Spatial and Temporal Patterns of Dengue Cases in Western Province, Sri Lanka from 2013-2023: A GIS based Approach

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Abstract

Dengue fever is a major global and local public health concern, primarily transmitted by Aedes aegypti and Aedes albopictus mosquitoes. As a tropical country, Sri Lanka is currently experiencing significant impacts from the disease. The simultaneous circulation of all four viral serotypes (DENV-1, 2, 3, and 4) since 2000 has resulted in a hyperendemic situation in the country in recent years. The Western Province has consistently been a hotspot for Dengue outbreaks over the past decade. This study aims to analyze the spatial and temporal patterns of Dengue cases reported in the Western Province from 2013 to 2023 using Geo spatial analyses. Weekly Dengue data from Medical Officer of Health (MOH) divisions were used in this descriptive study. In this study, time series and regression analyses were conducted to examine the temporal distribution of Dengue cases, while spatial patterns and regional risk areas were identified using Moran's I spatial autocorrelation analysis and hotspot mapping techniques in ArcMap 10.8. Trend analysis was also carried out to recognize the future trend of Dengue cases at the district level. Findings revealed significant variation in both temporal and spatial distribution of Dengue cases. Colombo District reported the highest number of cases, with a consistent pattern of higher incidence in urban areas across all three districts Colombo, Gampaha, and Kalutara. Moran's I and Hotspot analysis revealed a clustered case distribution, especially in areas marked by unplanned urban development, high population density, and poor waste management. Time series analysis indicated both positive and negative reporting trends in Colombo and Kalutara MOH divisions. However, it is noteworthy that all MOH divisions in the Gampaha District demonstrated exclusively positive trends in timely case reporting. Trend-based projections further suggest the emergence of future hotspots, particularly in expanding semi- urban regions. The findings underscore the need for targeted vector control measures, urban planning reforms, and sustained public health interventions to mitigate the effects of virus transmission in Western Province.

Keywords: Dengue Distribution, Spatial Variations, Temporal Variations, Urbanization, Western Province