Original Article

Spatial and Temporal Patterns of Influenza Outbreaks in a Metropolitan Area: An Epidemiological Analysis

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ABSTRACT

Background: Influenza is a significant public health concern, especially in densely populated metropolitan areas where outbreaks can spread rapidly. Understanding the spatial and temporal dynamics of influenza can inform targeted prevention and control strategies.

Objective: To characterize the spatial and temporal patterns of influenza outbreaks in a major metropolitan area and identify factors associated with the spread of the disease.

Methods: This was a retrospective, population-based epidemiological study. Influenza case data were collected from multiple healthcare facilities in the metropolitan area over a 5-year period. Geographic information systems (GIS) and spatial-temporal analysis techniques were used to map the distribution of cases and identify clusters of high incidence. Demographic, socioeconomic, and environmental factors were evaluated as potential predictors of influenza outbreak patterns.

Results: A total of 25,000 confirmed influenza cases were included in the analysis. Distinct spatial clusters of high influenza incidence were identified, often corresponding to areas with higher population density, lower socioeconomic status, and greater use of public transportation. Temporal analysis revealed seasonal peaks in influenza activity, with earlier onset and more rapid spread in certain neighborhoods. Factors such as population density, income level, and accessibility of public transit were significantly associated with the timing and magnitude of influenza outbreaks (p<0.001).

Conclusions: This epidemiological study provides valuable insights into the spatial and temporal dynamics of influenza outbreaks in a metropolitan setting. The identified high-risk areas and predictive factors can guide the targeted implementation of preventive measures, such as vaccination campaigns and public health education, to mitigate the impact of future influenza seasons.

Keywords: Influenza, Epidemiology, Spatial analysis, Temporal patterns, Metropolitan area, Risk factors