

CLINIC CONSULT PEDIATRICS

Dengue



Authors
Vipin M Vashishtha
Ajay Kalra

Contents

Preface v

Acknowledgments vii

CHAPTER 1
Introduction and Epidemiology 1

CHAPTER 2
Mechanism, Pathogenesis, and Pathophysiology 10

CHAPTER 3
Clinical Manifestations 15

CHAPTER 4
Diagnosis 26

CHAPTER 5
Management 36

CHAPTER 6
Prevention 64

Appendix: Dengue in a Nutshell *73*

Bibliograpy *75*

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CHAPTER 1

Introduction and Epidemiology

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INTRODUCTION

Dengue fever is a tropical viral disease caused by the dengue virus transmitted principally by *Aedes aegypti* mosquitoe. It may lead to high fever, headache, vomiting, pain in muscles and joints, and skin rashes. In some cases, the disease develops into a severe, life-threatening situation, due to bleeding, low levels of blood platelets and blood plasma leakage (previously known as dengue hemorrhagic fever), or into severe shock (also known as dengue shock syndrome), due to dangerously low blood pressure.

Dengue can occasionally affect several other body systems, either in isolation or along with the classic dengue symptoms. A decreased level of consciousness occurs in 0.5–6% of severe cases, which is attributable either to inflammation of the brain by the virus or indirectly as a result of impairment of vital organs, for example, the liver.

Other neurological disorders have been reported, such as transverse myelitis and Guillain-Barré syndrome. Infection of the heart and acute liver failure are among the rarer complications.

The word "dengue" has Spanish origin, but it is possibly derived from "*dinga*" in the Swahili phrase "*Ka-dinga pepo*", which means the disease is caused by an evil spirit.

The virus has five different serotypes. The earlier known four main serotypes were named DEN1, DEN2, DEN3, and DEN4. Infection with one type usually gives lifelong immunity to that type, but only short-term immunity to the others. Subsequent infection with a different type increases the risk of severe complications.

HISTORY

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 primary vector, *Aedes aegypti*, spread out of Africa in the 15th–19th centuries due to increased globalization and secondary to the slave trade. There have been descriptions of epidemics in the 17th century, but the most plausible early reports of dengue epidemics are from 1779 and 1780, when an epidemic swept across Asia, Africa, and North America. From that time until 1940, epidemics were infrequent.

Transmission of dengue by the *Aedes* mosquitoes was confirmed in 1906, and in 1907, dengue was the second disease (after yellow fever) that was shown to be caused by a virus. The basic understanding of dengue transmission was first described by John Burton Cleland and Joseph Franklin Siler.

VIROLOGY

Dengue fever virus (DENV) is an RNA virus of the family Flaviviridae; genus *Flavivirus*. Other members of the same genus include yellow fever virus, West Nile virus, St. Louis encephalitis virus, Japanese encephalitis virus, tick-borne encephalitis virus, Kyasanur forest disease virus, and Omsk hemorrhagic fever virus. Most are transmitted by arthropods

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(mosquitoes or ticks), and are therefore also referred to as arboviruses (*ar*thropod-*bo*rne viruses).

The dengue virus genome (genetic material) contains about 11,000 nucleotide bases, which code, for the three different types of protein molecules (C, prM, and E) that form the virus particle and seven other types of protein molecules (NS1, NS2a, NS2b, NS3, NS4a, NS4b, and NS5) that are found in infected host cells only and are required for replication of the virus. There are five strains of the virus, called serotypes, of which the first four are referred to as DENV1, DENV2, DENV3, and DENV4. The fifth type was announced in 2013. The distinctions between the serotypes are based on their antigenicity.

EPIDEMIOLOGY

Burden

Dengue is common in more than 110 countries. Each year between 50 and 528 million people are infected and approximately, 10,000–20,000 die (Figure 1). The earliest descriptions of an outbreak date from 1779.

Global

According to one study, around 3.9 billion people, in 128 countries, are at risk of infection with dengue viruses. One recent estimate (2013) indicates 390 million dengue infections per year of which 96 million manifest clinically (with any severity of disease), with 18% admitted to hospital and about 13,600 died.

