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THE ZIKA VIRUS - A WHOLE NEW GLOBAL HEALTH THREAT

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Abstract: - In 1947, the Zika disease was recognized to be transmitted by mosquitoes in Uganda. Although sexual contact, blood transfusions, and transmission from mother to fetus during pregnancy are the three main ways HIV is transmitted, Aedes mosquitos are the primary vectors. Among the Zika virus's warning signs and Complications include pyrexia, a rash, & pain in the joints. When the virus affects pregnant women, significant birth defects including microcephaly can develop. The Zika virus, for which no cure or vaccine is available, can be avoided by avoiding mosquito bites and practicing safe sex. In adults, children, and fetuses, the non-vector-borne Zika virus is known to cause serious neurological problems. There are, however, virus-specific therapeutic targets that could result in the creation of brand-new anti-ZIKV medications. Even though the most of them being linked in connection to the virus known as Zika victims exhibit minimal to no symptoms, there is a chance of more severe conditions like Guillain-Barre syndrome and congenital birth problems like microcephaly. Guidelines for safe sex have also been developed, especially for women who are or may become pregnant, in view of the potential for sexual transmission of the Zika virus. For the most recent Zika virus epidemics, we looked at the epidemiological backdrop, the mechanisms of transmission, the clinical signs, and the diagnostic and preventative measures in this study. It is essential to continue funding research and development in order to decrease the detrimental consequences of newly developing infectious diseases on public health.

Keywords: - Zika Virus, Yellow fever, mosquito-borne virus, Microcephaly

I. Introduction

In 2016, the World Health Organization (WHO) designated Zika virus (ZIKV) infection as a global public health emergency[1]. This is relevant because unwell pregnant women are more likely to develop Guillain-Barré syndrome and microcephaly. The Zika virus is a pathogen component that contains encapsulated single-stranded RNA. The Zika virus infection is caused by a virus carried primarily by Aedes mosquitos[2].ZIKV was discovered in a rhesus monkey in Uganda's Zika woods during a sylvatic yellow fever test in 1947. Two years after the initial human infection was recorded in Uganda and Tanzania in 1952, the virus was found in an eastern Nigerian newborn during a jaundice outbreak[3].

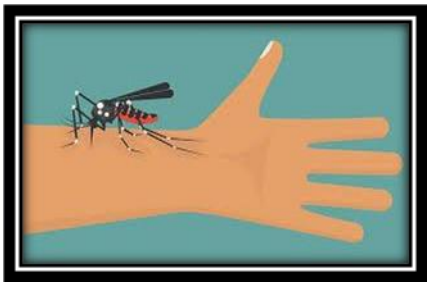

fig 01 aedes mosquitos

The virus that causes Zika disease (ZIKV) is a mosquito-borne sickness a Flavivirus genus and family Flaviviridae positive-stranded RNA virus with a small capsule. Mosquitoes are ZIKV flavivirus vectors[4].Women who are currently pregnant are especially susceptible towards viral infections during the first and second trimesters of pregnancy, when the possibility of hereditary abnormalities in the fetus is greatest. ZIKV infections can cause spontaneous intrauterine development exception, pregnancy termination, and microcephaly in developing children because they can contamination of cells within the placenta brain precursors[5].

II. History

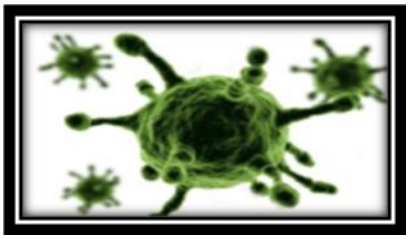

fig 02 **:-** image of virus

The Rockefeller Foundation funded yellow fever research that led to the discovery of ZIKV and numerous other arboviruses between 1914 and 1970. The Organization for Yellow Fever Investigation in Entebbe, Uganda, found ten viruses over a ten-year period (1937-1947), including seven unique viruses: WNV and Bwamba virus in 1937, Semliki Forest virus in 1942, and Bunyamwera virus in 1943[6]. Two amidst a variety of different species of mosquito from which ZIKV was found over the whole continents of Asia and Africa were Aedesafricanus, a mosquito that inhabits trees, and Aedesaegypti, a mosquito with a wide distribution in the tropics and subtropics, respectively[7].

