



Seasonal and Interannual Trends in Largest Cholera Endemic Megacity: Water Sustainability - Climate - Health Challenges in Dhaka, Bangladesh

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The last three decades of surveillance data shows a drastic increase of cholera prevalence in the largest cholera-endemic city in the world – Dhaka, Bangladesh. Emerging megacities in the region, especially those located in coastal areas also remain vulnerable to large scale drivers of cholera outbreaks. However, there has not been any systematic study on linking long-term disease trends with related changes in natural or societal variables. Here, we analyze the 30-year dynamics of urban cholera prevalence in Dhaka with changes in climatic or anthropogenic forcings: regional hydrology, flooding, water usage, changes in distribution systems, population growth and density in urban settlements, as well as shifting climate patterns and frequency of natural disasters.

An interesting change is observed in the seasonal trends of cholera prevalence; while an endemic upward trend is seen in the dry season, the post-monsoon trend is epidemic in nature. In addition, the trend in the pre-monsoon dry season is significantly stronger than the post-monsoon wet season; and thus spring is becoming the dominant cholera season of the year. Evidence points to growing urbanization and rising population in unplanned settlements along the city peripheries. The rapid pressure of growth has led to an unsustainable and potentially disastrous situation with negligible-to-poor water and sanitation systems compounded by changing climatic patterns and increasing number of extreme weather events. Growing water scarcity in the dry season and lack of sustainable water and sanitation infrastructure for urban settlements have increased endemicity of cholera outbreaks in spring, while record flood events and prolonged post-monsoon inundation have contributed to increased epidemic outbreaks in fall.

We analyze our findings with the World Health Organization recommended guidelines and investigate large scale water sustainability challenges in the context of climatic and anthropogenic changes in the region. Our findings may prove to be useful in both water sustainability and disaster management perspectives as the dry and wet seasonal trends are affecting both endemic and epidemic outbreaks, respectively, and are influenced by distinctly different seasonal and interannual drivers.