AN OVERVIEW ON DENGUE FEVER: AN EMERGING PUBLIC HEALTH ISSUE

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Abstract

Dengue is an emerging public health concern not only in Asian subcontinent but also in remote areas of world secondary to increase in number of mosquitoes, congested living facilities & lack of personal hygiene. Annually, morbidity and mortality secondary to dengue has created significant public health concerns from a socio-economic standpoint which requires increased awareness to general public. In this case, we discuss a case of a patient who was diagnosed with dengue in urban India. Here we elaborate upon various systemic manifestations of dengue fever and also demonstrate the progression of this patient throughout the time course in hospital. In addition, we also elaborate on an interesting public health model that has been used to risk stratify areas affected with Dengue.

Key words: Dengue, Fever, Mosquitoes, Symoptoms

Introduction

Dengue is one of the most common mosquito-borne viral diseases. The first and second epidemics of Dengue haemorrhagic fever occurred in Manila in 1954 and 1956, followed by the third in Bangkok in 1958. Since then, Dengue has spread throughout tropical Asian countries and has expanded globally. Dengue virus belongs to the flavivirus genus of the Flaviviridae family. They are transmitted among humans by Aedes mosquitoes bite such as Aedes aegypti. There are four serotypes, namely Dengue type 1, Dengue type 2, Dengue type 3 and Dengue type 4. Infection with any of the four serotypes causes clinical symptoms that may vary in virus virulence, and host response. And recovery from one infection provides life- long immunity against that particular serotype. Dengue has its progression from Dengue fever, which is a simple form of dengue it may lead to dengue hemorrhagic fever, a condition which involves sensitive stomach, petechial, weak pulse, and internal bleeding that can lead to black vomit or faeces.

If dengue hemorrhagic fever is untreated it may progress to dengue shock syndrome, a worst form of dengue which can also result to death. Dengue fever is a multisystem disorder caused due to infection by Dengue virus which is an ssRNA virus belonging to a Flaviviridae family.

History of Dengue

The origins of the word dengue are not clear, but one theory is that it is derived from the Swahili phrase "Ka-dinga pepo", meaning "cramp-like seizure caused by an evil spirit". The Swahili word "dinga" may possibly have its origin in the Spanish word "dengue" meaning fastidious or careful, which would describe the gait of a person suffering the bone pain of dengue fever.

The first record of a case of probable dengue fever is in a Chinese medical encyclopedia from the Jin Dynasty (265 – 420 AD) which referred to a "water poison" associated with flying insects. The first recognized Dengue epidemics occurred almost simultaneously in Asia, Africa, and North America in the

1780s. The first confirmed case report dates from 1789 and is by Benjamin Rush, who coined the term "breakbone fever" because of the symptoms of myalgia and arthralgia.

The viral etiology and the transmission by mosquitoes were only deciphered in the 20th century. Nowadays, about 2.5 billion people, or 40% of the world's population, live in areas where there is a risk of dengue transmission.

Possible factors for dengue fever –

1. Unplanned urban overpopulation of areas leading to inadequate housing and public health systems (water, sewerage and waste management)

2. Poor vector control, e.g., stagnant pools of water for mosquito breeding

3. Climate change and viral evolution (increased virus transmission has been linked to El Nino conditions)

Dengue virus

Dengue is caused by dengue virus (DENV), a mosquito-borne flavivirus. DENV is a single-stranded RNA of the family Flaviviridae, genus Flavivirus. DENV causes a wide range of diseases in humans, from a self limited Dengue Fever (DF) to a life threatening syndrome called Dengue Hemorrhagic Fever (DHF) or Dengue Shock Syndrome (DSS).

There are four antigenically different serotypes of the virus (although there is report of 2013 that a fifth serotype has been found) –

- DENV – 1
- DENV – 2
- DENV – 3
- DENV – 4

Here, a serotype is a group of viruses classified together based on their antigens on the surface of the virus. These four subtypes are different strains of dengue virus that have 60-80% homology between each other. The major difference for humans lies in the subtle differences in the surface proteins of the different dengue subtypes.