III Name of Zika Protein

Different zika virus protein types and an explanation of each one's function are shown in the table 1

table 01: proteins and functions

Proteins	Functions
C	Production of nucleocapsid
prM	Protects E during assembly
E	Membrane fusion plus coupling
NS1	Viral particle complex expansion as well as management of responses from the immune system
NS2A	Viral replication and cased assembly
NS2B	NS3 cofactor
NS3	RNA helices and serine protease NTPase
NS4A	Viral membrane formation
NS4B	Antiviral in nature condition is hindered.
NS5	RNA polymerase is an enzyme which must rely on RNA

III. Virus Structure[8]

fig 03:- structure of virus

The positive-stranded RNA genome of a flavivirus contains a solitary picture for concurrent browsing and two structured untranslated regions (UTRs). The zika virus contains an electron-dense core that is 30 nm in diameter and a spherical envelope that is 50 nm in size. It has a single polyprotein proteome that has been cleaved into 11 mature proteins, namely the E, M, and C proteins, and a 10.8 kb positive-sense, single-stranded RNA genome.

1. Mature Zika Virus [9]

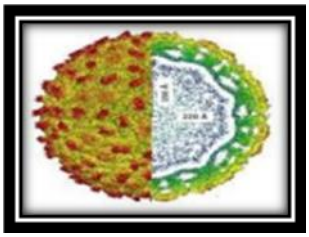

fig 04:- mature virus

On its smooth, icosahedral surface, the adult ZIKV has 180 copies pertaining regarding the E proteins and 180 copies of the M protein. Two teams used cryo-EM to compute the near-atomic structure of ZIKV at resolutions of 3.8 and 3.7, respectively, and it had been shown to have been compatible with other flavivirus structures. The mature 50 nm ZIKV virus molecule comprises upon there are approximately 180 copies in all proteins E and M, which are found in infected packaging. The chemical configurations of proteins E and M shown were derived using previously available cryo-EM structures

IV. Transmission[10]

The best times to get bitten are typically early in the morning and late in the day/evening. In addition, yellow fever, chikungunya, and dengue are all spread by the same bug.[8].

A. The Dengue virus Reproductive Reproduction

Contagious illness known as Zika potentially be spread through sexual activity. Infection through the virus known as the Zika virus was confirmed and been associated to poor fetal and pregnancy outcomes, which is concerning[9].Because transmission is based on instances, the original report indicated that there may have been a sexual transmission just a few days in the past, from a man to another womanto the initial episode of manifestations in the male. In the second report, a ZIKV isolate that was infectious was found in semen at least two weeks and maybe as long as ten weeks earlier the grievances commenced arriving in. It's significant to note that the blood that was collected simultaneously with the semen collection was tested by RT-PCR for ZIKV and confirmed to be negative, proving that transmission by semen is still possible even particularly in a state of presence of negative blood testing. The third report discusses a sexual transmission incident that took place in Dallas, Texas[10].

B. Blood Transfusion[10]

Females who are nursing or have recently given birth are especially vulnerable to transmission. It is critical to comprehend the dangers that can arise as a result of a widespread outbreak of diseases transmitted via blood transfusions. Additionally, there have been some accusations consequences due to the viral infection Zika spreading through platelet donations in Brazil[10].The following viral illnesses are on the list of those that can be spread via transfusions:

- Chikungunya disease.
- The hepatitis A virus.
- The hepatitis B virus.
- The hepatitis C virus
- HIV stands for human immunodeficiency virus[11]

