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A study on Dengue spread in Western province: using Spatial and Cluster analysis

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Dengue virus is transmitted to humans through the bite of infected *Aedes* mosquitoes, mostly *Aedes aegypti*. According to National dengue control unit of Sri Lanka, the recent outbreak of dengue fever in the country was reported on July 2017. Since the life cycle of a mosquito is short, it is highly influenced by the variations in the environment. Also, Sri Lanka has a changing weather over time, hence the spread of dengue mosquito is time dependant. Considering these facts objectives of the study were to identify the correlation between number of dengue incidences and the environmental factors such as temperature, rainfall and humidity, recognize homogeneous areas of dengue and discover dengue dense area and non-dense area in Western province. *Agglomerative hierarchical clustering* method used to observe homogenous areas in the study area. In this method, initially each observation is considered as a cluster and continue the procedure by connecting most similar observations. Several linkage methods that can be used to join observations into clusters. From literature, *Ward's* method proposed as the best linkage method in clustering where total within-cluster variance calculated and at every step clusters with minimum between cluster variance connected. After constructing the cluster dendrogram by connecting appropriate clusters, the optimum number of clusters identified using *Elbow* method. Spatial analysis explains a behaviour or a pattern of a variable geographically. Geographical maps are used to find the dengue dense and dengue non-dense areas. Number of dengue incidences and environmental factors for the period 2013 to 2017 of three districts in Western province were used for this study. R statistical software used to conduct the analysis. A descriptive analysis was carried out and outliers were treated using *Winsorizing* method. Normality of each variable was examined. *Pearson's correlation coefficient* calculated when variables are normally distributed otherwise; *Spearman correlation coefficient* calculated. According to the results obtained, rainfall and humidity have a negative correlation with number of dengue incidences while temperature has a positive correlation. Three clusters identified as follows; first two months and last three months fell into one cluster, March and April were the next and remaining months as another cluster. Cluster analysis showed that, during the first period of monsoon season of the year, there is an increase in the spread of dengue virus in the Western province. Spatial analysis showed that the Colombo as the dengue dense and Kalutara as the dengue non-dense area in the Western province.

Keywords: Dengue virus, Correlation, Cluster analysis, Spatial analysis