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A Review on Dengue Virus Infection Pathogenesis, Vaccine and Treatments

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KEYWORDS
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ABSTRACT:
Dengue is a mosquito-transmitted virus and the leading cause of arthropod-borne viral disease in the world. It is also known as breakbone fever due to the severity of muscle spasms and joint pain, dandy fever, or seven-day fever because of the usual duration of symptoms. Although most cases are asymptomatic, severe illness and death may occur. Aedes mosquitoes transmit the virus and are common in tropical and subtropical parts of the world. The incidence of dengue has increased dramatically over the past few decades. The infection is now endemic in some parts of the world. A few people who were previously infected with one subspecies of the dengue virus develop severe capillary permeability and bleeding after being infected with another subspecies of the virus. This illness is known as dengue hemorrhagic fever.

INTRODUCTION:

Dengue is a mosquito-transmitted virus and the leading cause of arthropod-borne viral disease in the world. It is also known as breakbone fever due to the severity of muscle spasms and joint pain, dandy fever, or seven-day fever because of the usual duration of symptoms. Although most cases are asymptomatic, severe illness and death may occur. Aedes mosquitoes transmit the virus and are common in tropical and subtropical parts of the world. The incidence of dengue has increased dramatically over the past few decades. The infection is now endemic in some parts of the world. A few people who were previously infected with one subspecies of the dengue virus develop severe capillary permeability and bleeding after being infected with another subspecies of the virus. This illness is known as dengue hemorrhagic fever.

EPIDEMIOLOGY:

DENVs are maintained in an endemic–epidemic cycle involving humans and mosquitoes in crowded tropical urban centres. These viruses are fully adapted to humans, and the highly domesticated principal vector mosquito Aedes aegypti emerged long ago from sylvatic cycles involving non-human primates and canopy-dwelling Aedes mosquitoes in the rainforests of Asia and Africa. Although these cycles still exist, their public health importance is uncertain. Aeaegypti was introduced to the Americas during the slave trade in the 1600s and spread worldwide as the shipping industry expanded. This species lives in intimate association with and feeds on humans, rests in their homes and lays its eggs in man-made water containers. The average female mosquito lives for approximately 1 week, but some females can live for ≥2weeks.

The female mosquito becomes infected when she takes a blood meal during the acute febrile and viraemic phase of illness. During the extrinsic incubation period, the virus first infects midgut cells and then disseminates to replicate in numerous mosquito tissues, ultimately infecting the salivary glands 5–12 (generally 8–10) days later, a process that is influenced by ambient temperature, the viral strain and the competence of the mosquito. Once the salivary glands are infected, the mosquito is infective and can transmit the virus to another person during blood-feeding. The mosquito remains infective for life and can infect every person it subsequently feeds on or probes while trying to feed. The time from infection to onset of illness (the intrinsic incubation period) in humans ranges from 3 to 14 days, with an average of 4–7 days.Vertical transmission can occur when the infected female mosquito transmits the virus through the eggs to her offspring, but the

