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Review Article

The dengue virus: A worldwide hazard to human health: A literature review

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Abstract:

Aedes mosquitoes are responsible for the transmission of dengue fever, a viral disease that manifests itself quickly and is caused by an RNA virus that is a member of the Flaviviridae family. Some of the symptoms that may be present include a fever that is not accompanied by any other visible symptoms, while others may include serious effects such as hemorrhagic fever and shock. The symptoms that are typically seen include a quick onset of high temperature, soreness in the muscles and joints, myalgia, a rash on the skin, episodes of bleeding, and circulatory shock. In cases of dengue infection, oral symptoms are not very common; nonetheless, there are certain circumstances in which mouth symptoms may be the only indicator that is evident. A diagnosis that is both prompt and accurate is absolutely necessary in order to reduce mortality. Despite the fact that dengue virus infections normally go away on their own, the prevalence of dengue illness has become a significant public health concern in nations that are classified as tropical or subtropical. On this page, you will find a complete review of dengue virus infections. This overview includes a discussion of the numerous clinical signs, techniques of diagnosis, differential diagnosis, as well as strategies for prevention and treatment.

Key Words: cutaneous rash, dental and public health, oral manifestations, Breakbone fever, hemorrhagic diathesis, dengue virus.

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INTRODUCTION

The Flavivirus genus, which belongs to the Flaviviridae family, is where the dengue virus is known to be categorised. There are four distinct serotypes of a virus that are transmitted by arthropods. These serotypes are DEN-1, DEN-2, DEN-3, and DEN-4. (Halstead, 1988; Kurane, 2007) First and second are the items that make up the list that serves as the input. According to the World Health Organisation (WHO), dengue fever is a significant global public health concern in countries that are classified as tropical or subtropical. The number of people who are infected with dengue fever has increased by a factor of thirty between the

years 1960 and 2010. (Gubler, 1988; Guzman et al., 2010) There are a number of variables that can be attributed to the rise in the number of diseases that are transmitted by mosquitoes. These factors include rapid population expansion, global warming, unplanned urbanisation, ineffective mosquito control measures, frequent air travel, and poor healthcare infrastructure. According to estimates, the number of people who live in areas where dengue fever is endemic ranges anywhere from three to five trillion (Guzman et al., 2010). There are around 400 million infections that occur each year, and the death rate might be anything from 5 and 20 percent in different locations. The user's text is (Linares et a l., 2013). Dengue fever is prevalent in over one hundred nations, including the United States of America and Europe. In 1780, Madras was the location where the first case of a disease similar to dengue fever was documented in India. In 1963 and 1964, the first virologically proven outbreak of dengue fever in India took place in Calcutta and the Eastern Coast of India. (Gupta Et al., 2013) Dengue virus infection can manifest itself in a wide variety of clinical manifestations, ranging from asymptomatic sickness to dengue fever to the severe condition known as dengue hemorrhagic fever/dengue shock syndrome (DHF/DSS). (WHO, 2009a) Participation of the oral mucosa These characteristics are more typically related with DHF than they are with DF, despite the fact that around thirty percent of patients exhibit this condition. (Thomas et al., 2007) Due to the fact that dengue virus infections can appear in a variety of clinical manifestations, receiving an accurate diagnosis is challenging and is dependent on laboratory confirmation. The illness typically resolves on its own, and there is currently no treatment available that is antiviral in nature. Care that is supportive and includes analgesics, hydration with fluid replacement, and adequate bed rest are the management strategies that are recommended above all others.

