



Prevalence of Dengue Virus Serotypes of 2021 Dengue Outbreak in Dhaka, Bangladesh

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Letter to the Editor

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Sir,

Dengue is a self-limiting febrile illness caused by four serotypes of dengue viruses (DENVs)-DENV1-4 [1]. Bangladesh being a tropical country is hyperendemic for dengue as it serves as an ideal habitat for the female *Aedes aegypti* and *A. albopictus*– mosquito vectors for DENVs, and thus, vulnerable to annual dengue outbreaks during the monsoon season which provides perfect egg-laying shallow, still-water habitats [2,3,4]. While it mostly leads to silent or mild-moderate symptoms, disease severity is often increased with reemergence of a serotype of DENV following years of absence, especially in cases of heterologous secondary dengue [5]. Since the first reported case in Bangladesh in 1964, dengue has occurred sporadically in the country with increased incidence every few years

and sometimes with all four DENV serotypes in circulation, as observed in 2000 [6,7]. In 2019, Bangladesh endured the worst dengue outbreak with DENV3 being the predominant serotype after its re-emergence in late 2017 since abstinence from circulation from 2002 [5,8]. To prevent a potential epidemic with a surge of cases with increased severity and mortality rate, nationwide preparedness through identification of circulating DENV serotypes is instrumental. As such, this study aimed to identify the prevalence of circulating DENV serotypes in the 2021 dengue outbreak in Dhaka, Bangladesh.

DENV RNA detection and serotyping was conducted with 90 NS1-antigen-positive samples, collected from consenting dengue patients from the out-patient department over a 6-month period from June to November, 2021.

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DENV RNA was detected via the Dengue virus real-time PCR detection kit (VISASURE, CerTest Biotec SL, Spain) and Multiplex real-time RT-PCR with Dengue differentiation kit (Fast-track Diagnostics, Sliema, Malta) was later carried out with the RNA positive samples for serotyping the DENVs in the samples. Anti-dengue IgG and IgM testing was done using SD BIOLINE Dengue IgG/IgM WB Test kit (Standard Diagnostics, Inc., Gyeonggi-do, Republic of Korea).

Among the NS1-positive samples, DENV RNA was detected in all (100%) patients. Among them, 88 (97.8%) samples were positive for DENV3, while 2 (2.2%) were DENV2-positive. Only DENV3 was detected in all 60 samples from June 2021 to September 2021 while in October-November 2021, 28 samples (93.3%) were DENV3 positive, and 2 (6.7%) samples tested positive for DENV2 (Fig. 1). This study also revealed that sixty-one (67.80%) of the dengue-patients had secondary infections with 59 (67.05%) cases being DENV3 and 2 (100%) being DENV2. The result, however, was not statistically significant (Chi-square, $P>0.05$).

This study, thus, identified DENV3 as the predominant DENV serotype in the 2021 dengue outbreak in Dhaka, Bangladesh with DENV2 being in co-circulation while observing the absence of DENV1 and DENV4. DENV1 was absent from circulation for the first time in the last decade [8,9]. The dwindling prevalence of DENV1 and DENV2, and absence of DENV4 were substantiated by the findings of Institute of Epidemiology, Disease Control & Research (IEDCR), Bangladesh, which showed that while

DENV1's prevalence had decreased from 50% in 2015 to 0% in 2021, DENV2's prevalence had also declined from 76% in 2016 to 0% in 2021⁸. Henceforth, while the surveillance reports of IEDCR had not reported any DENV2 cases in Bangladesh in 2021 [8], this study found two DENV2 cases in October-November study period (Fig. 1). With the majority (67.80%) of cases being secondary infections, explains an increased severity of DENV infections, as evident by a reported 57 dengue deaths among 15,000 cases since January, 2021 with another study reporting 98 deaths among 26,000 cases till November, 2021 [10,11]. Dengue being hyperendemic in Bangladesh explains the predominance of secondary dengue infections among the study population, as a significant percentage of the Bangladeshi population had prior exposures to dengue, particularly DENV2 which had been in circulation for the last few decades and DENV3 which has been prevalent since its reemergence in late 2017 [4].

This study concluded that DENV2 and DENV3 were the circulating DENV serotypes in the 2021 dengue outbreak in Dhaka, Bangladesh with DENV3 being predominant. It was also revealed that most of the cases were secondary dengue infections. Since majority of the cases were secondary infections which may have increased disease severity, studies to ascertain the circulating DENV serotypes must be carried out annually in Bangladesh to prevent unexpected reemergence of DENV1 or DENV4 after possible prolonged absence, as such an unforeseen circumstance without nationwide preparedness could lead to a massive outbreak with significant casualties.

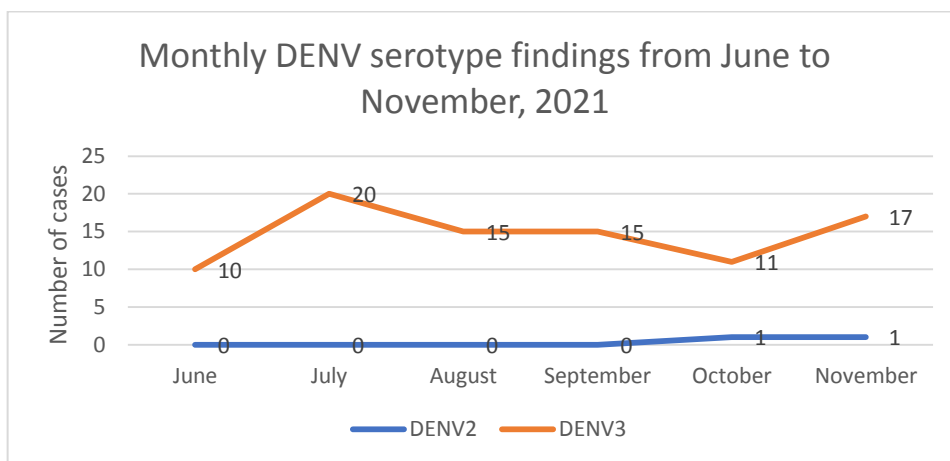


Fig. 1. Monthly DENV serotype findings from June to November, 2021

CONSENT

It is not applicable.

ETHICAL APPROVAL

Ethical approval was obtained from the Institutional Review Board (IRB) of Bangbandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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