V. Life cycle [12, 13]

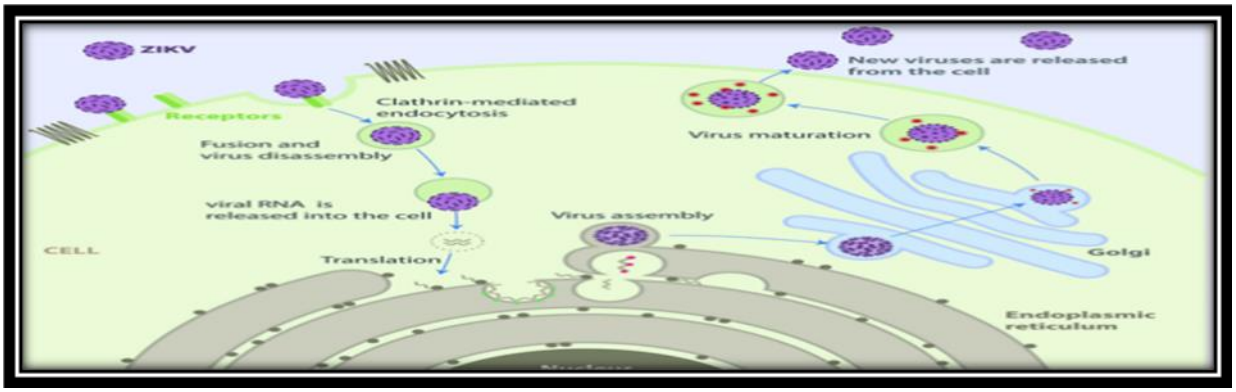

fig 05:- life cycle of virus

The developmental cycle that produces an infectious agent ZIKV, like that of other flaviviruses, can be loosely divided into binding, entry, translating, replicating, generating, and transferring stages. Following their release from the nucleocapsid has the power of enter the cytoplasm. From the viral positive-strand genomic RNA template, RdRp creates negative-strand genomic RNA. The host machinery then converts these mRNAs into viral polyproteins. Recent positive RNA can be employed to perform additional translational and replicational tasks. The endoplasmic reticulum is a cell component that governs cell development prior to budding and translocation towards the apparatus of Golgi for the production of embryonic infectious agents. After around 4 days, it develops into a pupa, the above shows up to have become a caterpillar's cocoon. The mosquito a pupa matures into a mature individual and leaves after two days. It can be completed in 8 days, but it may take the entire lifetime of 3 weeks. Some antiviral medications have particular sites of action or healing, as illustrated in the following table:

table no 02: antiviral with their drug targeting

Antiviral	Drug targeting
Duramycin, Nanchangmycin	Entry
Emetine, lycorine, fidaxomycin	Transcription/Translation
Ribavirin, sofosbuvir, cinidipine	Replication
Cavinafungin	Endoplasmic Reticulum

VII. ZIKV-Associated Neurological Disorder

a. Microcephaly [14]

It is an uncommon neurological condition characterized by undeveloped brains in neonates. Microcephaly infants have smaller skulls than healthy neonate's approximately comparable ages as well as gender[15].

fig 06:- microcephaly in infants

b. Guillain-Barré Syndrome[13, 14]

It is a severe disorder caused by immunological polyneuropathy, which mostly affects peripheral nerves and typically occurs following an infection. Previous research has linked other arboviruses, both dengue fever along with chikungunya, to a significant increase in the overall prevalence of GBS. A new CDC study discovered a significant the relationship among GBS along with Zika.

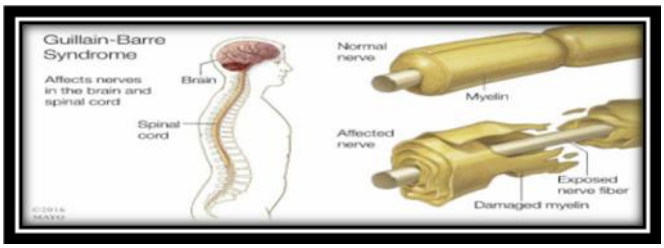

fig 07**:-** syndrome affecting peripheral nerves

c.Myelitis[13]

An additional indication of myelitis is diffuse lesions of different sizes that might affect any area of the spinal cord. The spinal cord may swell as an outcome of edema. The transverse plegia is a disorder that develops when bacteria, viruses, or fungi infecting the vertebral column...

