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Short Communication

Microbiology Section

Zika Virus: An Emergence of a New Arbovirus

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ABSTRACT

The world is facing a new pandemic in progress due to a mosquito-borne flavivirus popularly known as Zika virus. The emergence of this new virus is really alarming with the sudden increment in the cases of microcephaly reported from Brazil. The findings attributing the involvement of Zika virus as the reason for congenital deformations in the babies born in afflicted areas have really shocked the world. The present knowledge about this virus is very limited and in the absence of further studies the precautions seems to be the best way of protection from this virus. The present article is a short review about this new virus.

Keywords: Aedes, Flavivirus, French polynesia, Serum, Yap

INTRODUCTION

The flaviviruses are among the most important emerging viruses known to man [1]. Most are arboviruses being transmitted by mosquitoes or ticks [1]. The current pandemic of Zika Virus (ZIKV) is one of the most recent outbreak of four important arthropod-borne viral diseases in the Western Hemisphere [2]. The recent outbreak of ZIKV follows Dengue; West Nile virus, and Chikungunya, which emerged in 1990's, 1999 and 2013 respectively [2].

Aetiology and Epidemiology

ZIKV is a mosquito-borne flavivirus and is related to yellow fever virus, dengue virus, and West Nile virus [3,4]. ZIKV is a single-stranded positive RNA virus and is transmitted by many Aedes species mosquitoes, like Ae. africanus, Ae. luteocephalus, Ae. *hensilli, and Ae.aegypti* [5-9]. ZIKV is closely related to the Spondweni virus and was discovered incidentally first in rhesus monkeys during sylvatic yellow fever surveillance in the Zika Forest near Kampala, Uganda in 1947 and was reported in humans in 1952 [2,5]. However, in the year 1964, first well-documented report of human ZIKV disease was published [10].

The virus was more of an obscure virus and was confined to a narrow equatorial zone running across Africa and into Asia [2]. In the year 2007 from Yap Island, Federated States of Micronesia an outbreak of ZIKV was reported [11]. Followed by a major epidemic in the French Polynesia in 2013–2014 [12], and New Caledonia in 2014 from the imported cases from French Polynesia in 2013 [13]. ZIKV has also been isolated in several African countries (Uganda, Egypt, Tanzania, Central African Republic, Sierra Leone, and Gabon), Asian countries (India, Malaysia, Thailand, Indonesia, the Philippines, and Vietnam), South America, Central America and the Caribbean islands [2,3,14-26]. The commonest cause that has been found in the detection of these cases is the travel to a ZIKV infected country. Travelers to these countries are found to be affected with ZIKV. The reports from various parts of the developed world are also available where cases of ZIKV have also been confirmed [3,27].

Clinical Features

ZIKV is characterized as a mild or inapparent self-limiting dengue like disease with low-grade fever, muscle aches, conjunctivitis with eye pain, prostration, and maculopapular rash [15]. However, cases of Guillain–Barré syndrome and other neurologic conditions in affected population are also available in literature [2]. In studies on mice, ZIKV is found to be highly neurotropic; the virus was not isolated from tissues other than the brain, and the pathology showed cellular infiltration, neuronal degeneration, and softening in the brain in infected, young mice [15]. Thus, some public health officials believe that the explosive Brazilian epidemic of microcephaly and other congenital malformations, manifested by a many fold increase in incidence from 2014 to 2015 is caused by ZIKV [2]. ZIKV RNA in the amniotic fluid of afflicted newborns has been reported thus, giving a clear indication that the ZIKV could well be the culprit [28]. So far, no other flavivirus is known to have teratogenic effects, and thus in the absence of detailed studies finding correlation between the two, it is very difficult to make ZIKV responsible for it. But, in the absence of any clear causal relationship, a number of afflicted countries are advocating that the pregnant women should take proper precautions to shun away from mosquito bites and even to consider for postponement of pregnancy [2,29]. The virus has also found to cause ankle edema, axillary and/or inguinal lymphadenopathy, leukopenia with monocytosis and thrombocytopenia as reported from cases of ZIKV in travelers from Italy [15,30]. Besides, symptoms like high-grade fever, malaise, chills, anorexia, diarrhea, vomiting, leg pain, stomach aches, dizziness, lymphadenopathy and, hypotension have been reported from the studies from Indonesia [15,20].

Diagnosis

Fauci 2016, reported that the diagnosis is mainly by clinical examination, but that is applicable only in purely ZIKV epidemic areas [2]. The same is not true in the presence of other conditions like Chikungunya or Dengue, which result in identical clinical presentation and confounds clinical diagnoses due to the cross-reactivity of diagnostic flavivirus antibody assays [2]. The differential diagnosis should include the flaviviruses like Dengue, Chikungunya and ZIKV and the gene-detection tests like the Polymerase Chain Reaction (PCR) assay can reliably distinguish the three viruses, but ZIKV-specific tests are not yet widely available [2]. The diagnostic tests for ZIKV infection include PCR tests which detect viral RNA on acute-phase serum samples, and certain other tests to detect specific antibody against ZIKV in serum [3]. So far, no specific commercial tests for ZIKV has been developed, although reports of development of an ELISA to detect immunoglobulin (Ig) M to ZIKV are available in literature [2,3]. Mostly the diagnosis of flavivirus infections should involve two samples first an acute-phase serum sample obtained as early as possible and a second

sample collected two to three weeks after the first [3]. The data on presence of ZIKV in non-primates, is not available except in one study on rodents [3,31]. As per the recent reports infectious ZIKV has been detected in human blood samples as early as the onset of illness and the viral RNA has been found as late as 11 days after the onset of illness [3,14,32].

