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# Dengue Fever : An Analysis

KEYWORDS: Dengue Fever, Dengue Virus, Haemorrhagic Fever, Dengue Virus Proteins

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**ABSTRACT** *Dengue fever is one of the major tropical diseases caused by the dengue virus. Dengue is generally found in tropical and sub-tropical climates worldwide, often in urban and semi-urban areas. Dengue haemorrhagic fever is one of the leading causes of severe illness and death among children. The Aedes aegypti mosquito is the foremost vector of dengue fever. The dengue virus is passed to the humans through the bites of infected female mosquitoes. Drugs and vaccines are not available for dengue viruses. The way to prevent dengue fever is to control Aedes aegypti mosquito vector and prevent its bite. This paper presents the analysis of dengue fever.*

## INTRODUCTION

Dengue fever is an old disease that became distributed worldwide in the tropics during the 18th and 19th centuries when there was an expansion of shipping industry and commerce. Dengue has emerged as a worldwide problem from 1950's (WHO, 2002). Dengue virus infection is now recognized as one of the important mosquito borne human infections of 21st century. Dengue fever is the mosquito-borne viral disease and most rapidly spreading in the world (WHO, 2009). Dengue fever causes a major health, social and economic trouble on the populations of widespread areas. Travelers take part in the world wide epidemiology of dengue infections. Dengue infected people carry different dengue serotypes and spread into areas by mosquitoes that can transmit infection.

The World Health Organization (WHO) estimates that the dengue infection has now increased rapidly and an estimated 50–100 million people of dengue infections are now reported annually from more than 100 countries of the world (D. Prasad et al., 2013) The dengue fever to a severe, sometimes lethal disease characterized by shock and haemorrhage, known as dengue shock syndrome/dengue hemorrhagic fever (DSS/DHF), which is on the increase (U.C. Chaturvedi, 2008). Dengue fever is caused by the four viral serotypes transmitted from infected candidates to the humans by bites of Aedes aegypti and Aedes albopictus mosquitoes (WHO, 2009, Chaturvedi, 2008). Recovery from infection by one serotype gives lifetime resistance against that serotype but gives only partial and temporary protection against subsequent infection by the other three. Subsequent infection with other type increases the risk of severe problems (Debarati Guha-Sapir, 2005).

The National Vector Borne Disease Control Program report shows that dengue is found in India and is becoming widespread too many areas (Bhavna Gupta, 2013). Aedes aegypti mosquito is a tropical and subtropical species distributed worldwide. Humans are the major host of this virus. Dengue virus circulating in the blood of infected people is ingested by female mosquitoes during feeding. The virus then infects the mosquito and consequently spreads over a period of 8 to12 days (Vivien Cherng-Hui Yip, 2012). After this period, the virus can be transmitted to other people during consequent feeding or probing.

## DENGUE VIRUS

Dengue virus is a small single-stranded RNA virus consisting four distinct serotypes DEN-1, DEN-2, DEN-3, and DEN-4. These four viruses are called serotypes because each has various interactions with the antibodies in human blood serum (Protein Data Bank). The four dengue viruses are similar and share approximately 65% of their genomes. But within a single serotype, there is some genetic variation. Except these variations, infection with four dengue serotypes results in the same disease and similar clinical symptoms (Nature Publishing Group). Figure 1 show, where all four dengue serotypes circulate together in tropical and subtropical regions around the world.

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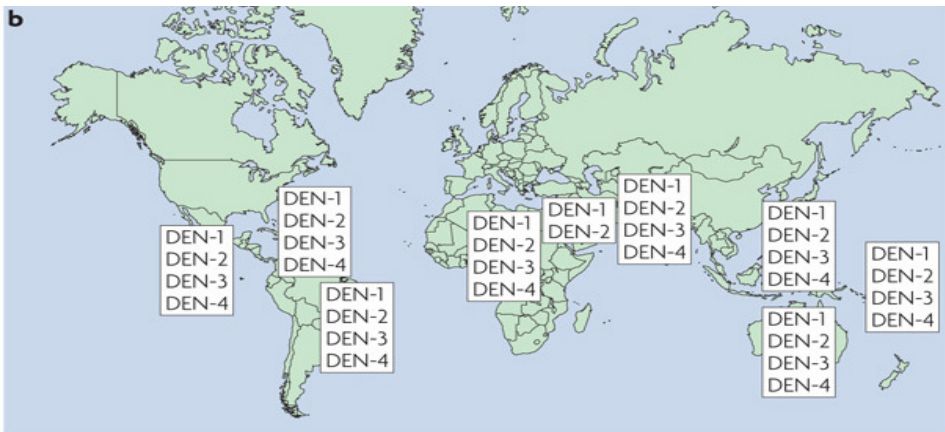


**Figure 1: The change in distribution of dengue serotypes (Nature Publishing Group). The distribution of dengue serotypes in 1970 (a) and 2004 (b).**

