

Dengue Fever

Introduction

Dengue fever is an arthropod borne virus of the genus *Flavivirus*, and within the family *Flaviviridae*. Other flaviviruses include Japanese encephalitis and yellow fever. There are four distinct serotypes of dengue virus (DEN 1, DEN 2, DEN 3 and DEN 4) all of which have the potential to cause either classic dengue fever (DF) or the more serious form of the disease, dengue haemorrhagic fever (DHF). Dengue is transmitted by the bite of an infective *Aedes* mosquito.

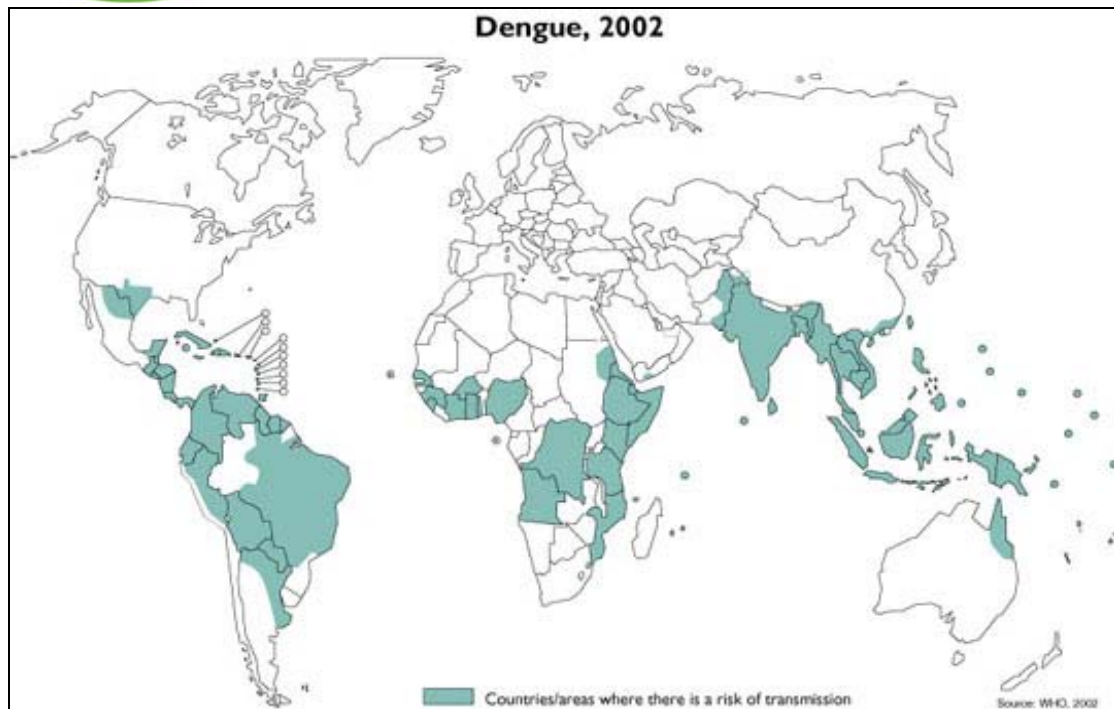
Epidemiology

(Data from the Travel Health Surveillance Section of the Health Protection Agency Communicable Disease Surveillance Centre)

Global Epidemiology

Dengue has been reported since the 18th century and major epidemics occurred at intervals of 10 to 40 years in Asia, Africa, and North America. The *Aedes* mosquito and the dengue virus were dependent on sailing vessels to transport them from one population to another, and when a new serotype was introduced, new epidemics occurred¹. This also meant that the outbreaks tended to be focused mainly in seaports. The epidemiology of dengue changed after the Second World War, due to increasing economic growth and the urbanisation of South East Asia in particular, where millions of people moved to the cities. Urban centres grew rapidly, often with inadequate water and sewage systems, thus providing a perfect environment for the *Aedes* mosquito to breed². The dengue virus spread rapidly and the disease developed into pandemic proportions.