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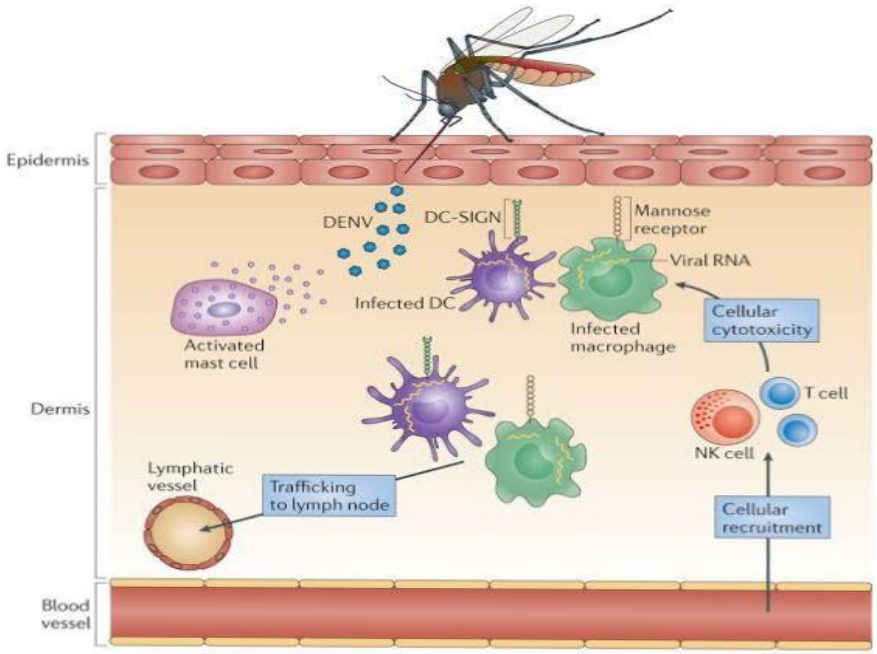
epidemiological importance of this mode of transmission is uncertain.

PATHOPHYSIOLOGY:

Part of the Flavivirus family, the dengue virus is a 50 nm virion with three structural and seven nonstructural proteins, a lipid envelope, and a 10.7 kb capped positive-sense single strand of ribonucleic acid. Infections are asymptomatic in up to 75% of infected humans. A spectrum of diseases, from self-limiting dengue fever to hemorrhage and shock, may be seen. A fraction of infections (0.5% to 5%) progress to severe dengue. Without proper treatment, fatality rates may exceed 20%. These occur primarily in children. The typical incubation period for the disease is 4 to 7 days, but it can last from 3 to 10 days. Symptoms more than two weeks after exposure are unlikely to be due to dengue fever.The exact course of events following the dermal injection of the dengue virus by a mosquito bite is unclear. Skin macrophages and dendritic cells appear to be the first targets. It is thought that the infected cells then move to the lymph nodes and spread through the lymphatic system to other organs. Viremia may be present for 24 to 48 hours before the onset of symptoms. A complex interaction of host and viral factors then occurs and determines whether the infection will be asymptomatic, typical, or severe. Severe dengue fever with increased microvascular permeability and shock syndrome is thought to be associated with infection due to a second dengue virus serotype and the patient's immune response. However, cases of severe dengue do occur in the setting of infection by only a single serotype. Worsening microvascular permeability often transpires even as viral titers fall.



TREATMENT:

There is no specific therapy available for dengue virus infections.it is important to exclude other treatable diagnoses. Patients at risk for dengue can acquire other diseases with similar clinical features, such as malaria, typhoid fever, and leptospirosis. Symptoms in patients with dengue virus infections resolve in five to seven days. Supportive treatments are available for the specific disease manifestations of dengue virus infection. Dengue Fever: Patients with dengue fever should be cautioned to maintain their intake of oral fluid to avoid dehydration. Fever and myalgias can be managed as needed with acetaminophen. Aspirin or nonsteroidal anti-inflammatory agents should generally be avoided because of the risk of bleeding complications and in children because of the potential risk of Reye's syndrome. The most important measure to assist the patient with dengue fever is to carefully evaluate the patient for impending complications. Dengue virus infection with significant Bleeding: Gastrointestinal bleeding or menorrhagia in patients with DHF, and occasionally in patients with dengue fever as well, can be severe enough to require blood transfusion. Factors that contribute to bleeding include thrombocytopenia due to decreased platelet survival and, in severe cases, frank disseminated intravascular coagulation. Platelet transfusions are rarely given, but may be warranted in patients with severe thrombocytopenia (<10,000/mm3) and active bleeding.

