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Unmasking Dengue: A Holistic Review of Virus Classification, Pathophysiology, Diagnosis & Herbal Remedies

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ABSTRACT:-
The virus that causes dengue, known as the dengue virus(DENV),is a member of the Flavivirus genus and is spread by mosquitoes. The mosquitoes Aedesaegypti and Aedesalbopictus are the main vectors of transmission. With an estimated 390 million infections each year worldwide, the disease is common in tropical and subtropical climates. From mild feverish disease (dengue fever) to serious complications like dengue hemorrhagic fever (DHF) and potentially fatal dengue shock syndrome (DSS), dengue can appear with a broad range of clinical symptoms. Skin rashes, retro-orbital pain, joint and muscle pain, high fever, intense headache, and bleeding tendencies are some of the main symptoms. Supportive care, particularly hydration management, is essential in severe patients due to the paucity of specialized antiviral therapies. The global dengue burden may be lessened thanks to recent developments in diagnostics, vaccinations, and vector control techniques. To control and prevent dengue epidemics, however, extensive, interdisciplinary approaches are required due to issues like vaccine safety and effectiveness, insecticide-resistant mosquitoes.

KEYWORDS - Poverty, Vascular fragility, Capillary leakage, Haemorrhage, Thrombocytopenia, Liver injury

I. INTRODUCTION:-

A member of the genus Flavivirus and family Flaviviridae, the dengue virus is an arthropod- borne infection that has four different serotypes: DENV-1, DENV-2, DENV-3, and DENV-4. dengue is most nearly linked to impoverished communities in tropical and subtropical locales, it's appertained to as a complaint of Poverty. Dengue hemorrhagic fever(DHF) is a condition in which the primary DENV infection maybe a symptomatic or beget mild fever, but if it gets severe, it can be get coagulopathy, increased vascular fragility, and increased permeability. DHF can also progress to hypovolemic shock, also known as dengue shock syndrome (DSS).(1,2)

Although a tiny percentage of dengue infections proceed to serious illness, with fast start of capillary leakage accompanied by haemorrhage, thrombocytopenia, and liver injury, most infected individuals either show no symptoms or have moderate, self-limiting disease. Following a series of genetic verification procedures, it was determined to be a novel DENV- 5 serotype that primarily occurred in South-East Asian forests. The novel DENV-5 serotype, which differs phylogenetically from the other four serotypes, suggests that DENV is still emerging and that more virus emergences may occur in the future as a result of zoonotic transmission brought on by alterations in the climate and ecology.(1,2,10)

The four antigenic ally different DENV serotypes (DENV-1, DENV-2, DENV- 3, and DENV- 4) can usually induce a series of infections that lead to severe symptoms like dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS).Treatment is currently only supportive because there is no therapeutic option. Controlling sickness usually involves replenishing lost fluids. Both early and accurate diagnosis and early signs of development to severe disease are badly needed. Due to the wide range of clinical presentations that dengue virus infections might present with, accurate diagnosis is difficult and relies on laboratory confirmation. The sickness is usually self-resolving and currently has no antiviral therapy. Supportive therapy with analgesics, proper bed rest, and hydration with fluid replacement make up the optimal management strategy.(10,2,1)

CLASSIFICATION:-

Dengue Fever is categorised by the WHO as either severe or uncomplicated. The remainder cases are classified a sun complicated, while severe cases are associated with severe tube escape, organ impairment or extensive bleeding. From the

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potentially fatal dengue shock pattern(DSS) to the mild flu- such like illness known as dengue fever (DF), a DENV infection can beget a broad range of clinical symptoms. In DSS, significant bleeding and shock can develop, and if treatment isn't entered, mortality can reach 20. In distinction, DF symptoms include fever, nausea, vomiting, rash, and stings and pains. (1,3)

DENGUEFEVER-

"Break-bone fever" is another term for dengue, referring to the pains in the muscles and joints that accompany the illness. The three stages of an infection are critical, recuperation, and febrile. High fevers, often exceeding 104°F, are a common feature of the febrile phase, which typically lasts two to seven days. This is where you could get petechiae, which are little red spots that are caused by burst capillaries. After the high fever has subsided, the critical phase, if it happens, usually lasts one to two days. Increased capillary permeability and leakage during this phase may result in a substantial buildup of fluid in the chest and abdominal cavity. This causes the circulation and organs to lose fluid. Organ failure and significant bleeding (usually from the GIT) may happen during this stage.