Differential diagnosis based on symptoms is challenging due to dengue's non-specific symptoms such as fever, aches and fatigue that are often overlap with other endemic infections. Dengue-associated mortality can be reduced from 20–30% in severe cases to less than 1% with appropriate fluid replacement and supportive care, which is greatly facilitated by early diagnosis.

Dengue-A global issue:

Dengue is a major public health issue globally. It has been found that that, "...estimated that about 2.5 billion individuals, a staggering 40% of the worldpopulation, inhabit areas where there is a risk of transmission of DF (Dengue Fever) and that the disease burden has increased at least fourfold in the last three decades. Modelling also suggests that approximately 50–100 million human infections occur annually, of which about 500000 are

DHF (Dengue Hemorrhagic Fever)".

The global incidence of dengue fever and more severe forms of the disease was recently estimated at 96 million. Currently, the only available mitigation strategy is the attempt to interrupt transmission by vector control, though numerous investigations are underway to develop vaccines and other therapies aimed at preventing infection and limiting severe disease.

Signs and Symptoms

The disease has a sudden onset and symptoms may include

- fever for 3-7 days
- intense headache and pain behind the eyes
- muscle and joint pain
- loss of appetite
- vomiting and diarrhoea
- skin rash
- bleeding, usually form the nose or gums

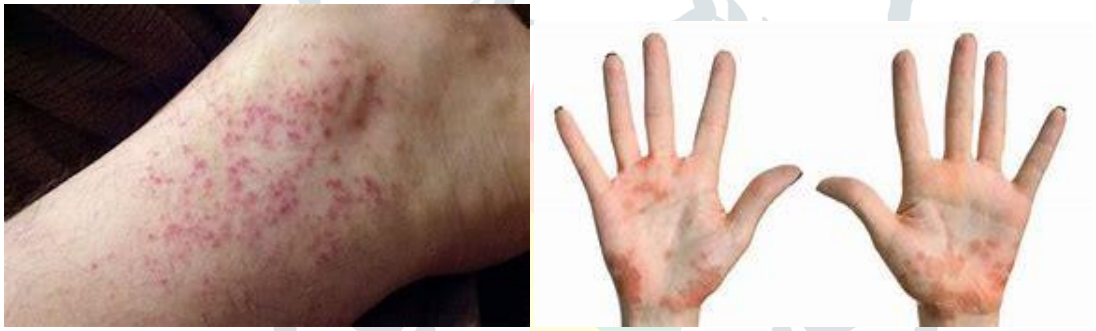

Fig-1

Recovery is sometimes associated with prolonged fatigue and depression. Repeated episodes of dengue fever may result in excessive bleeding and appropriate treatment, are rarely fatal.

Diagnosis

The diagnosis of dengue fever is made by clinical presentation and a blood test.

Incubation period

It is the time between becoming infected and developing symptoms. It is usually 3-14 days, commonly 4-7 days.

Infectious period

It is time during which an infected person can infect others. A mosquito becomes infected if it bites an infected person while the person is having fever (average period of about 3 to 5 days.
After biting an infected person, it takes 8-12 days before the mosquito infects other people. The mosquito remains infectious for life. Dengue fever is not directly spread from person-to-person.

Prevention

- There is no vaccine to prevent human infection.
- Prevent access of mosquitoes to an infected person.
- Protect yourself from mosquito bites at all times.
- Use a repellent containing 20%-30% DEET (Diethyltoluamide) or 20% Picaridin on exposed skin. Re-apply according to manufacturer's directions. Avoid using DEET on young children.
- Mosquito traps and nets – nets treated with insecticides are more effective, otherwise the mosquito can bite through the net if the person is standing next to it. The insecticide will kill mosquitoes and other insects, and it will repel insects from entering the room.
- Wear neutral-colored (beige, light grey) clothing. If possible, wear long-sleeved, breathable garments.
- If available, pre-soak or spray outer layer clothing and gear with permethrin.
- Get rid of water containers around dwellings and ensure that door and window screens work properly.
- Apply sunscreen first followed by the repellent (preferably 20 minutes later).

