [2].

Other non-vector modes of Zika virus transmission include perinatal [1], congenital [23] and sexual [7, 21]. Possible transmission by animal bite [18], blood transfusion [20] and lab culture contamination [26] have been studied thoroughly.

1.5 Disease symptoms & diagnosis of ZIKV:
In humans, ZIKV infection is diagnosed by characteristic features such as mild fever (37.8°C–38.5°C); arthritis, notably of small joints of hands and feet; conjunctivitis; headache; myalgia, retro-orbital pain; and cutaneous rash. ZIKV infection is believed to be asymptomatic or mildly symptomatic in maximum cases [5]. Thus, Zika can be misdiagnosed during the acute (viremic) phase because of nonspecific influenza like signs and symptoms. Haemorrhagic signs have not been reported in ZIKV-infected patients [7, 15]. However neurologic problems, including Guillain-Barré syndrome, have been observed [22].

Biological confirmation of ZIKV infections is frequently based on detection of virus RNA in serum by using reverse transcription PCR (RT-PCR). Relatively few laboratories have proper infrastructures to develop IgM against ZIKV for detection by ELISA. In recent past, Gourinat and others, investigated and evaluated the diagnostic utility of urine as a source for detection of ZIKV RNA by real-time RT-PCR [9].

1.6 Management & prevention:
Precise treatment or vaccine is not available for Zika virus infection. Management is helpful and includes antipyretics, analgesics, fluids and rest. Aspirin and other nonsteroidal anti-inflammatory drugs should be eluded until dengue is completely cured because of the jeopardy for haemorrhage among dengue patients. Other general measures focus on prevention of mosquito bites, including individual protection (e.g. bed nets, insect repellents, light-coloured clothing, long pants), particularly during known *Aedes aegypti* peak activity (biting) hours (early morning and late afternoon). Community-level approaches target mosquito breeding through elimination of potential egg-laying sites (e.g. potted plant saucers, used tires, water reservoirs) by drying wet environments or using insecticide treatment. Pregnant women residing in countries that are not endemic to Zika virus, are advised not to travel to affected countries. Men who live in or have travelled to an area of active Zika virus transmission and who have a pregnant partner should abstain from sexual activity [28].
2. Results & Discussion

Zika virus has been avowed a public health emergency. Around 1.3 million people have been affected solely in Brazil, and almost 20 countries or territories have reported local transmission of the virus during 2016 [25]. By virtue of air travel and international trade, further likely to spread into non epidemic regions, and potential transmission risk is possible in locations with competent mosquito vectors.

2.1 Reports on case studies including first instance of ZIKV from India:

However there were three cases of ZIKV so far ensued in India including first record of ZIKV, where a middle aged female, delivered a healthy baby at BJ Medical College (BJMC) in Ahmedabad, Gujarat on November, 2016. By that time, she developed a low grade fever after delivery. A blood sample (serum) from the patient was referred to the Viral Research & Diagnostic Laboratory (VRDL) at the BJMC for dengue test and subsequently found to be positive for Zika virus. The sample was confirmed again as Zika virus positive by RT-PCR and sequencing at NIV, Pune. This is probably the first case report of Zika virus from India.

During the Antenatal clinic (ANC) reconnaissance during second week of January 2017, a total of 111 blood samples were collected at BJMC in Ahmedabad, Gujarat. One sample from a 22-year-old pregnant female has been tested positive for Zika virus disease and thereby reported ZIKV for 2\textsuperscript{nd} time from the country.

During the Acute Febrile Illness (AFI) investigation in second week of February 2017, a total of 93 blood samples were collected at BJMC, Ahmedabad, Gujarat State. One sample from an old male presenting with febrile illness of 8 days’ time period (negative for dengue infection) was found to be positive for Zika virus at BJMC, Ahmedabad. These three cases were confirmed from the reports of WHO.

Nonetheless, further entomological research is needed to delineate the range of Zika virus vectors and to identify new areas where autochthonous transmission could take place to enable early intervention. Investment is also needed in stable control measures such as adaptable vaccine platforms for arboviruses; Zika virus vaccines are not sufficiently advanced for development [6]. Aspects of Zika virus pathogenesis remained ambiguous. Zika virus’s connotation with neurologic sequelae, including probable neuro-pathophysiologic mechanisms, is being studied comprehensively. Continuous knowledge on epidemiology, in connection with animal models, will offer better insight, which could spur novel disease prevention strategies [6]. Zika virus has the susceptibility to infect large numbers of people with severe consequences in some case studies.

3. Conclusion

The epidemic has serious therapeutic and economic corollaries, particularly in countries where the resources for early diagnosis are lacking and potential intervention measures are discouraged or illegal [25]. However continuous vigilance is coveted, along with a rigorous effort toward refining our understanding, management, and prevention of this emerging pathogen.

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5. References


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