Transmission and Management

Since the disease is mostly self-limiting the management is by bed rest and supportive care [2]. There is no clinical vaccine or antiviral therapy available presently for ZIKV [2,33]. Increased fluid intake and the use of Acetaminophen for fever is recommended [34,35]. The other nonsteroidal anti-inflammatory drugs including, Aspirin are not typically used in pregnancy and these medications should specifically be avoided in suspected ZIKV infection until Dengue can be ruled out so as to reduce the chances of hemorrhage [28,34,36,37]. Besides, in the absence of clear treatment options of ZIKV only preventive measures seems to be the best way to prevent this virus. Strategies for the prevention and control of ZIKV disease should include the use of mosquito repellent and mosquito vector eradication, as mentioned elsewhere [38].

The ZIKV is transmitted mainly by the infected mosquitoes [5-9]. However, the cases of transmission by blood transfusion was reported [15,39]. Also, the isolation of ZIKV from three percent (%) of blood donors in French Polynesia had already raised the alarms for this form of transmission [15,40]. Furthermore, ZIKV was isolated from semen in a patient from French Polynesia, and thus a non-vector borne, most likely sexual, transmission was observed in USA [41,42]. The transmission through urine or through maternal-fetal blood is also available in the literature [41]. The role of thorough history taking in the pregnant females, including the history of travel to countries where the ZIKV epidemic is present would help in early diagnosis and management. In cases with the travel to such countries the CDC Interim Guidance should be used for evaluation [34]. Besides, in symptomatic cases with suspected ZIKV the role of amniocentesis and subsequent RT-PCR of the amniotic fluid to identify the ZIKV is recommended in pregnancies of ≥15 weeks of gestation since if done in early part of gestation, it could lead to complications [34]. The CDC also recommends that in a live birth with evidence of maternal or fetal ZIKV infection, the histopathological examination of the placenta and umbilical cord; testing of frozen placental and umbilical cord tissue for ZIKV RNA; and the testing of cord serum for ZIKV and Dengue virus IgM and neutralizing antibodies [34]. In cases with laboratory evidence of ZIKV in serum or amniotic fluid, serial ultrasounds should be done to monitor the anatomy of the fetus and growth every three to four weeks [34]. Also, all such cases should be referred to a maternal-fetal medicine or infectious disease specialist for the pregnancy management [34]. The CDC is currently developing the guidelines for the infants infected by ZIKV [34].

The U.S. Centers for Disease Control and Prevention alerts that as the Aedes mosquitoes carry the virus live around the world, the virus will probably spread to previously unaffected areas [43,44]. Also, the latest update, as on 28 November 2015 from the Ministry of Health Brazil has confirmed that there is a relationship between the virus and the occurrence of microcephaly and is based on the presence of ZIKV in samples of blood and tissue of the baby born with microcephaly and other congenital malformations [44]. Besides, the initial analysis has revealed that the risk is much higher in the first three months of pregnancy [44]. The ZIKV has been reported from India in the past in a study conducted in the year 1952-53 in six states where the neutralizing antibodies in the sera to certain viruses including ZIKV was found in the Indians [45,46]. This detection could well be due to cross reactivity among different flavivirus antibody assays. But since then there is no reported case of ZIKV from India, yet the Asian countries like India, Pakistan, Bangladesh, etc. are always at the risk due to the presence of ideal breeding conditions to the mosquito vector transmitting the ZIKV [46]. In these countries where the per capita income is low and only a fraction of the annual budget goes to health, there are already multiple public health issues and in such a situation the new emergence of ZIKV would only add to the sufferings [47-49]. Also, the latest updates about the ZIKV spread are coming from all over the globe and are alarming [50]. In the absence of clearer picture about the new viral infection, the role of proper dissemination of healthcare information to the lay public is very important and all the stakeholders like the governments, health care providers and NGO's like HIFA 2015, etc. should play an active and an important role [51-56].

CONCLUSION

The newest pandemic of ZIKV is alarming. Although, with the paucity of literature the exact details of the disease are not clear, but its rapid spread and mutations in the viral RNA could become a problem in future. The current situation of vaccines against the flavivirus is not encouraging and in such a situation the emergence of a new virus is really grave. Until a vaccine or a drug against this virus is developed the precautionary measures, including community-level mosquito surveillance and preventive or control measures are the best way of protection. Furthermore, thorough investigative research, both in human and animal models is also the need of the hour.

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