Prevention is extremely important via early detection and reducing rate of transmission. Best prevention can be achieved by avoiding travel in endemic areas during monsoon when Dengue is the most prevalent.

Further reduction of transmission can occur via use of mosquito sprays multiple times a day in house to prevent harboring, stay in a well ventilated cold environment and wear mosquito repellent protection on skin with topical emollients like permethrin. Two common modes of transmission of Dengue are epidemic and hyper endemic dengue. In hyper endemic dengue, disease and vectors are always present in local area and viral strain circulates either seasonally or all year around in humid environment which leads to more infections. In contrast, epidemic dengue is an introduction of new strain brought on by an isolated transmission from area outside of infection which starts an infectious cycle amongst hosts. We believe this patient to be affected due to hyper endemic dengue.

However, due to increase global immigration, it is possible that dengue strains can become a widespread epidemic or even a pandemic. In terms of diagnosis NS-1 antigen test has been used extensively to assess the index of suspicion of Dengue fever. Study by Para-navigate ET. Al demonstrated rapid NS-1 antigen detection test to be extremely efficient in outpatient setting at bedside and had comparable sensitivity and specificity to NS-1 antigen capture ELISA. In addition, presence of NS-1 antigen is extremely important in predicting high clinical severity of disease. Recently, it has been found that NS-1 antigen induces pathogenesis by induction of interleukin. In addition; the symptom of “fever” has been proven to be the most significant predictor in terms of diagnosis for patients with Dengue infection and stratifying patients in low versus high risk.

Addition, it is important to rule out disorders like chikungunya which has similar presentation but has the hallmark of bone breaking fever without pancytopenia. With

Growing incidence of Zika virus in US (which is also transmitted by A. Egypt), Dengue and Chikungunya should always be considered in clinical decision making

Report on Telangana

Southern part of India is pivotal for several viral diseases, amongst which the DENV tops the list. Recurrent dengue outbreaks were experienced by South Indian states such as Telangana and Andhra Pradesh with increased disease severity, but regarding circulating serotypes, very few studies are available. DENV-3 and

DENV-4 were reported from Hyderabad during the outbreak of 2007; however, the circulation of all four serotypes was noted in the same place during 2014.

The first confirmed report of dengue infection in India dates back to 1940s, and since then more and more new states have been reporting the disease in epidemic proportions often inflicting heavy morbidity and mortality Kolkata in India was the first to witness the epidemic (1963), but many more regions from the country reported the same in different time frames, Visakhapatnam (1964), Vellore (1968), Ajmer (1969), Kanpur (1969), Jalore (1985), Chandigarh (2002), Mumbai (2004), Ludhiana (2007), New Delhi (1996, 2003, 2006, 2010), Chennai (2006-2008) and Kerala (2008).

Treatment:

Increased oral fluid intake is recommended to prevent dehydration. Supplementation with intravenous fluids may be necessary to prevent dehydration and significant concentration of the blood if the patient is unable to maintain oral intake. A platelet transfusion is indicated in rare a case if the platelet level drops significantly (below 20,000) or if there is significant bleeding. People who suffer from dengue fever have no risk of death but some of them develop Dengue Hemorrhagic Fever (DHF) or Dengue Shock Syndrome (DSS). In some of these cases death can occur. If a clinical diagnosis is made early, a health care provider can effectively treat DHF using fluid replacement therapy. Adequately management of DHF generally requires hospitalization.

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	Fever	Rash	Conjunctivitis	Joint pain(arthralgia/ myalgia)	Sign of sepsis(haemorrhage/ shock)
Zika		+	+		
Chikangunya	+			+	
Dengue	+	+			+

