

# DENGUE OUTBREAKS IN BANGLADESH

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Dengue is a mosquito-borne viral disease. This is one of the leading causes of acute febrile illness as well as acute systemic viral infection in tropical and subtropical countries in the last few decades. Infection with Dengue virus in humans ranging widely in severity from a mild fever with spontaneous remission to life-threatening hemorrhagic fever and/or shock syndrome. The etiological agent of dengue fever (DF) is Dengue virus (DENV), is a single stranded RNA virus belongs to the genus *Flavivirus* of the family *Flaviviridae*. The virus is transmitted to human by infected *Aedes* mosquitoes. Vectors are of two types *Aedes aegypti* and *Aedes albopictus*. Population bloom, unplanned urban development, poor water management and behavior of the people is responsible for emerging of this disease. There are four antigenically distinct serotypes of DENV (DENV-1 to DENV-4) and all of them are found in the tropical and subtropical regions across the globe. Human infection with one serotype confers long-lived serotype-specific immunity. Preexisting antibody cannot confer protection against another serotype, rather secondary infection with heterologous type is frequently associated with severe clinical manifestations e.g. dengue hemorrhagic fever/dengue shock syndrome (DHF/DSS). For better control of dengue, it is essential to understand the proportion of the infections and to monitor circulating DENV serotypes in a target population. It is necessary to identify the circulating serotype of dengue virus at the beginning of every season for prediction of disease amplitude and severity of the disease in coming season. The increased transmission rate during the months of April–July, a

seasonally determined peak, indicates for a potential opportunity to strengthen a range of public health interventions. Currently, July–September is considered as the dengue outbreak period in Bangladesh and thus resources are allocated to control the vector mosquitoes more intensively during this period of the year. These data showed that dengue cases are consistently increasing at a much higher rate during April–July compared to the rest of the months examined and thus piloting a vector control programme that starts earlier in the season, might be more efficient in limiting the dengue outbreaks in Bangladesh.

In Bangladesh, the first documented case of dengue like fever was documented in 1964. At that time it was named as “Dacca fever” which later on serologically proved as dengue fever.<sup>1</sup> Sporadic cases of dengue fever (DF) during 1977–78 and 1996–1997 might occur but undetected due to under-reporting. So the extent of dengue prevalence in those periods is poorly documented in Bangladesh. It was observed that sporadic or ongoing transmission occurred during the 1964 to 1978 and 1978 to 1997 time frames, but The first identified epidemic of DF and dengue hemorrhagic fever (DHF) in Bangladesh, took place during the monsoon season of 2000, and resulted in 5,521 officially reported cases with 93 fatalities.<sup>2,3</sup> So dengue became an emerging public health problem in Bangladesh in 2000. Then it became endemic in more than 100 countries and approximately 4 billion people at risk of contracting the disease and 96 million human cases per year.<sup>4</sup> There is upward trend of severe infections in Southeast Asia, Africa, South America and Western Pacific countries. At

present, the WHO Southeast Asia Region (SEAR) is considered hyperendemic for multiple Dengue virus (DENV) serotypes. From 2000–2009, 91.0% of all reported dengue cases were from Dhaka making it the most endemic urban area of the country<sup>5</sup>. Cases of DF were clustered during the time periods: 2000–2002, 2003–2005, and 2006–2009 and Dhaka was the locality with ‘the most likely cluster for DF in all three periods’.<sup>6</sup> According to World Health Organization (WHO) Bangladesh is one of the 10 countries of the Southeast Asia Region where 52% of world’s total population at risk of dengue fever.<sup>8</sup> Since 2003, the death rate has declined gradually, with zero fatalities in subsequent years. Since 2009, the number of reported dengue cases was also declined in Bangladesh<sup>7</sup> But there was a devastating turn with 10,148 cases and 26 deaths in 2018. In 2019, during January to July, number total cases were 18,484, with 57 deaths. In the year 2019-2022, there was significant increase in number of cases occurring throughout the country and even from the rural areas but the case fatality rate (CFR) was not very high. The intensity of dengue activity has varied from year to year, and its determining factors remained relatively unknown.

Bangladesh has been experiencing episodes of dengue fever in every year since 2000. All four serotypes have been detected, with DENV-3 predominance until 2002. During 2013-2016, DEN2 was predominant followed by DEN-1 in circulation. IEDCR predicted that as the serotypes DENV-3 and DENV-4 are in circulation in the neighboring countries, they may create epidemics of secondary dengue in the near future in Bangladesh. In 2013, DEN2 was the only serotype that was in circulation in Chittagong and Khulna metropolitan cities, whereas in Dhaka, along with DEN2, DEN1 (31%) was also found to be circulated. In 2014, it was observed that DEN1 began to spread outside Dhaka and emerge in Chittagong, but still Khulna was free from DEN1. In 2015, DEN1 appeared in the circulation along with DEN2. In 2016, DEN2 became the predominant strain with existence of DEN1 in all three cities. In 2017, reemergence of DENV-3 was identified;

subsequently there was a sharp rise in dengue cases from the beginning of the monsoon season in 2018. There is the re-emergence of DEN 4 in Dhaka city since 2000. In 2021, the circulating strain was DEN3 in Dhaka city. Primary infection with DEN1 and DEN3 owing to severe clinical manifestation compared to other serotypes has been reported. Dengue hemorrhagic fever occurs more frequently with DENV-2 or DENV-3 infections in DENV-1 exposed individuals. Circulation of more than one serotype or introduction of new serotype of DENV at the same time usually confers severity of the Dengue infection. Primary infection with DEN 4 usually causes mild infection but can cause severe clinical manifestation when cross reacts with another serotypes. Past exposure to dengue virus was highly associated with age, possession of indoor potted plants, types of mosquito control measures used, and human movement and attendance in mass gatherings.<sup>9</sup> These are important factors that affect exposure to dengue. Intervention strategies should therefore target to the factors e.g. water management or storage practices and recognition and elimination of mosquito development sites and participation in mass gatherings for effective prevention and control of dengue infection. The reasons for increased incidence and rapid geographic spread of dengue are not fully understood but effective vector control is most important determining factor for DENV transmission. On the other hand it is also important to determine the epidemiological, socioeconomic and ecological factors and the dynamics of exposure to DENV infection, risk and epidemic potential.

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