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Letter to Editor

Spatial Proximity Distribution of COVID-19 in Iran (Panel: February 2019-February 2023)

Dear Editor

Despite substantial advancements in disease management, contagious diseases continue to be important in epidemiology and public health.[1] One of the primary purposes of epidemiology is to aid in the identification of geographical regions and vulnerable populations that are more likely to contract diseases[1, 2] and encounter risk factors that may lead to mortality.[3] Spatial behavior analysis plays a crucial role in determining the location and distribution of diseases, as well as in conducting location surveys for healthcare facilities and services.[4] It is an essential component of epidemiological and health studies, since it helps to establish the geographical boundaries and borders of societies.[5] In this regard, the purpose of this study was to determine the spatial distribution of the COVID-19 pandemic and the Index of Proximity Distribution (IPD) in 31 provinces of Iran from February 2019 to February 2023. Moran index indicated the spatial order with Z-Score of 1.485 by random pattern in March 2019. However, a Z-Score of 3.039 in February 2023 indicated clustered distribution of COVID-19. Distance-based spatial autocorrelation analysis revealed a positive Moran index of 0.136627 at 383.3 Km from Tehran and a negative Moran index of 0.040246 at 726.6 Km from Tehran; which indicated a reduction in the number of pandemics. In addition, the analysis of hot spots categorized Tehran in the hot cluster and Bushehr in the cold cluster. According to the research findings, at a distance of 383.8 Km from Tehran province, Moran's coefficient and z-score were 0.136627 and 2.292634, respectively, which indicates positive spatial autocorrelation with a confidence level of 99%. The positive spatial autocorrelation indicated the large number of people infected with COVID-19 within a radius of 383 Km. Moreover, the findings suggested that at a distance of 762.6 Km from Tehran province, Moran's coefficient and z-score were -0.040246 and -0.252883, respectively; which indicates a negative spatial autocorrelation (figure 1).

The modeling of the spatial distribution process of COVID-19 in Iran is illustrated in figure 2. In the neighboring districts of Tehran province, there is a high prevalence of patients with this condition. In terms of spatial features, time and distance had a significant impact on the spatial distribution of COVID-19 in Iran. The primary limitation of the study was the absence of the Air Quality Index for the spatial dynamics of the pandemic, which is specifically analyzed for each of the 31 provinces.

According to the figure, the black color theme indicates a high spatial distribution of SARS-CoV-2. These areas, which are shown in black in the first layer of the figure, were found to be COVID-19 hotspots from February 2019 to February 2023. As the theme changes from black to gray (shifting from high to low), the spatial distribution of the pandemic decreases. The final layer, indicated by the low-color theme in the image, denotes cold spots in the distribution of the virus.

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Authors' Contribution

A.M: Conception of the study, interpretation of data, drafting, and revising. M.AK: Conception of the study drafting, and revising. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

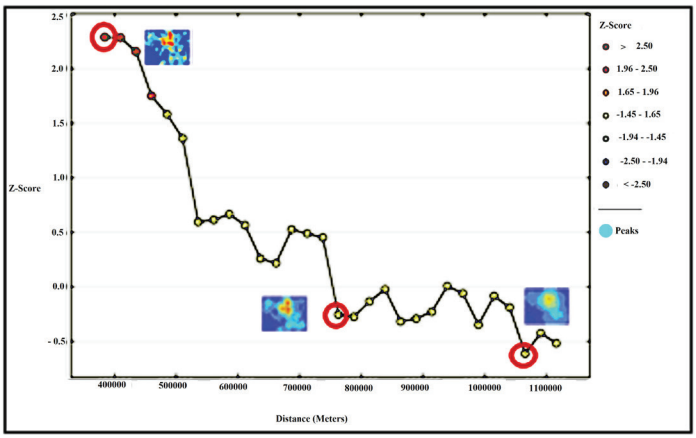

Figure 1: Spatial autonomy of COVID-19 in Iran (Created using ArcGIS software).

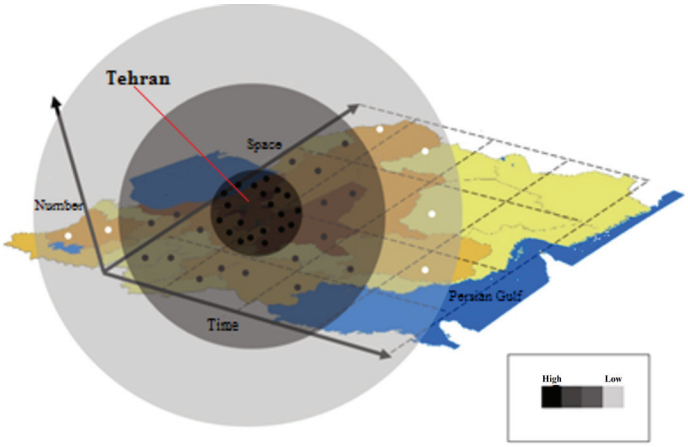

Figure 2: Spatial pattern of COVID-19 distribution in Iran (Created using ArcGIS software).

Conflict of Interest: None declared.

Keywords ● COVID-19 ● Spatial behavior ● Disease hotspot ● Supply and distribution ● Iran

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