Review: Cholera dynamics due to climatic variables and modeling

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Abstract

Cholera is a global killer with the world especially developing countries of Asia, Africa and Latin America witnessing an extraordinary rise in cholera infection and transmission since the 1990s. This paper presents a review of the literature dealing with the influence of climatic stresses on cholera dynamics in Asia, Africa and Latin America. Climatic changes and an increase in extreme weather events (extreme temperature, drought or rainfalls) have been linked to the cholera incidences/outbreaks. Cholera outbreaks show biannual peaks in its native homeland, the Bengal Delta (Bangladesh and a part of India) while it shows a single annual peak infection pattern in the most affected areas of the world. The procedure behind this dual peaks has been described as a consequence of low flows in the major rivers Ganges and Brahmaputra enhancing coastal phytoplankton to encroach to the inland that can cause pre-monsoon peak cholera outbreak and as a consequence of high flows sourcing floods that might be the reason of post-monsoon peak of cholera outbreaks. Coastal phytoplankton in the Bengal Delta has a unique positive relation with the increase of sea-surface temperature while in the most coastal areas of the world this is inversely related. This paper also reviews of climate variation-guided mathematical models done on cholera; and reveals that there is a research gap of evaluating the impact of future extreme climatic variables that might be accountable for further increase of peaks of cholera outbreaks in many regions of the world.

Keywords: Review; cholera outbreaks; climatic variables; mathematical models