An increase in commercial air travel has subsequently aided the transmission of the virus between populations so that dengue is now endemic in over 100 countries throughout tropical and sub-tropical areas of the world. The principle areas affected include the Caribbean, South and Central America, Mexico, Africa, the Pacific Islands, South East Asia, Indian Sub-Continent, Hawaii and Australia (see map). By 2002, more than 2.5 billion people were at risk of infection (roughly 40% of the world's population). It is also estimated that annually, there are 100,000 cases of dengue haemorrhagic fever (DHF) in tropical Asia and the Caribbean, mainly in children, which can be caused by any of the four serotypes of the dengue virus. Epidemic dengue increased in East Africa in the 1980s, and all four serotypes have now been documented throughout the African continent. The continued increase in urbanisation, population growth and global travel introduces the co-circulation of different serotypes into new populations.



This map is reproduced with acknowledgment to the World Health Organisation.

The highest burden of disease occurs in SE Asia and the Western Pacific, but over the last few years there has also been a rising trend in South America and the Caribbean. To standardise the reporting of dengue and improve the quality and accuracy of dengue statistics, the World Health Organization (WHO) has created DengueNet³. This is an online database containing dengue statistics from 1955 to 2002.

Figure 1 Worldwide reports of Dengue Fever¹ from DengueNet, 1980 - 2002²

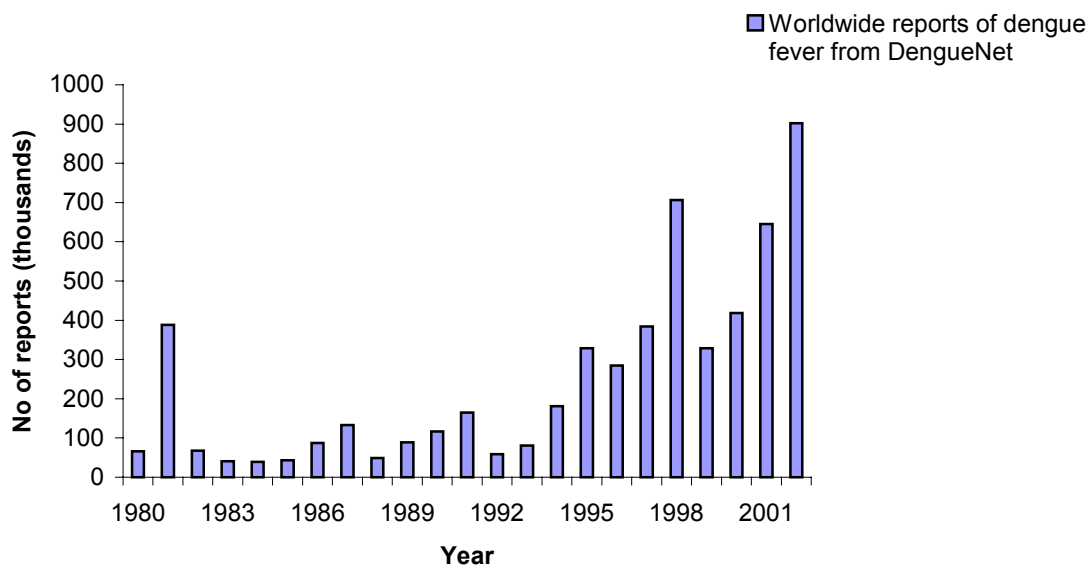


Figure 1 shows the worldwide figures for dengue fever as reported by DengueNet. There has been a general increase in worldwide incidence from 1980 to 2002 with high peaks in 1981, 1998 and 2002. The peak in 1982 was due to an explosive outbreak that started in Cuba in May 1981, resulting in over 300,000 cases of dengue fever, including 10,000 cases of DHF and 158 deaths⁴. Dengue epidemics tend to be cyclical and this is illustrated by Figure 1.

¹ Dengue fever figures include cases of dengue haemorrhagic fever.

² Figures for 2002 are from a pilot test of the DengueNet system, are not official country information and need to be interpreted with caution.

