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TRANSMISSION OF ZIKA VIRUS FROM INFECTED MOTHER TO FETUS

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ABSTRACT

Zika virus (ZIKV) is a mosquito borne flavivirus that has become threatens to public health infecting both adults' and new-borns. It was characterized by maculopapular rash, fever, non-purulent conjunctivitis and arthralgia. In infants and children, this virus also causes malformation along with microcephaly which can be diagnosed through ultrasound. ZIKV infection and microcephaly related to the epidemics and possible mechanisms of flavivirus.

KEYWORDS: Zika Virus (ZIKV), Pregnancy, Flavivirus, Microcephaly.

INTRODUCTION

Zika virus (ZIKV) is a mosquito borne flavivirus, it was first isolated in 1947 from febrile sentinel rhesus monkey in Zika forest of Uganda. It was also identified in Aedesafricanus, aedesluteocephalus and aedesaegypti mosquitoes from the same forest.[1,2] Flavivirus of Zika are related with yellow fever, dengue, West Nile and Japanese encephalitis. Symptoms of ZIKV rash, conjunctivitis, mild fever, nausea or vomiting, lymphadenopathy, and arthritis.[3,4] Infected ZIKV can be detected by using IgM antibodies. They can modify geographically in terms of population and climate dynamics are major concern for health aspects throughout the world.[6] Outbreak of ZIKVbecame major concern due to hurried dissemination mostly in Africa and Asian countries.

GENOMIC CONFIGURATION OF ZIKV

Flavivirus genomes are single-stranded RNA molecule of positivepolarity also include[5], structure. The encoding sequences of prototype strain of ZIKV MR766, which can be isolated by intra-cerebral inoculation of febrile monkey.[7,8] ZIKV genome has shown10794 nucleotides in length. This genome encodes poly-protein of concerning 3419 amino acids that contains single open reading frame (ORF) located at 5′ and 3′ ends of the genome with prototype ZIKV MR766 are of 106 and 428 nucleotides in length.[9] This nucleosides shows the sequence of CAU, GGA, and UGA are preferred with codons ACG, UCG and UUA are amongst the rare codons present in NC_012532.1 strain of ZIKV.[10]

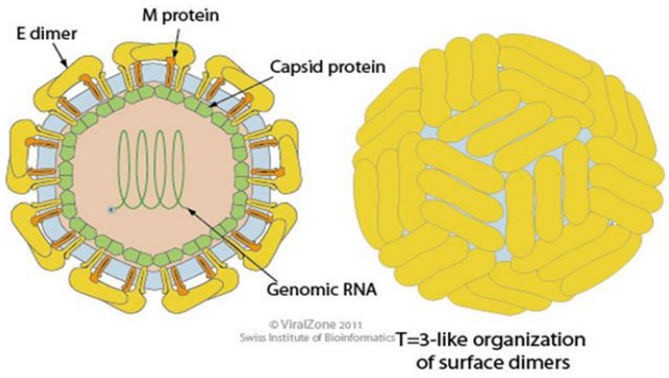

Figure 1: Zika Virus mechanism (4)

EPIDEMIOLOGY INCIDENCE of ZIKV

The first evidence of human infected with ZIKV in 1952 reported by several countries of Africa and Asia. In 1954, a case of 0.5% positive Zika antibodies observed in French Equatorial Africa.In Nigeria 1971–1975, febrile patient 3.1% affect by ZIKV.[11] Epidemic outbreak of ZIKV seen in 2007 in Micronesia and the 2012-2013 it reported in French Polynesia, apart from French it also reported in Germany, Canada, Italy, Japan, the United States, and Australia. For the first time on 29th April 2015, this virus was detected in Brazil and Latin America. The presence of ZIKV in amniotic fluid of pregnant women has been confirmed in the state of Paraiba by Fiocruz.[12] Gratitude of ZIKV infection produces mild and febrile illness, similarity cases seen in Guillain–Barré syndrome.[13] ZIKV can transmit by aedes mosquitoes, with competence of aedesaegyptiin which transmission occur outside African countries and aedesalbopictus species spread largely in southern Europe continent. ZIKV can also affects during blood transfusion mediated, perinatal and possible sexual transmission.[14] The epidemiological surveillance of ZIKV is pointed out as vector-borne

diseases, such as dengue and chikungunya that complies with obligatory trails across the country.[15]

ZIKA VIRUS TRANSMISSION

ZIKV is mainly transmitted by bite of female aedesaegypti mosquito, sexual transmission through human semen, blood transfusion, through placenta by vertical transmission, in pregnant women are suitable to ZIKV infection and congenital anomalies occurs in foetus through trans-placental transmission.[16,17] ZIKV are present in body fluids, which involve in female genital tract of during course of sexual transmission. It can be transmit from male to female after vaginal intercourse that prior clinical illness in man. Vaginal fluids and mucous found to be positive for RNA Zika virus through PT-PCR.[18]