DENGUE HEMORRHAGIC FEVER-

DHF is linked to a complex pathophysiology. The causes that are attributed include vascular disease, platelet deficiencies and dysfunction, and abnormalities in the blood coagulation path ways. The scope of DHF risk modeling shows are search deficit, especiallybetween2011 and 2021, as there are currently no studies on DHF dynamics and risk factors.(1,13)

DENGUE SHOCK SYNDROME-

The primary cause of shock is the syndrome of increased vascular permeability, whose pathogenesis was previously discussed. There is little knowledge about the pathophysiology of severe dengue. The dreaded shock syndrome is believed to be caused by a number of factors, including antibody-dependent enhancement, which increases viral replication. Short-term shock is followed by a speedy recovery for the patient with supportive care.(1)

THROMBOCYTOPENIA-

Thrombopoiesis is the process by which megakaryocytes make platelets, also known as thrombocytes, which are colorless cell fragments. Al though plate lets typically makeup 150000 to 350 000 per micro liter of blood, their minuscule size means that they only make up a very small portion of the blood volume. A significant contributing cause to thrombocytopenia in DV infection is decreased platelet synthesis and subsequent platelet clearance from peripheral circulation; nevertheless, platelet breakdown is more noticeable in DV infection cases.(4)

DENGUE DURING PREGNANCY-

Women were prescribed paracetamol (for fever). For management, women who showed symptoms of a preterm delivery or miscarriage were moved to the Gyneco-Obstetrics Ward. The administration of antibiotics was determined by the outcomes of laboratory testing. Following discharge, all expectant mothers were observed until delivery and requested to return for evaluation and convalescence serum on days 10–14 or later. All of the tests and investigations were redone if any women experienced a second bout of fever during their pregnancy. there is limited substantiation of cardiovascular physiological changes in infected maters . Available substantiation notes that in infected maters, there could be a narrowing of palpitation pressure increased capillary permeability. Approximately half of the world's population, including women of reproductive age, is at risk for dengue infection, which is on the rise. However, it is yet unknown how dengue infection during pregnancy affects foetal mortality. As a result, we looked into the relationship between still birth and pregnancy-related dengue infection symptoms.(5,6,7)

DENGUE DRUG DISCOVERY-

The creation of dengue virus (DENV) anti virals would be difficult, but it would be extremely beneficial to public health given the current state of the only vaccine (DENGVAXIA), which was commercialized in multiple countries but offers greater dangers to those who have not been exposed. This review examines the latest developments in DENV medication discovery from both business and academia labs. Given the particular immunopathology triggered by this acute viral infection, what makes a perfect DENV antiviral compound is outlined. Novel chemical classes that target host proteins and viruses, particularly NS4B, were discovered by biochemical, biophysical, and phenotypic screening. These classes have encouraging

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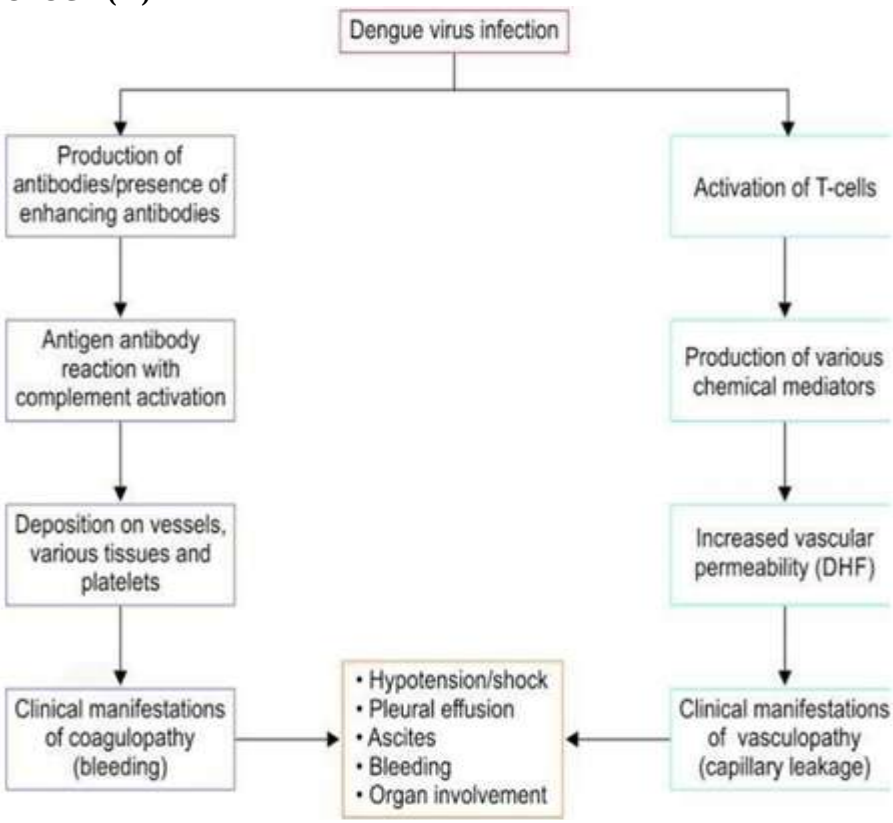
prospects for future research. Specifically, new approaches (or "omics") can hasten the development of long-awaited inhibitors specific to flaviviruses.(8)

PATHOPHYSIOLOGY-(17)



HERBAL REMEDIES

Herbal and Ayurvedic Treatments for Dengue The Ayurvedic treatment of dengue fever involves several upchar or remedies, such as panchana (digestive), deepana (stimulating appetite), mruduswedana (sweating), and langhana (fasting) (Singh et al., 2017). There are numerous ayurvedic herbs that are used to cure hyperthermia (jwara), strengthen the immune system, and deter mosquito bites. All the dhatus (plasma, blood, muscle, fat, bone, bone marrow, and reproductive fluid) and doshas (Vata, Pitta, and Kapha) can be impacted byfever (Jwara). Dengue is treated with medications such as padmakaditaila, lakshagodantichurna, vasavaleha, sudarshanchurna, sootshekhara, sanjivanivati, vasantsukumar, etc.,and a summary of the herbs used to make them is provided. Vatta (space and air) and Kapha (earth and water) are also observed, but pitta (fire and water) dominance (fever and aggravation of RaktaDhatu) is the primary cause of dengue, a sannipataja disease (disturbance in all three doshas).