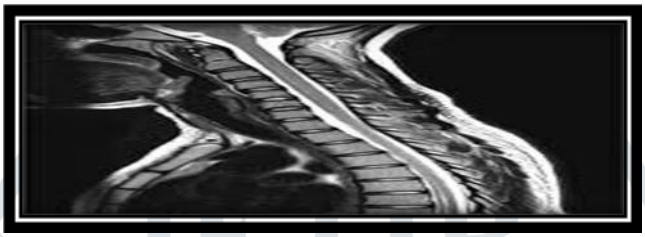

fig 08:- myelitis affecting spinal cord

d.Meningoencephalitis[15]

While Treatments involving the Western Nile the virus associated Japanese encephalitis symptoms are well-known and frequently seen, other flaviviruses, encompass ZIKV can occasionally have detrimental effects. In individuals with meningoencephalitis, convulsions, localized impairments, and progressive somnolence are frequent. The illness occasionally leads to a severe coma or brain death.

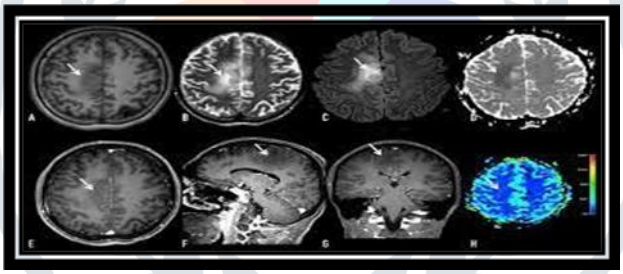

fig 09:- meningoencephalitis cause brain death

VIII. Clinical manifestation

About three as well as seven consecutive days of a mosquito bite, the most prevalent characteristics as well as evidence for ZIKV infection were fever (72%), arthralgia and myalgia (65%), conjunctivitis (63%), headache (46%), lethargy, and/or rash. ZIKV takes anywhere from three to twelve consecutive days to incubate and, most of the time, has little effect on serious illness in humansirrespective of what happened as the overwhelming majority of individuals in sufferers have symptom alleviation within 2-7 dayst[15, 16]. Microcephaly and other types of brain abnormalities are among the unfavorable impacts consequence of the virus known as Zika in pregnant women.[17].Many asymptomatic people are still being affected the mosquito-borne the disease known as Zika is on its way to us blame. The overwhelming majority of common clinical indicators include a rapidly rising temperature, as well as severe maculopapular irritation, arthritic stiffness.

IX. Pathogenesis

The virus known as the Zika virus which is most frequently spreads via the sylvatic transmission cycle. The virus known comparable to that of the virus responsible for Zika (ZIKV) transmits from one vertebrate to another during its reproductive cycle via mosquito bites. Antiviral medications that stop the ZIKV replication cycle as well as virus entrance. [18]. Recent research on animals with immunological issues demonstrated the vertical transmission method developed by ZIKV and its effect on fetal brain development. [19].

X. Zika Infection in Pregnancy[20]

a. Symptoms

Pregnant women contaminated through the virus called Zika experience symptoms that are arthralgia, conjunctivitis, pruritic rash, and low-grade fever are mostnoticeable.

b. Pregnancy Complications

In different populations of pregnant ZIKV-infected female mothers, birth abnormalities and the baby's intrauterine growth death or IUFD have been documented in greater numbers. Notwithstanding having proven imaging-detectable fetal brain abnormalities, approximately twenty percent of ZIKV-infected neonates were demonstrated to have challenges with fetal development and placental-related dysfunctions.

c. **Management of Pregnant Women**[21]

The mosquito-borne Zika virus is contagious detected through RT-PCR on serum within the beginning weekend of first symptoms of clinical the condition. The genetic material due to the infectious agent causes Zika potentially also be found in urination to feed no fewer than a two-week period afterwards indications have started to surface. If samples received less than 7 days resulting from the change in the pattern of warning signs are used, urine research ought to have undertaken accordingly in addition to serum testing.