Infected Zika arise in maternal-fatal of infected pregnant women occurs throughout pregnancy. Microcephaly of ZIKV has been already detected in amniotic fluid of mother that observed to viral antigen and RNA isolated in placenta and brain tissues that died soon after birth of tissue miscarriages.[19] ZIKV is a perinatal transmission virus which transpires from mother to infant pairs of infection in perinatal period that conforms within four days of delivery date. Asymptomatic infants are isolated diffuse rash.[20] This ZIKV show similarity between dengue and chickengunya by potential infection, this aedes mosquito can be controlled by removal of water, covering water storage container, chemical control and bio-insecticides.[21]

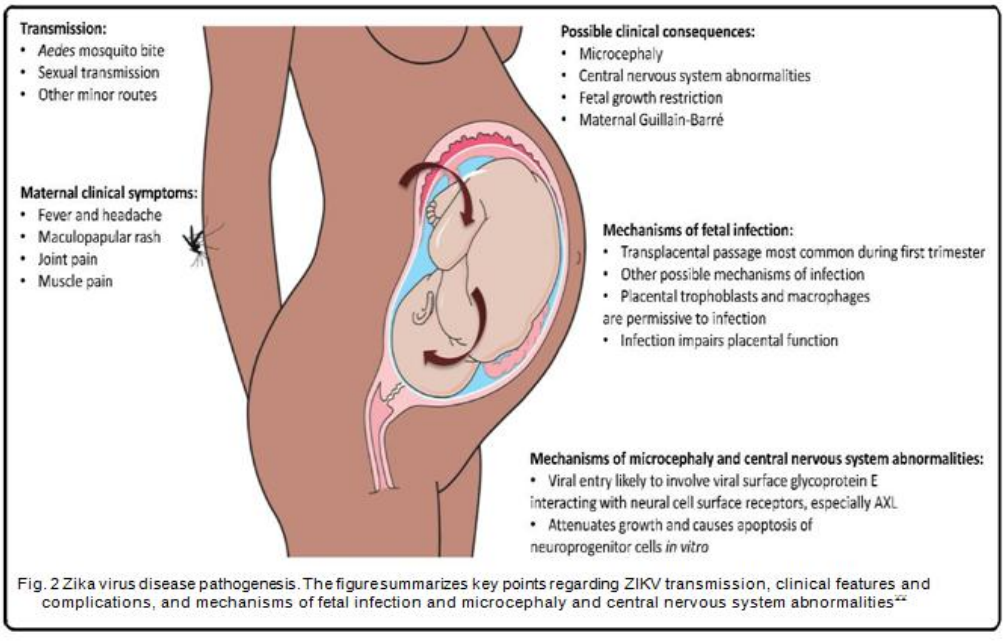

Fig. 2 Zika virus disease pathogenesis. The figure summarizes key points regarding ZIKV transmission, clinical features and complications, and mechanisms of fetal infection and microcephaly and central nervous system abnormalities[22]

CLINICAL MANIFESTATION

Zika Virus is pathogenesis of mosquito-borne flavivirus that can replicate through dendritic cells, they spread through lymph nodes and then to bloodstream. Zika virus infection manifested through fever, malaise, conjunctivitis and joint pains. Infection with this virus begins mild headache followed by maculopapular rash. Few certain demonstrations followed by Zika virus that include diarrhoea, constipation, abdominal pain, anorexia, dizziness and conjunctivitis.[2,23] Frequently these infections emerged 2-7 days after bitten by an infected mosquito, microcephaly in foetuses have spot in pregnant women with the help of amniotic fluid. Erratic increased cases of Guillain Barre Syndrome are affects with zika virus which affect to neurological activity.[24,25] These viruses indicate through invasive neurological infection due to Japanese encephalitis virus and encephalitis or meningitis due to West Nile virus and chikungunya virus. They have ability to produce defect in neurons and can still unclear if effects occur on central nervous system.[26] Around 80% of infection occurs due to asymptomatic, 2-14 days of incubation time taken after a bite by zika infected mosquito. This zika infection can distinguish into two types namely Zika fever and congenital infection; it includes renowned edema of extremities, less severe headache and milder thrombocytopenia.[27]

MANAGEMENT AND PREVENTATION

Zika virus vaccine Target product profile (TPP) is now available. TPP was published in 2017 by WHO. Prevention of ZIKV infection, avoid mosquito bites at the time of early morning and late afternoon, elimination of mosquito breeding of egg-laying sites by dry wet environment.[1] This flavivirus are inactivated at 56^0C for at least 30 minutes, UV light and gamma radiation, they can susceptible to disinfectants such as 1% sodium hypochlorite, 2% glutaraldehyde, 70% ethanol, 3%–6% hydrogen peroxide and 3%–8% formaldehyde. Pre-donation screening has been made whether the donor travelled from affected place from last 14 days.[27] Reduction of unprotected sexual intercourse and controlled mosquito vector, pregnant women should avoid unnecessary travel to area ongoing Zika virus transmission, mosquito repellent, permethrin treatment for clothing, window screens and air conditioning.[2] Men with partners who are pregnant should withdraw from sexual activity or use condoms during sexual intercourse for at least 2 months from area of known zika transmission.[23]

Table 1: Zika Virus infection and mode of transmission in country during 1947-2015.