ETIOPATHOGENESIS

People of all ages are susceptible to DF, a severe flu-like infection that can affect infants, children, teenagers, and adults. (Thomas et al., 2007) Humans catch the disease by mosquitos known as Aedes aegypti and the majority of transmissions occur during the rainy season. (Arshad Et al., 2011) The following are the possible causes of dengue virus infection:

• Replication of viruses, mostly in macrophages (Wu et al., 2000)

• The virus's direct skin infection (Bhamarapravati, 1980)

• Immunological and chemical mechanisms brought on by the contact between the virus and the host. (Bhamarapravati, 1980)

The dengue virus gets into the host through the epidermis, the top layer of skin, after an affected insect bites it. The innate, cellular, and humoral host immune reactions affect how the disease gets worse. The speed at which the virus leaves the host body is directly linked to how bad the symptoms are. As a result, there is no link between having a lot of virus particles and having the worst symptoms during the infection phase. The person's sentence is (Whitehorn & Simmons, 2011). Changes in thromboregulatory mechanisms and the permeability of capillary microvessels cause more plasma and protein to be lost. Plasma leakage is believed to be facilitated by the activation of endothelial cells triggered by monocytes, T-cells, the complement system, and other inflammatory substances. Thrombocytopenia is linked to changes in the production of megakaryocytes, which leads to reduced growth of precursor cells and susceptibility to infection in human blood cells. Platelet malfunction, injury, or reduction can result in significant haemorrhaging. The provided text is a list comprising the digits (Guzman & Kouri, 2003; WHO, 2011).

A diagrammatic illustration of dengue's pathophysiology is shown in Figure 1.

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CLASSIFICATION

The World Health Organisation (WHO) classifies DF into two distinct categories: severe and uncomplicated. The user's input is the list (Whitehorn & Farrar, 2010; WHO, 2011). Simple instances are considered as the remaining cases, whereas severe cases are linked to significant plasma leakage, organ dysfunction, or substantial haemorrhaging. The user's text is (WHO, 2011b).

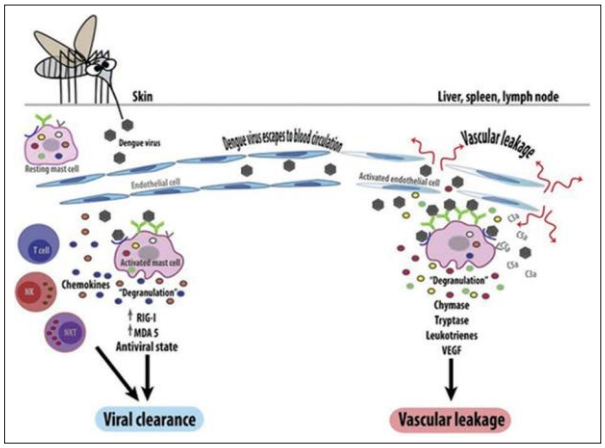

Figure 1: Pathogenesis of dengue virus infection

According to the classification that was used in 1997, dengue fever can be broken down into three distinct categories: DHF, DF, and nonspecific fever. (Ranjit & Kissoon, 2011) On the basis of DHF, grades I through IV were distinguished.

Grade I: Occurrence of only slight bleeding or a positive result on the tourniquet test. Grade II: Characterised by uncontrollable bleeding into the dermis and other areas of the body

Grade III: Manifestation of shock symptoms observed during clinical examination. Grade IV: The individual is experiencing severe shock characterised by a feeble pulse and blood pressure that cannot be measured. The user's text is (WHO, 1997).

In this case, DSS is made up of grades III and IV. (WHO, 2011b).

SYMPTOMS AND PRESENTATION

Pyrexia of unknown origin

This stage is primarily recognised during the initial infection, however it can also occur with a subsequent secondary infection. From a clinical perspective, it is difficult to differentiate this syndrome from other viral diseases and often remains unnoticed.

Dengue fever

The demographic most commonly impacted by DF includes adults and older children, who experience the condition alongside primary and secondary infections. Upon the onset of symptoms, individuals may experience a prolonged, intense fever that exhibits two distinct phases and persists for a duration of three to seven days. The user's text is (Ahmed et al., 2001; Narayanan et al., 2002). Other reported symptoms include intense headaches (particularly behind the eyes), fatigue, muscle discomfort, joint pain, a metallic taste in the mouth, loss of appetite, vomiting, diarrhoea, and stomach pain. Dengue is commonly known as breakbone fever due to the myalgia and joint discomfort it induces. The interval is (Whitehorn & Farrar, 2010; Chen & Wilson, 2010). Patients with DF commonly report the occurrence of an atypical skin rash in 50-82% of cases. The given input is a list containing the