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DIAGNOSTIC:

Viral components in the blood can be found directly in a laboratory setting, or serological tests can be used to confirm the diagnosis indirectly. The timeframe of the clinical presentation influences the test selection. The early stages of the febrile phase are the most susceptible times to find viral components in the blood. Reverse transcriptase polymerase chain reaction (RT-PCR) assays and enzyme-linked immunosorbent assays (ELISA) can be used to detect viral nucleic acid in serum or the virus-expressed soluble non-structural protein 1 (NS1).17. Beginning on the fifth day of sickness, serology is used to detect IgM and IgG. It also aids in distinguishing between primary and secondary dengue infections. A high titre of antibodies to haemagglutinin indicates a recurrent dengue infection.

MANAGEMENT:

The WHO clinical management guideline for dengue fever offers specifics for making decisions about inpatient or at-home care. As such, a patient may initially be classified into one of three groups: A, B, or C. Those who fit group A's requirements could be managed under supervision at home. Group C requires hospitalization.10. Moreover, each nation has its own dengue control policies.Eleven Dengue poses a serious hazard to human health, but there is currently no specific antiviral medication for it.

FLUID MANAGEMENT:

Careful fluid resuscitation is the cornerstone of treating dengue fever, especially during the critical phase when the rate of fluid supply and the plasma leak are matched. These suggestions rely on numerous presumptions as well as professional judgment. According to some guidelines, a fluid quota of 50 mL/kg fluid deficit (up to 50 kg) and maintenance fluid should be supplied over the 48-hour critical phase, with the fluid quota being calculated for the estimated 48-hour period. In conclusion, this works out to 4,600 mL for a 48-hour period for a 50 kilogram person. Maintaining an appropriate intravascular compartment fill while preventing the patient from being overly stressed is the basis for fluid management throughout the crucial period of dengue fever. In order to do this, the clinician must exercise extreme caution and administer fluids in incremental or decremental steps according to clinical parameters, urine output, and the level of hemoconcentration. Steroids are the first-line treatment. The second-line fluid therapy in cases when the response to crystalloid boluses is insufficient is colloids (dextran 40, hetastarch). Maintaining adequate perfusion and a about 0.5 mL/kg/h urine production is the goal of fluid management. The guidelines offer strategies for managing dengue shock that can be used. Moreover, during the clinical course of dengue, correction of acidosis, blood sugar, and calcium (ABC) is crucial.

PREVENTIVE MEASURES:

Vector management:

Because of the mosquito's high degree of domestication, traditional vector control methods have proven less successful. Reductions in vector density may result from other, more recent vector control methods, such as the release of genetically modified male mosquitoes that sterilise the wild-type female population.22 An alternate method is to introduce strains of the obligatory intracellular bacterium Wolbachia into Aegypti embryos, rendering the mosquito immune to DENV.22 It is advantageous to employ personal protection measures like wearing appropriate clothing and applying insect repellent.

Vaccine development:

For a variety of reasons, developing a DENV vaccine has proven extremely difficult. All four serotypes must be covered by the vaccine to prevent immune augmentation. Thus, the creation of a tetravalent vaccine is the goal. Moreover, no animal model exists to replicate the human process, and the pathophysiology of DENV remains unclear. The development of viable vaccine candidates is hampered by all of these. Many issues with the first licensed vaccine, Dengvaxia (CYD-TDV), which was approved in 2015, are being addressed by researchers in the field in an effort to develop a better vaccine that targets all four serotypes.

Conclusion

Dengu has show to advantage of the consequential hazardous implication for human and it's accelerate to day by day as there is pronto no extreamly adequate vaccine to manner of the stringency of dengu by all the serostrain vaccines antagonistic towards dengu virus corruption should be exorbitant as the manhood of countries encounter epidemic are sparingly provocation dengu fever also expand hugely considering of human induced activities such as water retention in plastic ,metal drum and cement tanks which enhances the bad manner of dengu filth mosquito Dengu beering mosquito control management should be discharge without abreak of environmentally chemical and biological executive The insistance requirement for a vaccine to trivialize morbidity and mortality due to this illness has been sanctioned in commercial manner in newest year.

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