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The association between potential predictors and death of patients during the COVID-19 pandemic in Shiraz: a hierarchical multiple regression analysis

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Abstract

Introduction Identifying clinical factors that increase the risk of mortality in COVID-19 patients is crucial. This enables targeted screening, optimizing treatment, and prevention of severe complications, ultimately reducing death rates. This study aimed to develop prediction models for the death of patients (i.e., survival or death) during the COVID-19 pandemic in Shiraz, exploring the main influencing factors.

Method We conducted a retrospective cohort study using hospital-based records of 1030 individuals diagnosed with COVID-19, who were hospitalized for treatment between March 21, 2021, and March 21, 2022, in Shiraz, Iran. Variables related to the final outcome were selected based on criteria and univariate logistic regression. Hierarchical multiple logistic regression and classification and regression tree (CART) models were utilized to explore the relationships between potential influencing factors and the final outcome. Additionally, methods were employed to identify the high-risk population for increased mortality rates during COVID-19. Finally, accuracy was evaluated the performance of the models, with the area under the receiver operator characteristic curve (AUC), sensitivity, and specificity metrics.

Results In this study, 558 (54.2%) individuals infected with COVID-19 died. The final model showed that the type of medicine antiviral (OR: 11.10, $p = 0.038$) than reference (antiviral and corticosteroid), and discharge oxygen saturation (O₂) (OR: 1.10, $p < 0.001$) had a positive association with the chance of survival, but other variables were not considered as predictive variables. Predictive models for the final outcome (death) achieved accuracies ranging from 81 to 87% for hierarchical multiple logistic regression and from 87 to 94% for the CART model. Therefore, the CART model performed better than the hierarchical multiple logistic regression model.

Conclusion These findings firstly elucidate the incidence and associated factors of the outcome (death) among patients in Shiraz, Iran. Furthermore, we demonstrated that antiviral medication alone (without corticosteroids) and high O₂ increase the survival chances of COVID patients.

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Supplementary Information

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Supplementary Material 1

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Author contributions

PGH and ZM aided in the conceptualization, design, and critical revision of the final manuscript. ZM, MR, PGH, MMR, SG and BKH, aided in design, preparation of manuscript and critical revision of the final manuscript. ZM, PGH aided in data analysis and critical revision of the final manuscript. All authors read and approved the final manuscript.

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Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

I hereby confirm that all experimental protocols conducted in this study were approved by the Shiraz University of Medical Sciences, Iran, based on a proposal with grant number 21032 and the Ethics code number IR.SUMS.NUMIMG.REC.1401.011 issued on 18.10.1401. In addition, informed consent was obtained from all subjects or their legal guardian(s) prior to their participation in the research.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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