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GEO-SPATIAL MODELLING OF INFECTIOUS DISEASE OUTBREAKS AND RISK ZONING IN THE STATE OF WEST BENGAL, INDIA

Abstract

Malaria, Cholera and Viseral Leishmaniasis are some of the common diseases causing frequent outbreaks under favourable bio-climatic condition and geographic set up especially in the eastern state of West Bengal, India. Cholera is a bacterial disease associated with epochs of excessive rainfall coupled with warm and humid temperature and increase in the phytoplankton population. In the recent past (August, 1998) Maldah district of West Bengal witnessed an unprecedented diarrhoeal case of 16590 out of which 276 deaths were reported. Diarrhoeal cases were also reported during the flooding of September 2000, July 2002, October 2005 and July 2006 in the region. About 3000 cases were reported from East and West Midnapur districts of West Bengal during the recent flooding of June, 2008. Flooding, population migration, sanitation, safe drinking water and geo-environmental parameters are considered for aggravating the risk of diarrhoea. The risk can be minimized if the episode of bacterial transmission cycle is studied vis-à-vis different bio-geo-environmental factors. A study on macro and micro scale information are needed for better understanding and modeling of disease outbreaks. A Systematic study of geo-environmental parameters derived from satellite data in conjunction with ground intelligence enabled modeling of risk zones and temporal suitability towards developing advance warning system. Geographic Information System integrated with remote sensing has been used for modeling disease epicenters and various risk zone in spatial domain.

High resolution Indian satellites data from IRS LISS IV (multi-spectral) and Cartosat-2 (pan) have been used for studying environmentally risk parameters viz. peri-domestic vegetation, dwelling condition, wetland ecosystem, land use etc towards risk assessment. Land and Sea surface temperature from MODIS and Chlorophyll from OCM have studied in macro scale and detailed geo-environmental parameters have been studied using IRS LISS IV and Cartosat. Apart from satellite data historical weather data for ground stations and disease information from historical records and ground intelligence were used for model simulation and validation. The disease outbreak has been studied both at macro level in relation to prevailing regional climate and land / surface phenomena as well as micro level where detailed information on wetland, ponds and its use, settlements, source of drinking water supply, sanitation, vegetation conditions, cropping pattern, rainfall, extent and duration of flood inundation, drainage condition and tidal phenomena has been used. The diarrhoeal disease model found to be significantly matching with real situation for the southern part of the state of West Bengal. The villages with diarrhoeal risk have been identified in the districts of East and West Midnapore based on this model. The results envisages that this bio-geo-climatic model can help predicting proneness of diarrhoeal disease outbreaks and to develop

a early warning system for impact minimization.