XI. Diagnosis

a. Direct viral diagnosis[22]

The main technique used to recognize ZIKV infection is RT-PCR. The viral period is supposed to have been short because the infectious agent is quite dangerous. spotted in blood from day 0-4complying with a sensation of uneasiness. The duration of existence expected to detect viral RNA in the blood varies depending on the viral load during the most serious phase of the disease the illness because viremia lessens over time. It is also conceivable to inspect additional specimens from various periods for the Zika virus[12]. ZIKV infection is currently diagnosed using PCR is the acronym for the polymerase chain of reverse transcription reaction. A Dengue outbreak is being actively researched probable assuming hemoglobin exclusively contained Zika-specific autoantibodies without any additional confirmation examination indicating the occurrence of other distinguishing characteristics characteristics[22].A Zika condition will be considered reasonable when just Virus-specific antibodies have been discovered in serum with no further verification check for the reason of holding existed of other identifying components factors[22].

b. Serological diagnosis[23]

Between days 4 -5complying with the beginning of indications, serologic testing reveals ZIKV IgM antibodies. It takes approximately the ages of two and three months for flavivirus-specific IgM antibodies to become undetectable. Dengue (confirmed) and chikungunya (possible) co-infections could represent the foundation underlying challenging diagnosis[12].Isolation of blood viruses on top of PCR are used to diagnose zika virus. The infectious agent is capable of communicating with other flaviviruses like Yellow fever, the dengue fever, and this includes the Western Nile virus is apparent oars well as others and are all brought about by viruses., making serological diagnosis challenging (WHO)[23].

XII. Treatment

Unfortunately, additionally, there are currently zero FDA-approved pharmaceuticals. Or prevention strategies for ZIKV. Acetaminophen is advised as a being a component of what is encouraging Zika fever medicine regimen for fever, headaches, and myalgia. Due to the elevated risk of Reye's syndrome in they're both kids aged the potential danger of clotting in people with thrombocytopenia, aspirin should be avoided. Regardless of the actuality that here are many ZIKV vaccines under growth and development, none has yet to receive an official utilization authorization[24].It has become essential that exercise prudence while using antipyretics and analgesics to prevent adverse effects such nephropathy, allergies etc. To reduce bleeding problems in those who have been misdiagnosed with ZIKV infection, aspirin treatment should be avoided because clinical diagnosis and serological analysis can be unreliable[25]. According to the likelihood of bleeding, nonsteroidal anti-inflammatory medical products shouldn't be discontinued unless infections considering a virus called dengue has been identified eradicated have been ruled out. Pregnant women who reside in Zika transmission areas or who demonstrate the warning signs and appearances of illness of a viral infection should visit a healthcare professional for clinical treatment[26].

XIII. Some Herbal remedies Used in Medication connected to the virus called Zika Disease complications

1. Ocimum basilicum

fig 10:- ocimum basilicum

Using naturally occurring chemicals derived from plants as larvicides has the benefit of not harming the environment or non-target animals. Plant-derived chemicals have been predicted to be utilized as weapons in upcoming attempts to lower mosquito populations since they possessing an innate capacity to serve as general toxicants, growth and reproduction inhibitors, repellents, and oviposition-deterrents. Headaches, migraines, menstrual cramps, fevers, and bug bites are the most prevalent illnesses that it is utilized throughout the process of therapy of Nguyen and Niemeyer[27].

