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Mathematical Modelling to Forecast Dengue Epidemics in Gangawata Korale and Kandy Municipal Council Medical Officer of Health (MOH) Divisions in Kandy District, Sri Lanka

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Dengue caused 150,407 cases within the first 8 months of 2017, becoming the most challenging health issue in Sri Lanka. The limitations in human resources, technology, and public awareness, along with poor coordination for community mobilization have been key difficulties in controlling dengue. A model to forecast dengue epidemics allows the local authorities to take necessary and timely precautions, especially for vector control. This study attempts to formulate an empirical model for predicting dengue incidence in the Medical Officer of Health (MOH) areas of Gangawata Korale and Kandy Municipal Council (KMC) in the Kandy district. Secondary data such as dengue cases notified to MOH offices from January 2009 to December, 2015 and monthly vector indices [Breteau Index (BI), Container Index (CI), and Premises Index (PI)] for *Aedes aegypti* and *Aedes albopictus* were acquired. The collected data were arranged at the Grama Niladhari Division (GND) level and the step-wise multiple regression modelling technique (in SPSS) was used to develop the empirical model for predicting dengue incidence. The model was validated for 2016, by using Coefficient of performance (CP_A'), distribution of residuals, and Relative Error (RE). The results showed that BI and CI of *Ae. aegypti* and CI of *Ae. albopictus* had positive correlations with the dengue incidence, while the rest indicated negative relationships.Among the correlations observed, only CI for *Aedes albopictus* and BI and PI for *Aedes aegypti* were statistically significant ($p<0.05$ at 95% level of confidence). The following empirical model gave the best predictive power of dengue incidence within the study area.

Dengue cases = 28.87 + 2.61 BIA – 3.42 PIA

where, BIA is the Breteau Index of *Ae. aegypti* andPIA is the Premises Index of *Ae. aegypti*. The predictions of the model were reliable based on statistical values of 75.1% and 94.5% of residual points within ±1SD and ±2SD ranges, CP_A'=1.89 and RE=+0.75%. It was evident that only BIA and PIA had a significant influence on the active transmission of dengue within the study areas, empha-sizing the dominant role played by *Ae. aegypti*. This approach can be used for predicting dengue incidence based on entomological indices, enabling timely precautionary action for vector control.

Keywords: Dengue, vector Indices, regression modelling

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