numbers (Waterman & Gubler, 1989; Itoda et al., 2006). The initial rash, characterised by a temporary reddening of the face, commonly appears prior to or within the first one to two days of a fever. This rash is a result of the widening of small blood vessels. The second rash appears 3 to 7 days after the fever and is characterised by a painless rash with flat and raised red spots, resembling measles. Occasionally, lesions combine to create little bleeding spots and circular circles of unaffected skin within larger areas of redness, like white islands in a sea of red. (Waterman & Gubler, 1989; Radakovic-Fijan et al., 2002). The skin rash typically does not cause any symptoms, and only 16–27% of cases have been associated with itching. The given input is a list containing two elements: 26 and 9. Bleeding episodes are infrequent in individuals with DF, however they may occur in cases of petechiae/purpura, heavy menstruation, gingival bleeding, epistaxis, and gastrointestinal haemorrhage. The values in the range are (Ahmed et al., 2001; Kabra et al., 1998).

Hemorrhagic fever caused by dengue

DHF is frequently reported in instances of recurring dengue fever. However, infants might also be affected by dengue during their initial sickness due to the presence of dengue antibodies acquired from their mother. The user's text is (Halstead et al., 2002). The following criteria are recommended for the diagnosis of DHF: The user's text is a reference to a specific source or citation.

a. Clinical features: The initial sudden fever phase is defined by a protracted high-grade fever lasting from two to seven days. Episodes of bleeding (at least one type described below): Petechiae, purpura, haematemesis and/or melena, gingival and mucosal bleeding, ecchymosis, epistaxis, gastrointestinal tract or injection site bleeding Optimistic adhesive and a substantial liver.

b. Lab parameters: Insufficient platelets (platelet count <100,000/cu mm)

There are several things that can lead to hemorrhagic events in DHF. Blood clot issues, not having enough platelets, or problems with how blood clots are thought to be to blame. (Chiu et al., 2005) Thrombocytopenia can happen in people with DHF because platelets are lost more quickly and fewer are made (La Russa, 1995; Rosenfeld & Young, 1991). (Phanichyakarn et al., 1977) Platelets that don't work as well make blood valves weak, which lets blood flow freely. (WHO, 2001)

The clinical course of DHF can be divided into three distinct phases: febrile, leaky, and convalescent. The febrile illness commences with an initial high-grade fever, accompanied by constitutional symptoms and facial erythema. The user's text is (Narayanan et al., 2002). The early febrile sickness is characterised by hemorrhagic tendencies and a morbilliform rash. (Richards et al., 1997). Once the patient enters the convalescent or plasma leakage phase their temperature decreases and returns to either normal or below-normal levels. This temperature change often lasts for a duration of two days to a week. The user's text is (Srikiatkhachorn et al., 2007). Instances with elevated plasma escape are distinguished by the presence of an open shock accompanied by ascites, cyanosis, reduced pulse pressure, hepatomegaly, and the accumulation of fluid in the pericardial and pleural cavities. Occasionally, there may be cases where one experiences severe bruising and bleeding in the gastrointestinal tract, which can be followed by nosebleeds. During this stage, one can see pallor, erythema, confluent petechial rashes, and bradycardia.

The symptoms of dengue shock

DSS is DHF with an uneven pulse, low pulse pressure (<20 mmHg), shaking, cold, clammy skin around the mouth, and cyanosis around the eyes. The high death rate from DSS is due to widespread intravascular clotting, damage to multiple organs, and shock that gets worse over

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time. The patient quickly returns from shock that only lasts for a short time after getting supportive care. (Gurugama et al., 2010; Shivpuri, 2011)