Reference	Year	country affects with ZIKV	Infection of ZIKV with widespread
Dick et al[28]	1947	Uganda (Zika forest)	First ZIKV noted on rhesus monkey
Smithburn[29]	1948	Uganda (Zika forest)	Neutralizing antibody against patient sera
MacNamara[30]	1951	Nigeria	Evaluated offspring affected through ZIKV
Smithburn[29]	1952	Uganda	Initial virus present in human anti-sera
Smithburn[29]	1952	India	Evidence of ZIKV in human antibodies
Hammonet al[31]	1953	Philippines	ZIKV antibodies found in blood strain
Smithburnet al[31]	1954	Egypt	Deactivated antibodies originated from adulthood
MacNamara[33]	1955	Nigeria	Diagnosed zika in blood sample
Brès[34]	1957	Mozambique	Originated virus from infants and adulthood sera
Weinbren&Williams[35]	1958	Uganda (Zika forest)	Initiated ZIKV seen inA.africanus
Kokernotet al[36]	1960	Angola	Serological survey of virus from indigenous inhabitant
Chippaux-Hyppolite[37]	1961-62	African Republic	Antibodies are originate from blood
Sériéet al[38]	1961-1964	Ethiopia	Derive zika antibodies noted in human blood
Robinet al[39]	1965	Côte d'Ivoire	Generate human blood found zika antibodies
Brès[34]	1966	Togo	Blood strain found zika antibodies in human
Brès[34]	1967	Mali	Blood strain initiatezika through antibodies
Henderson[40]	1969	Uganda	ZIKV originate from antibodies from infants & adults
Gonzaleset al[41]	1979	African Republic	Pygmy and non-pygmypopulation seen Zika antibodies
Monlun et al[42]	1988,1999	Senegal	Breed of zika in human antibodies
Wolfeet al[43]	1997	Malaysia	Arise of virus in blood strain
Akoua-Koffiet al[44]	1999	Côte d'Ivoire	Antibodies occurs in human blood
Filipeet al[45]	2007	Pacific island of Yap	Outbreak of virus in human
Foyet al[46]	2008	Senegal	Transmission through sexual activity
Heanget al[47]	2010-2015	Cambodia	Scattered reports detected by voyager

DISCUSSION

Zika virus affect 1.3 millions of people around 20 countries, these virus are not endemic and proficient with vectors. ZIKV correlate with neurological, neuropath physiological mechanism and infected through gestational. Endemic features of Zika can imply during transfusion- transmitted virus, medical grave, decent and economic implication, deficient and potential intervention measures are unenthusiastic.[48] Generous numbers of infants are affected microcephaly with undesirable pregnancy, prevalence difficulties shown burden illness from Guillain-Barre syndrome. Emerging mechanism of aedesaegypti acts primary vector under globalization and urbanization. Viral mutation leads to epidemic spread of Zika and outbreak adverse during pregnancy that may develop less immune response.[13] ZIKV detected in semen by sexual course transmission that infect high and endure over 8-10 weeks of past symptoms and poor pregnancy has concluded.[49]

During pregnancy fetal ultrasound shows deformity which includes microcephaly, dislocated development of brain, intracranial calcifications, conjunctivitis, growth restriction, limb abnormalities and sever arthrogryposis in extremities.[50] The risk factors of microcephaly are observed in first trimester and consequent risk of 1% to 13% of maternal uniform distribution.[51] Consequently infected ZIKV in foetus injure cells in central nervous system from maternal blood to foetus.[6] Control of aedesaegypti mosquitoes infected women have to manage pregnancy for long or short period of time. If women infect with ZIKV requiring high risk has to delay for long term pregnancy.

CONCLUSION

Infection of ZIKV affect during congenital abnormalities and pregnancy. This study reveals that aedes mosquito can defect neurological and neuropatho-physiological condition that arise in foetus during the period of pregnancy. This ZIKV can also affect through transfusion blood, unprotected sexual intercourse and in placenta. The abnormalities link with microcephaly and flaw nervous system on the foetus among pregnant mothers.

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