Treatment with panchkarm as therapy is not advised (Shepherd and Hinfey,2015). Boil the tulsi in water and drink it all day long to boost your immune system. Chew 10 to 15 basil leaves twice a day to streng then the body's defenses. Euphorbiahirta(L.) Millsp. and Caricapapaya L. were the most often used plants in various geographical places for treating DENV infection, according to 35 studies that documented the traditional use of 25 plants from 20 families (Saleh and Kamisah, 2021).(18)

DIAGNOSIS-

The first alterations in laboratory tests are a drop in white blood cells (leukopenia), followed by a fall in platelet counts (thrombocytopenia), and metabolic acidosis. DF is confirmed by microbiological laboratory tests. The isolation of these viruses, the identification of viral antigens or RNA in serum or tissues, or the identification of certain antibodies in the patient's serum are the only ways to provide a conclusive diagnosis of dengue virus infection.(8)

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SEROLOGICAL TEST-

Immunoglobulin M (IgM) capture enzyme linked immunosorbent assay (MAC- ELISA), complement fixation (CF), neutralisation test (NT), hemagglutination inhibition (HI), and indirect immunoglobulin GELISA are the five serological tests that have been used to diagnose dengue infection. A non-avivirus (like Chikungunya virus or easternequineence phalitisvirus), another avivirus (like yellow fever virus, Japanese encephalitis virus, or St. Louis encephalitis virus),and ideally an uninfected tissue control antigen should be included in the antigen battery for the majority of these serologic tests.(9)

NS1 TEST-

The most recent target in dengue diagnostics development is the NS1 protein. This protein is produced by all flaviviruses and has been observed to be released in different amounts from infected cells. High levels of it in serum or plasma lately could be a sign of an imminent danger of developing severe dengue. However, it is still unknow nifNS1contributes to or results from plasma leakage.(15)

IgM & IgG ANTI BODY TEST-IgM TEST-

The identification of IgM specific to dengue is a valuable tool for surveillance and for individuals. In 50of the restored cases, IgM is initially detectable 3–5daysafterthebeginning of fever. When assays are approved 5 days or more after the onset of fever, IgM has an independent perceptivity and particularity of 90 and 98. IgM specific to dengue is expressed before Ig Gspecific to dengue. When paired sera are obtained within the appropriate time frame to demonstrate serocon version between acute and convalescent blood samples, dengue- specific IgG-based assays can be utilised to detect both present and past dengue infections. To ascertain an end- point titre, assays are often performed using several dilutions of each serum examined.(14)

GENRAL GUIDELINES FOR THE USE OF TEST KIT-

- Kits should not be used beyond the expiry date and reagents from one kit should not be used in another kit or batch
- The evaluation should replicate the practices that the manufacturer in structs laboratories to use in the field
- If a commercial test does not work appropriately or failures were defined during the performance by reference laboratories these kits will not be sent to the rest of the laboratories for evaluation
- Occasionally, assays produce results that are difficult to interpret and are erroneous, which might be due to factors inherent to the specimens or clerical errors. If such results occur consider the following: check specimen integrity; check equipment and reagents; have the same person re-test the sample; repeat the test with another technologist; repeat the test blindly; repeat in different laboratory or a reference laboratory; verify labelling, paperwork and procedures.(14)

FUTURE PERSPECTIVES–

Although dengue immunisation is on the verge of major breakthroughs, a number of obstacles need to be overcome to maximise public health benefits. As the evaluation of vaccination candidates such as Qdenga® and Dengvaxia® continues, extensive long-term studies are obviously required to completely comprehend their safety and effectiveness profiles across a range of populations. Subsequent investigations ought to concentrate on refining vaccine compositions to augment defences, particularly against less responsive serotypes like DENV- 4, and tackling issues about diminished effectiveness in younger, dengue-naïve children.(16)

II. CONCLUSION

Aedesaegypti mosquitoes are most prevalent in tropical and subtropical areas, making Dengue fever a serious global health concern. The disease has several obstacles since it spreads quickly, there is no proven antiviral treatment, and outbreaks are becoming more frequent as a result of urbanisation and climate change. Insecticide use, community involvement, and the removal of mosquito breeding areas are all important preventative methods to stop the spread of the disease. Public health programs that emphasise personal preventative measures and awareness are essential for lowering the dengue burden. Timely diagnosis, supportive treatment, and preventative strategies like community awareness, mosquito control, and immunisation of eligible populations are all essential components of effective care. To lessen dengue's effects and protect the public's health, governments, healthcare systems, and individuals must work together.

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