It is reported in at least 22 countries in Africa; but is likely present in all of them with 20% of the population at risk. It has now spread to south China, Pacific Ocean countries, and America with increased threat of reaching Europe.

The America, South-East Asia, and Western Pacific regions are the most seriously affected (Figures 2 and 3).

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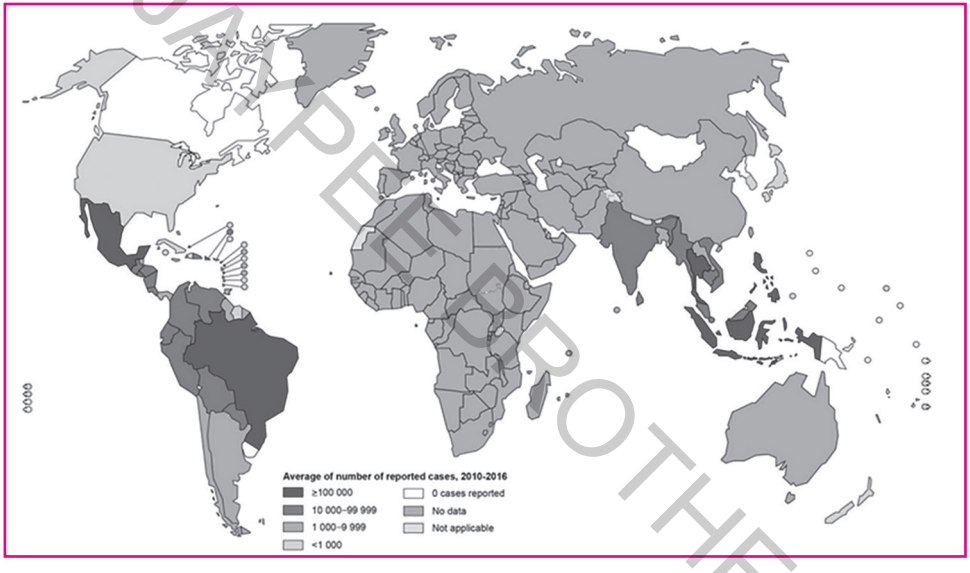


Figure 1: Distribution of dengue, worldwide, 2016. ***(For color version, see Plate 1)***

Source: World Health Organization (WHO). Map production: Control of Neglected Tropical Diseases, WHO.

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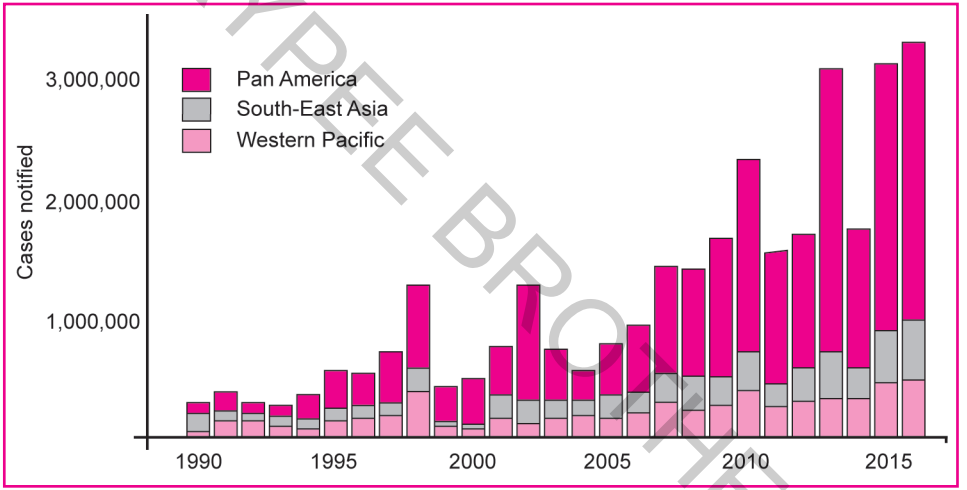


Figure 2: Number of cases, Global, 1990-2016.

