

## **Dengue: A Mosquito-Borne Epidemic**

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Dengue is the most important arthropod transmitted human viral disease, and constitutes an important worldwide health problem including Bangladesh. Dengue is caused by dengue virus (DENV1, DENV2, DENV3 and DENV4). Dengue virus is transmitted by female mosquitoes mainly of the species *Aedes aegypti* and, to a lesser extent, *Ae. albopictus*. These mosquitoes are also vectors of chikungunya, yellow fever and Zika viruses.

The global incidence of dengue has grown dramatically in recent decades. About half of the world's population is now at risk. There are an estimated 390 million infections each year. Despite a risk of infection existing in 128 countries [1], 70% of the actual burden is shouldered by Asia [2]. Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas. Even rural areas are beginning to be affected in some countries. According to the Directorate General of Health Services (DGHS), Bangladesh, some 50,176 dengue patients were identified throughout the country in between 2000 and 2018 end. Risk is present throughout Bangladesh and year-round with peak transmission during the monsoon season, from June to September. Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and

semi-urban areas. Even rural areas are beginning to be affected in some countries.

The virus is transmitted to humans through the bites of infected female mosquitoes, primarily the *Aedes aegypti* mosquito. Mosquitoes can become infected from people who are viremic with DENV from 2 days before the onset of symptoms of the illness [3, 4], up to 2 days after the fever has resolved [5]. An infected mosquito is capable of transmitting the virus throughout its life time. Dengue cannot be spread directly from human to human, though there is evidence of the possibility of maternal transmission (from a pregnant mother to her baby) but vertical transmission rates appear very low.

The *Aedes aegypti* mosquito lives in urban habitats and breeds mostly in man-made containers like Earthenware jars, metal drums, concrete cisterns used for domestic water storage, discarded plastic food containers, used automobile tires and other items that collect rainwater. *Ae. aegypti* is a day-time feeder; its peak biting periods are early in the morning and in the evening before sunset [6]. Female *Ae. aegypti* frequently feed multiple times between each egg-laying period [7]. Once a female has laid her eggs, about 5-7 days required from eggs to become adult mosquitoes. The eggs can lie dormant in dry conditions for up to about

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9 months, after which they can hatch if exposed to favourable conditions, i.e. water and food.

Dengue causes a wide spectrum of disease ranging from subclinical disease (asymptomatic) to febrile illness i.e 'Dengue Syndromes', which encompass undifferentiated fever, Dengue fever and severe dengue (Dengue haemorrhagic fever and Dengue shock syndrome). Severe dengue has a higher risk of death when not managed appropriately. Severe dengue was first recognized in the 1950s during dengue epidemics in the Philippines and Thailand. Today, severe dengue affects most Asian and Latin American countries and has become a leading cause of hospitalization and death among children and adults in these regions. Because of these varied presentation, there is every chance of misdiagnosis of dengue fever as other febrile illness [8].

Classical symptoms of dengue fever are high fever (39 °C and 40 °C or 102° F to 104° F), retro-orbital pain, photophobia, backache, severe pain in the muscles and joints/bones (Break bone fever) and rash (maculopapular or rubelliform).

Dengue fever is diagnosed clinically (high suspicion i.e. patient with fever residing or returning from endemic area) and confirmed by detection of NS1 antigen (non-structural protein 1) (Rapid ICT or ELISA) which is positive from first day of illness but becomes negative from day 4-5 of illness. NS1 rapid antigen is an excellent test for confirmation of dengue syndrome.

Anti-dengue IgM/IgG are also helpful but interpretation is a bit difficult. Detection of virus by PCR is confirmatory but not widely available.

There is no specific treatment for dengue/severe dengue. Early detection of disease progression associated with severe dengue, and access to proper medical care (appropriate fluid replacement) lowers fatality rates of severe dengue to below 1%.

Symptomatic treatment for fever and bodyache with paracetamol is sufficient. NSAIDS should be avoided.

Dengue prevention and control depends on effective vector control measures. Sustained community involvement can improve vector control efforts substantially. The proximity of mosquito vector breeding sites to human habitation is a significant risk factor for dengue as well as for other diseases that these species transmit. At present, the main method to control or prevent the transmission of dengue virus is to combat the mosquito vectors. This is achieved through:

- Prevention of mosquito breeding in and around houses and places of work, schools and health facilities;
- Personal protection from mosquito bites;
- Community engagement.

A dengue vaccine (Dengvaxia) has been licensed in December 2015 and has now been approved by regulatory authorities in ~20 countries. Dengvaxia vaccine is the live attenuated dengue vaccine (CYD-TDV).

We hope that vaccine will be widely available in near future and should be considered as part of an integrated dengue prevention and control strategy.

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