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DENGUE PREDICTION MODELLING AND DEVELOPMENT OF AREA-SPECIFIC THRESHOLDS FOR EPIDEMIC MANAGEMENT IN URBAN SETTINGS OF GAMPAHA DISTRICT, SRI LANKA

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Abstract

INTRODUCTION AND OBJECTIVES

The growing global threat of dengue in both endemic and non-endemic countries have shifted the attention to establishing an early warning system to assist in dengue control and effectively allocating scarce public health resources to manage outbreaks. Thus, the current study was designed to develop localized thresholds to aid in sustainable dengue vector control measures in three Medical Officer of Health (MOH) areas (Negombo, Wattala, Kelaniya) in the Gampaha District.

METHOD

The cross-correlation function analysis (CCF) was performed to check the effects of climatic variables (average rainfall, rainy days, average temperature, humidity) and Breteau Index (BI) with dengue case incidence from 2014 to 2019. The dengue incidence at time t, BIs with a one-month lag; *Aedes aegypti*; BIA(t-1), *Aedes albopictus*; $BIB_{(t-1)}$ and monthly average rainfall; $RFavg_{(t-2)}$, rainy days; $RD_{(t-2)}$, Average relative humidity; $RHavg_{(t-2)}$ at two-month lag and monthly average temperature; Tavg at three-month lag were checked. Area-specific thresholds were derived from multiple linear regression. The model was validated for the Jaela MOH area for the same period.

RESULTS

Stepwise regression has excluded temperature, rainfall and BIB in urban areas and a statistically significant strong association (r= 0.775) was displayed with BIA(t-1) and $RHavg_{(t-2)}$. When the incidence of the cases exceeded 25, it reached an alarming situation while exceeding 44 was classified as an epidemic in urban areas. BIA>1, RHavg >85%, BIA>2; RHavg>81%, the model implies an early outbreak scenario and when BIA >3; RHavg > 88%, BI>4; RHavg>84%, BIA>5; RHavg>81%, and whenever BIA > 6; RHavg>77% it reached up to severe epidemics. The model accurately predicted all outbreaks in the Jaela MOH area.

CONCLUSIONS AND RECOMMENDATIONS

The common thresholds utilized for vector control entities remain ineffective and cannot be applied throughout the country. Therefore, early warning indications can plan a prior month source reduction in a low-risk zone. In contrast, government-led source reduction programs should be maximized and an intense integrated vector control method must be implemented before it reaches an epidemic.

Keywords: ***Aedes, Dengue, Breteau Index, Climate, Entomological Threshold***