Relation of cholera outbreaks and climatic variables

Salima Sultana Daisy[1*], A K M Saiful Islam[1], Peter Kjær Mackie Jensen[2], Ali Shafqat Akanda[3],

Emily S. Gurley[4]

[1] Institute of Water and Flood Management, Bangladesh University of Engineering and Technology, Dhaka 1000, Bangladesh

[2] University of Copenhagen, COPEnhagen Center for Disaster Research, Institute of Public Health, Øster Farimagsgade 5a, Building 24, 2 floor, 1353 Copenhagen K, Denmark

[3]Department of Civil and Environmental Engineering, University of Rhode Island, Kingston, Rhode Island, USA

[4] Programme for Emerging Diseases, Emerging Infections, Infectious Diseases Division, International Centre for Diarrheal Disease Research, Bangladesh (icddr,b), Mohakhali, Dhaka, Bangladesh

[*] Corresponding author,emails: salima.sdaisy@gmail.com, phone: +8801712159895

ABSTRACT

Cholera is a major public health problem, which alone contributes around 1.4 billion people at risk globally. Recently, many studies have indicated the enhancement of the potential risks of cholera under the changing climate. Hence, a systematic review to summarize worldwide published literatures about the relation between the cholera incidence and climatic variables has been conducted. Additionally, as one of the highest cholera incidents reported in Bangladesh, we have done statistical cross-correlation with cholera incident in Dhaka with its triggering climatic

variables such as mean relative humidity, maximum temperature and rainfall of Dhaka city. Cross-correlation analysis has been conducted using monthly cholera incidence from icddr,b for the past 14 years (2000-2014) and meteorological data from Bangladesh Meteorological Department (BMD). A significant correlation with cholera has found with monthly mean maximum temperature (r = 0.50, p<0.001) and mean total rainfall (r = 0.38, p<0.001). Seasonal Auto-Regressive Integrated Moving Average (SARIMA) model was used to determine the impact of climatic variables on cholera. The SARIMA $(1,0,0)(1,0,0)^{12}$ model revealed that AR and SAR (p<0.001) were highly significant with seasonal difference. Literature review also confirms that climatic variables are associated with cholera in different scales in different countries. Climatic variables have significant relations with the cholera outbreaks that might be used for preparedness of cholera outbreaks all over the world.