OROFACIAL FEATURES

Dengue Hemorrhagic Fever (DHF) is more commonly associated with oral features than with dengue virus infection. The primary oral manifestations of dengue virus infection include erythema, crusting of the lips, vesicles on the tongue, and soft palatal lesions. (Chadwick et al., 2006) saw vesicular eruptions over more than 50% of the soft palate, but Sanford reported a higher occurrence involving the mucosa with scleral injection, reaching 90%. The user's text is (Sanford, 1986). Byatnal et al. found numerous hemorrhagic bullae on the floor of the mouth, lateral side of the tongue, and sublingual mucous membrane. There were rough-surfaced, brown-colored plaque-like lesions on the buccal mucosa that bled upon touch, as well as spontaneous bleeding from the tongue and gingiva. Additionally, there have been documented cases of nosebleeds, bruising, purple patches on the skin, and small red spots known as petechiae. (Byatnal et al., 2013) Mitra et al. noticed hemorrhagic plaques, enlarged tonsils, and bleeding gums in a patient infected with dengue. The user's text is (Mithra et al., 2013). Isolated hypoglossal nerve palsy is an uncommon occurrence that can happen after contracting dengue. The numeral (Jaganathan & Raman, 2014) is surrounded within square brackets. Other possible symptoms of DF include swollen lymph nodes, changes in taste, and redness of the conjunctiva. The text provided by the user is enclosed within tags. Table 1 presents the orofacial traits that are related with dengue.

DIAGNOSIS

Dengue fever (DF) should be thoroughly evaluated if a patient develops a significant fever within a 14-day period after travelling to tropical or subtropical areas. The numeral (Simmons et al., 2012) is encapsulated inside square brackets. The initial changes noted in laboratory tests consist of leukopenia (a reduction in the quantity of white blood cells), thrombocytopenia (a reduction in the quantity of platelets), and metabolic acidosis. The confirmation of DF diagnosis is achieved through microbiological laboratory tests. The preferred microbiological techniques are cellular virus segregation cultures, nucleic acid demonstration using polymerase chain reaction (PCR), and serological detection of viral antigens (such as NS1) or specific antibodies. The user's text is (Guzman et al., 2010). Precise diagnosis can be achieved using viral segregation and nucleic acid demonstration, but the expensive cost of these procedures restricts their availability.

DIFFERENTIAL DIAGNOSIS

When a patient has a fever and a rash resembling that seen in DF, a comprehensive differential diagnosis is conducted. Tables 2 and 3 display a comprehensive list of clinical signs that have resemblance to the febrile and severe stages of dengue infection.

MANAGEMENT OF DENGUE INFECTION

Fluid replacement and antipyretic therapy with paracetamol are the treatments that are indicated to be administered after the fever episode has passed. It is recommended that additional nonsteroidal anti-inflammatory drugs not be taken when pregnant. Fluid administration has a crucial role in treating the illness during its critical phase. Examples of commonly provided fluids include normal saline, Ringer's lactate, and 5% glucose solutions that are diluted in normal saline, plasma, or plasma substitutes. Another example is 5% albumin.

The WHO recommendations provide a concise summary of the key concepts related to fluid treatment. The user's text is (WHO, 2012). Oral fluid replenishment is necessary to the maximum extent possible. However, intravenous fluid administration is required in situations

where the patient is incapable of absorbing fluids by oral intake, such as when the patient is in a state of shock, undergoing severe vomiting, or extreme exhaustion.

• Crystalloids, which are 0.9% saline, are the first-line alternative for intravenous fluid administration.
• Hypertensive conditions that do not respond to intravenous crystalloid boluses are included in the second-line measures; colloids, such as dextran, are an example of this type of treatment.
• In the event that the patient's platelet levels remain in the critical phase despite being low, there is a significant cause for concern regarding the possibility of bleeding. An intravenous transfusion of fresh whole blood is the course of action that is indicated in cases where bleeding episodes are suspected.

