

Title: Two Decades of Endemic Dengue in Bangladesh (2000-2022): Trends, Seasonality, and impact of Temperature and Rainfall Patterns on transmission dynamics

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Abstract: Background The objectives of this study were to compare the dengue virus (DENV) infection, deaths, case-fatality ratio, as well as meteorological parameters between the first and the recent decade (2000-2010 vs. 2011-2022) and to understand the trends, seasonality, and impact of change of temperature and rainfall pattern on transmission dynamics of Dengue in Bangladesh

Methods For the period 2000-2022, dengue cases and death data from Bangladesh's Ministry of Health and Family Welfare's website, and meteorological data from the Bangladesh Meteorological Department were analyzed. Mann-Kendall and Sen's slope tests were used for trends and variations and fitted a time series Poisson regression model to identify the impact of meteorological parameters on the incidence of dengue cases. A forecast of dengue cases was performed using an autoregressive integrated moving average model.

Results Over the past 22 years, a total of 244,246 dengue cases were reported including 849 deaths (Case fatality ratio [CFR] =0.34%). The mean annual number of dengue cases increased eight-fold during the second decade, with 2216 cases during 2000-2011 vs. 18,321 during 2012-2022. The mean annual deaths have doubled (21 vs. 46) although the overall CFR had decreased to one-third (0.69 vs 0.24). Between the periods, the annual temperature increased by 0.49 °C, and rainfall decreased by 314 mm despite increasing unusual rainfall in the pre-and-post monsoon period. An increasing trend of dengue cases is observed with a much stiffer rise after 2018. Monthly mean temperature (Incidence risk ratio [IRR]: 1.26), first-lagged rainfall (IRR: 1.08), and second-lagged rainfall (IRR: 1.17) were significantly associated with monthly dengue incidence.

Conclusions The increased local temperature and unusual rainfall might have contributed to the increased incidence of DENV infection in Bangladesh. Community engagement, vector control, and destruction of mosquito habitats are key to controlling dengue.

Keywords: Dengue Virus (DENV) Epidemiological Trends Temperature and Rainfall Variability Time Series Analysis Mann-Kendall Test Poisson Regression Model

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