2. Neem and Papaya Leaves[28,29]

a. Neem

fig 11:- neem

The high metabolite content of neem leaves gives them a strong, overwhelming effect on insects some has been around since prehistoric times. Farmers have used it to suppress insects due to a plant component known as "azadirachtin." Neem can efficiently substitute conventional insecticides by delaying the molting process of mosquito larvae, as per a study conducted on the effects of azadirachtolides leaves on mosquitoes. Neem is an insecticidal impact, may be utilized to decrease mosquito populations.

b. Papaya

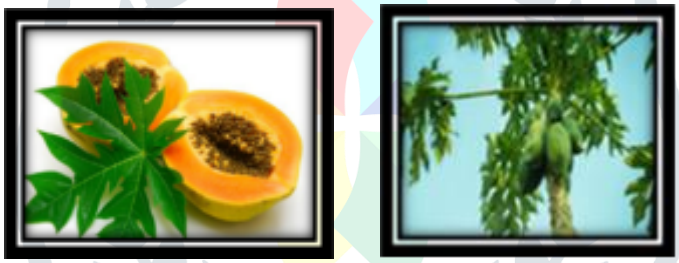

fig 12:- papaya

An investigation examining the effectiveness of papaya and neem leaf extracts against mosquitoes found that when compared to other extracts, the combination had the highest fatality rate. Mosquito larvicidal activity was subsequently previously claimed that be attributed to secondary metabolites, specifically proteins, alkaloids, coumarins etc[28].

3. Hippeastrum glaucescens

fig 13:- hippeastrum glaucescens

Hippeastrum-related plant species are a good source of chemicals that have antiviral capabilities and can combat DENV-2 and ZIKV. Pretazettine, narciclasine, and narciclasine-4-O-β D-xylopyranoside have anti-ZIKV characteristics that work well against the virus[29].

XIV. Precautions

Clinicians must concentrate on patient education while providing top priority to preventive measures including utilizing insect repellent, avoidingbug penetrates around the day's activities, by employing air conditioning, installing window/door screens, and dropping household tangle and water containers that act as mosquito breeding grounds. In order to avoid preventing more mosquitos from becoming inoculated with the infectious agent and avoid the probability of local transmission, patients who have Zika, among others Chikungunya, and dengue virus strains infection ought to be safeguarded against additional mosquito exposure, especially throughout its initial days the illness[30].In numerousmosquito varieties, mosquitoes operate as the main point of contact carriers of diseases such as disorders with chikungunya, dengue along concerningthe Zika virus has spread throughout the world. viral infections. Therefore, avoiding mosquito contact is the first step in prevention. These methods include spraying insecticides, saturating mosquito breeding grounds, and using insect repellents[12].There is unfortunately zero the zika virus vaccine. The type of immunological reaction continues to be a major impediment assisting in the advancement of development vaccines. Furthermore, the reasons for this are remains undiscovered if immunizations are safe for those with compromised immune systems[30].

XV. Conclusion

Understanding the zika virus better may enable us to anticipate more effective strategies to prevent it. When the zika maternal women are victims of infectious diseases can lead to congenital defects such microcephaly, early birth, and miscarriage. Neuropathy, mellitus, and the Guillain-Barré syndrome have all been linked to Transmission as an aftermath of illness known as Zika during both adults and children[26]. We don't yet know how the ZIKV epidemic will progress in the future[12, 13]. Considering the globalization of the Zika disease similarly to the after the bacteria that cause known aschikungunya dengue and that its future is unknown, we forecast that it will pose a significant threat to public health globally[4]. Additional investigation needs to be conducted upon both therapeutic and preventative strategies[19]. Undoubtedly, more to nurture, analysis needs to be conducted. effective antivirals that might have been administered for managing an infection contaminated with the virus known along with the virus known for example the virus known as Zikawithout having any negative side effects[31].The main prophylactic approach is for the purpose to steer clear of being bitten by mosquitoes, but since the vector is the most likely mode of transmission, this is not recommended[10]. Considering the vast majority of the population of recent residents' efforts to combat the virus known as Zika has been identified and confirmed in the last year, our understanding of this infection has been restricted to a certain extent last ten years. [32].

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