DENTAL ADMINISTRATION

Oral lesions are rarely identified and sometimes misinterpreted as platelet abnormalities. The user's input is represented by the value (Radakovic-Fijan et al., 2002). Platelet transfusions are essential for treating severe bleeding symptoms. Generally, there is no need to give preventative platelets, even if the platelet count is less than 20,000 per cubic millimetre. Prophylactic platelets can be given when the platelet count falls below 10,000 per cubic millimetre and there are no indications of bleeding. In cases of extensive and substantial bleeding, it may be necessary to administer both red blood cell transfusion and platelet transfusion. Regular monitoring of liver functions is essential.

Table 1: Summary of reported orofacial features in dengue

Author(s) and year	Reported orofacial features
Chadwick D, Arch B, Wilder-Smith A, Paton N. 2006	Mucosal involvement with scleral injection
Sanford JP, 1986	Vesicles on soft palate
Byatnal A *et al*. 2013	Hemorrhagic bullae on sublingual mucous membrane, lateral surface of the tongue, and floor of the mouth Brown-colored plaquelike lesions with a rough surface on the buccal mucosa Spontaneous bleeding from the gingiva and the tongue Petechiae, purpura, ecchymoses, and nasal bleeding
Mithra R, Baskaran P, Sathyakumar M, 2013	Bleeding gums, hemorrhagic plaques, and inflamed tonsils
Jaganathan S, Raman R 2014	Isolated hypoglossal nerve paralysis
Gubler DJ 1998	Taste alteration, conjunctival redness, and lymphadenopathy

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Table 2: Conditions that mimic the febrile phase of dengue infection

Flu-like syndromes	Influenza, measles, chikungunya, infectious mononucleosis, HIV seroconversion illness
Illnesses with a rash	Measles, scarlet fever, rubella, meningococcal infection, chikungunya, drug reactions
Diarrheal diseases	Rotavirus, other enteric infections
Illnesses with neurological manifestations	Meningoencephalitis febrile seizures

HIV-Human Immunodeficiency Virus.

Table 3: Conditions that mimic the critical phase of dengue infection

Infections	Acute gastroenteritis, leptospirosis, malaria, typhoid, typhus, viral hepatitis, acute HIV seroconversion illness, bacterial sepsis, septic shock
Malignancies	Acute leukemia and other malignancies
Miscellaneous conditions	Acute abdomen - Acute appendicitis Acute cholecystitis Perforated viscus Diabetic ketoacidosis Lactic acidosis Leukopenia and thrombocytopenia±bleeding; platelet disorders Renal failure Respiratory distress (Kussmaul breathing), systemic lupus erythematosus

ADVANCED RESEARCHES

Future dengue prevention and treatment options include developing a dengue vaccine, antiviral medications, and effective mosquito control measures.

Two methods for controlling mosquito (vector) transmission are keeping guppies (Poecilia reticulata) or copepods (Doridicola agilis) in stagnant water and introducing bacteria from the Wolbachia species. (Simmons et al., 2012)

There is a growing demand to develop a dengue vaccine due to the escalating severity and widespread transmission of the sickness. Ensuring global public health necessitates the availability of a tetravalent dengue vaccine that is both cost-effective and demonstrates high levels of safety and effectiveness. The progress of vaccine research has been impeded by intricate pathophysiology, the need to govern four virus serotypes, and inadequate funding from vaccine inventors. (Hombach, 2007)

An extensive scientific inquiry is currently undertaken to produce antiviral medications that can effectively manage DF and prevent possibly fatal episodes. The given input is a list of integers (Sampath & Padmanabhan, 2009; Noble, 2010).

CONCLUSION

Over 2.5 billion individuals in more than 100 nations are afflicted with dengue fever, which poses a potential threat of death. Dengue has emerged as a significant public health concern on a global scale. In addition to having detailed understanding of the numerous clinical manifestations of this condition, the physician is responsible for ensuring that an effective and quick treatment plan is implemented. The development of vaccines, antiviral treatment regimens, and mosquito control measures will be the primary areas of concentration for future efforts to defeat this debilitating illness.

Funding and backing

There is no information or value present.

Conflicts of interest

There are no instances when personal interests might influence or compromise the impartiality or objectivity of the situation.

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