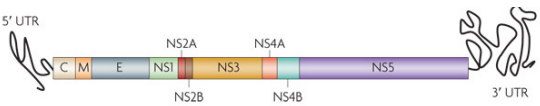


**Figure 2: Dengue virus genome**

## DENGUE VIRUS PROTEINS

Four closely related serotypes of the dengue virus belong to the genus Flavivirus, family Flaviviridae (Nivedita Gupta et al., 2012). The grown-up element of the dengue virus is sphere-shaped with a diameter of 50nm comprising a host-derived membrane bilayer, multiple copies of the three structural proteins and one copy of a positive-sense, single-stranded RNA genome (Protein Data Bank). The dengue virus genome contains approximately 11000 nucleotide bases and encodes 10 genes. The genome is translated as a single, long polypeptide and then cut into 10 proteins. Figure 2 shows the dengue virus genome and its ten proteins. Within these three are structural proteins and the remaining seven are nonstructural proteins. Three structural proteins are the capsid (C), envelope (E), and membrane (M) protein. Nonstructural proteins are NS1, NS2A, NS2B, NS3, NS4A, NS4B and NS5 (Henrique Nemesio et al., 2011).

## DIAGNOSIS AND SYMPTOMS

Dengue is not directly transmitted from person-to-person and it spread through bites of Aedes aegypti mosquitoes. Symptoms range from normal fever to unbearable high fever with severe headache, muscle and joint pain, rash and pain behind the eye (Ted M. Ross, 2010).

Diagnosis of dengue virus infection is proved in the laboratory. During the stage of fever there is viraemia with existence of NS1 antigens in blood (U.C. Chaturvedi, 2008). The presence of virus in blood is identified either by isolation of the virus using child rats or by RTPCR (Huo-Shu H. Houng et al., 2001) or in tissue culture and the NS1 is detected by ELISA. During the post feverish stage lasting a few weeks, IgG and IgM (Khoa T.D. Thai et al., 2010) antibodies are present. These antibodies are detected by Capture- ELISA (U.C. Chaturvedi, 2008). During first infection, fever and viraemia coincides, but during a second time infection, the viraemia is present for 2 to 3 days and NS1antigens in blood lasts little longer. With a newer approach, artificial NS1 receptors have been inserted on a reusable microchip that can capture and detect NS1 immediately and may be used for bedside diagnosis of dengue virus infection (Tai D.F. et al., 2006).

## NATIONAL STATUS

In India, the first epidemic of dengue like illness was recorded in Madras in 1780 and the first proved dengue fever occurred in Calcutta and Eastern Coast of India in 1963-1964 (Nivedita Gupta et al., 2012). It spread to northern and southern part of the country and gradually the whole country has the wide spread epidemics. In India also, the research is going on the dengue virus. Some of the research centers are

1. National Chemical Laboratory, Pune
2. National Institute of Virology, Pune
3. International Center for Genetic Engineering and Biotechnology, New Delhi

Achievements of Indian scientists are considerable, but the scientific studies addressing various problems of dengue disease have been carried out at limited number of centers and a lot remain to be achieved.

## PREVENTION AND CONTROL MEASURES

Dengue fever was discovered more than seventy years back but there is no effectual vaccine against it, which shows problems in its development. Scientists are sincerely engaged in developing efficient treatment measures for dengue fever (U.C. Chaturvedi, 2008). Since there is no proper treatment and vaccine for dengue infections (Klasen J, 2008), dengue vector control is the major step to prevent infection.

The main way to destroying the disease vectors is either by direct spraying on vector habitats or through the use of insecticide-treated bed nets (Raghavendra K, 2011). Dengue controlling efforts are mainly aimed at destroying/reducing mosquito breeding sites. Aedes aegypti mosquitoes breed in small, transient pools of water, as found in disposed plant axils, soda cans, air-cooler trays, roof gutters, flower pots, tires, discarded receptacles, etc., and it is practically impossible to eradicate all such breeding sites. Direct spraying on vector locations is problematic as it affects the human health and the environment negatively. Use of insecticides has been further complicated by the development of insecticide resistance in Aedes mosquitoes that makes the dengue vector control more pathetic and a challenging task (Bhavna Gupta, 2013). In order to control the development of resistance in mosquitoes against these presently working insecticides, efficient monitoring and development of alternative vector control strategies are very important.

There are no specific antiviral that can remove the virus from an infected candidates. However, treatment and supportive care can be effective in treating dengue fever. Paracetamol and other antipyretics can be used to treat fever. Bone pain should be treated by painkilling tablets or analgesics. During occurrences of dengue haemorrhagic fever/dengue shock syndrome, the death rate in the absence of hospitalization

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can be as high as 50%. With proper treatment, such as intravenous fluid replacement, the death rate is very much reduced (Ted M. Ross, 2010). Identify the area-specific knowledge on vector breeding, vector density, dengue virus serotype, susceptibility of populations and even secondary resources of dengue virus to control the infection. For effective control of disease outbreaks, precise and a rapid diagnosis of dengue fever is of vital importance (Anita Chakravarti, 2005).

**CONCLUSION**

Dengue is increasing its geographical areas mostly everywhere now and this dengue epidemiology demands efforts and support from the society for controlling the disease effectively. Dengue fever sometimes leads to death without proper treatments and care. There is no vaccine and drugs to control infection but it is curable with proper medicines and efforts. There is a need of support and dedication from public to solve these problems and minimize the human burdens.

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