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Data-Driven Analysis and Prediction of Suicide Patterns Using Data Mining and Geographical Visualization in Shiraz City

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ABSTRACT

Introduction: Suicide is one of the most critical health issues caused by various social, cultural, and demographic factors. The objective of this study was to analyze and predict suicide in Shiraz using visualization and data mining methods.

Methods and Materials: The dataset utilized in this research consists of information from 923 individuals and 13 features, including demographic information, address, method of suicide, reason for suicide, history of mental illnesses, employment status, and history of suicide attempts. These data were collected from Hazrat Ali Asghar Hospital in Shiraz, a specialized center for treating poisonings. To improve the modeling accuracy, only data relevant to the city of Shiraz were included, and missing values were replaced using the most/average method. Then, descriptive-statistical analysis was performed to examine the influence of gender, age, and cause of suicide on the method of suicide using SPSS 16 software. ArcGIS software was used for geographical visualization of the 11 regions in Shiraz. In the next stage, neural network and K-NN algorithms were used to predict suicide methods and visualize them on the map using the Orange V3.3 tool.

Results: After preprocessing of data, 883 suicide cases were included in the study, of which 74.18% were females. The majority of the individuals were under 37 years old, and they mostly attempted suicide due to family problems and emotional issues using common therapeutic drugs. In Shiraz, regions 2, 5, 7, 8, and 11 had a relatively higher relative risk than other areas. Additionally, the results of the predictive models of neural networks and K-NN with accuracies of 77.3% and 77.4%, respectively, identified high-risk areas for drug-related suicide in Shiraz.

Conclusion and Discussion: The findings of this study demonstrate that females are more vulnerable than males, and the most common method of suicide is through the use of common therapeutic drugs. By employing visualization in predicting drug-related suicide methods, this study effectively highlighted high-risk areas in Shiraz. Additionally, predicting drug-related suicide methods and visualizing them on a geographic map can help health policymakers in identifying vulnerable individuals and regions and taking appropriate measures for prevention, control, monitoring, evaluation, education, resource optimization, and managing access to therapeutic drugs.

Keywords: Data mining, Prediction, Suicide

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