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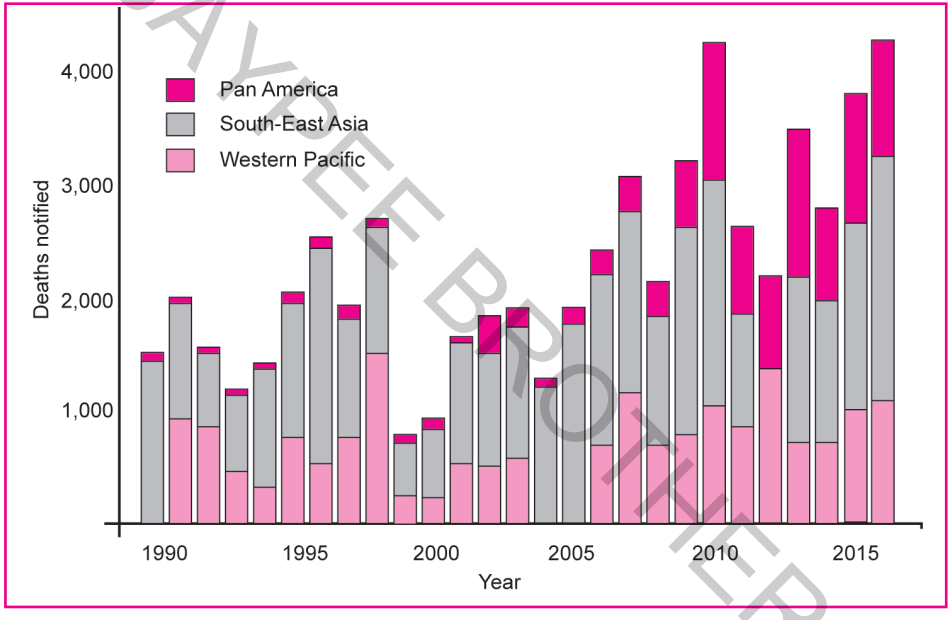


Figure 3: Number of deaths, Global, 1990-2016.

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Local transmission of dengue was reported for the first time in France and Croatia in 2010 and imported cases were detected in 3 other European countries. In 2012, outbreaks of dengue were reported from Portugal and 10 other countries in Europe. In 2015, 2.35 million cases of dengue were reported in the America alone, of which 10,200 cases were diagnosed as severe dengue causing 1,181 deaths. In the year 2016, the America region reported more than 2.38 million cases and 1,032 deaths. Brazil alone contributed slightly less than 1.5 million cases. In 2017 (till week 11), the Region of America have reported 50,172 cases.

The Western Pacific Region reported more than 375,000 cases of dengue in 2016, of which the Philippines reported 176,411 and Malaysia 100,028 cases.

Overall, an estimated 500,000 people with severe dengue are admitted every year out of which about 2.5% die. This makes it one of the most common vector-borne diseases worldwide. The worldwide cost of dengue case is estimated US$9 billion.

South-East Asia

For the decade of the 2000s, 12 countries in Southeast Asia were estimated to have about 3 million infections and 6,000 deaths annually.

India

In the years 2015 and 2016, India has reported more than 100,000 cases with around 250 deaths each year (Figure 4). In 2015, Delhi recorded its worst outbreak since 2006 with over 15,000 cases. Till July 2, 2017, the number of cases of dengue reported in the country is 18,760, maximum being from Kerala (9,362) and Tamil Nadu. It is estimated that the probable number of cases should be 34,875. About 80 persons are suspected to have died.

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Your Everyday Clinical Companion

Key features

- An up-to-date monograph on dengue that covers all aspects of the disease in a concise manner
- Provides a focused summary of epidemiology, microbiology, clinical assessment, diagnosis, and management of this complex clinical problem, which will be invaluable for clinicians
- Provides a clear understanding of dengue scenario in India as well as the global perspective and the challenges associated with it
- Each chapter ends with a key message that summarizes the discussion
- Written by experts with an enormous knowledge- and skill-base
- In summary, it is a clinical guide for all medical practitioners, undergraduate and postgraduate students, and the nurse practitioners.

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