Fig-2

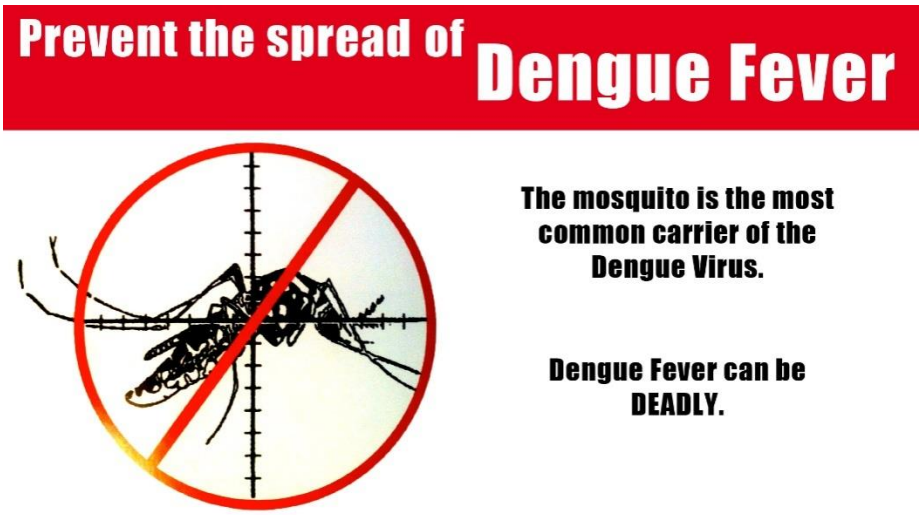

Fig-3

REPORT ON TELANGANA

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In a major health scare, 700 new cases of dengue, including 23 from Hyderabad, were reported from across the state in just a fortnight. While thousands of patients have landed in hospitals, 46 cases of dengue were reported on Sunday, mostly from Khamman and Warangal last year.

The number of dengue cases went up from 1,121 on August 30 to 1,816 on September 15, according to records maintained by National Vector Borne Disease Control Programme. While 2,560 cases were reported between January to October 5 of 2018, 1,587 cases were reported during the same period in 2017, an increase of 973 cases.
According to statistics available with the State Health department -- Khammam, Hyderabad, Adilabad, Peddapalli and Bhadradri Kothagudem, continue to be the highly affected districts in the State.

Most of the cases have been reported during the periods of August – October. Most of them occurring during the month of June to September depict the role of rainy season in the study conducted by

Kashinkunti et al, fever was the most common symptom found in all the patients followed by headache (83.1%), Myalgia (77.3%), retroorbital pain (74.7%). Hypotension was found in 86.5% of the patients. Thrombocytopenia, leucopenia and bleeding manifestation were found in 84.0 %, 84.8% and 58.8% patients respectively. Study conducted by Kashinkunti et al, found the most common presentation was fever 100 (100%), followed by headache (90%), myalgia (81%), vomiting (56%) and abdominal pain (48%).

Discussion:

Dengue based fever can successfully recovered in 2 weeks by secondary to aggressive hydration therapy and preventative measures. Clinical presentation of Dengue can vary from being asymptomatic to very severe presenting as fever, joint pain, muscle aches, skin rash characterized by erythematic and warmth, narrow pulse pressure and delayed capillary refill. Minority of patients end up progressing to a more severe form of shock or hemorrhagic fever which includes additional hematological manifestations like pancytopenia bleeding and severe hypotension is secondary.

Images are used to demonstrate a characteristic rash with red discoloration with the upper and lower extremities. Rash is used clinically to ensure remission of patient from dengue fever after initiation of treatment.

Conclusion:

Studies have established that around 80% of dengue virus infection come from individuals who have mild or no symptoms of dengue, but are carriers, meaning that many more cases might be going unreported. The fact that people with no symptoms of dengue could be carriers was found in a study conducted in the year 2017 by the US-based University of Notre Dame.

Scientists are investigating the mechanisms by which the dengue virus causes disease by focusing on understanding dengue pathogenesis, the virus itself, and vector biology. Researchers also aim to improve diagnostics for patients with dengue so that they can receive effective treatments sooner. In addition, by improving surveillance of dengue cases and mosquito vectors, researchers hope to reduce the effect of dengue epidemics.

Control measures:

1. Use of Mosquito Repellents.
2. Wearing Protective Clothing.
3. Avoid mosquito-attracting smells.
4. Using mosquito deterrents in the home.
5. Avoid breeding grounds.

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