Dengue fever in UK travellers

Dengue fever has been imported into the UK in small numbers. Table 1 shows the number of dengue cases that have been diagnosed by the Specialist Pathogen Laboratory at the Health Protection Agency, Porton Down (Formerly the Centre for Applied Microbiology and Research, CAMR) in 2001 and 2002.

Table 1 Laboratory reports of dengue fever in the UK, 2001 and 2002.

Year	Confirmed ³	Probable ⁴	Possible or Past infections ⁵	Total
2001	40	57	101	198
2002	39	56	147	242

In 2001, 69% of the total dengue reports had a travel history and of those, the majority of cases were acquired in Thailand, India, Malaysia, Indonesia and Sri Lanka. In 2002, of the reports with a travel history, the majority of cases had also travelled to Asia. (Information on specific countries was not available at the time of writing.)

Risk for Travellers

The chance of contracting DF is determined by several factors including travel destination, length of exposure in endemic areas, the intensity of dengue transmission, and the season of travel.

Risk of infection is thought to be higher during periods of intense mosquito feeding activity (2-3 hours after dawn and during the early evening)⁵.

There is a risk of infection for all travellers to tropical countries where dengue is endemic, although determining the actual level of risk of illness may be difficult. Several studies have demonstrated that travellers who spend a long period in endemic areas (such as expatriates or aid workers) are at increased risk, however, even short-term visitors may be at risk^{6,7,8}.

³ Confirmed by PCR and IgM

⁴ IgG and IgM positive

⁵ IgG positive

Transmission

Transmission occurs following a bite from an infected *Aedes* mosquito. Worldwide, *Aedes aegypti* is the usual species to transmit dengue virus although geographical variation occurs.

The cycle of transmission typically involves humans and mosquitoes. The virus is spread from an infected human to mosquito to human, often in areas of dense population. In parts of South-East Asia and Africa, the transmission cycle may involve jungle primates (monkeys) that act as a reservoir for the virus.

The *Aedes* mosquito prefers to breed in water-filled receptacles close to human habitation. Although they are most active during daylight hours biting from dawn to dusk, they will feed throughout the day indoors and during overcast weather. The mosquito becomes infective 8-10 days after feeding and remains infectious for life (2-3 months).

Signs and symptoms

Studies from populations where dengue is endemic suggest that between 14 and 87% of cases are asymptomatic or sub-clinical^{10, 11, 12}. The incubation period of DF is 5 to 8 days. In previously non-immune persons, dengue begins with a fever lasting 1 to 5 days. The fever may subside and then recur after a few days. Common symptoms include headache, myalgia, and cough. A maculopapular rash, which typically spreads from the trunk to include the limbs and face, occurs between days 3 and 5 of the illness. Most infections are self-limiting with improvement in symptoms and rapid recovery occurring three to four days after the onset of the typical rash.

DF may, however, progress to the more serious dengue haemorrhagic fever (DHF). It is not certain what precipitates such progression, although it has been suggested that previous infection with a different sub-type of the virus predisposes to DHF when a person becomes re-infected. This form of dengue is more common in children and rarely seen in travellers.

When DHF occurs there is a sudden deterioration in condition between days 2 to 7. There may be bleeding under the skin (purpura), from the gums and from the gastrointestinal tract. The individual may develop shock. Respiratory failure or renal failure occurs in severe cases. Mortality rates in uncontrolled shock have been as high as 40 – 50%; with good physiologic fluid replacement therapy, rates should be 1 – 2%¹³.

Lifelong immunity to the infecting virus serotype occurs in those who recover, however, infection with one serotype does not confer any immunity to the other 3 serotypes or to other flaviviruses.

Treatment

There is no specific antiviral treatment in either classic dengue or DHF. Supportive nursing care and symptomatic management are the standard.

Prevention

There is no vaccine to prevent dengue fever. Prevention is by minimising mosquito bites especially during daylight hours. Particular vigilance with [bite precautions](#) should be taken around dawn and dusk.

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Reading list

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