4-16-2024

Hyponatremia As A Predictive Marker Of Mortality In Hospitalized COVID-19 Patients: A Healthcare System Analysis

Harjinder Singh

Candi C. Bachour

David Metcalf

Kavita Luthra

Vivek Kak

Hyponatremia As A Predictive Marker Of Mortality In Hospitalized COVID-19 Patients: A Healthcare System Analysis

Harjinder Singh, MD; Candi Bachour, PharmD; David Metcalf; Kavita Luthra, MD; Vivek Kak, MD
Henry Ford Jackson Hospital, Jackson, Michigan

Background

- There is documented evidence associating hyponatremia with mortality in hospitalized patients, including patients admitted with coronavirus disease-2019 (COVID-19) pneumonia [1]
- One of the proposed mechanisms of hyponatremia in COVID-19 is the syndrome of inappropriate antidiuretic hormone (SIADH) due to circulating cytokines such as IL-6 [2]
- These cytokines are proposed to be associated with lung inflammation and correlate with respiratory failure and in-hospital mortality [3]
- This study was undertaken to associate the severity of hyponatremia with in-hospital mortality in patients admitted with COVID-19 in multiple hospitals over a single health system network

Objectives

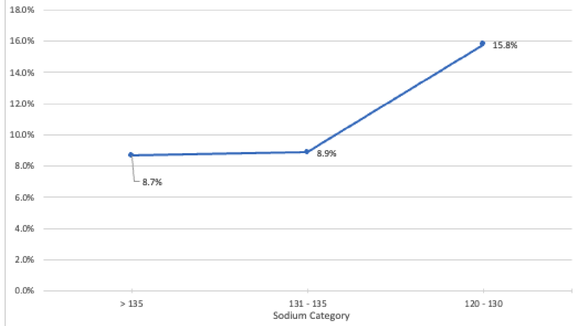
- To determine if hyponatremia is associated with worse outcomes in patients admitted with COVID-19, as measured through in-hospital mortality and hospital length of stay
- Hypothesize hyponatremia as a prognostic factor for survival in COVID-19 patients

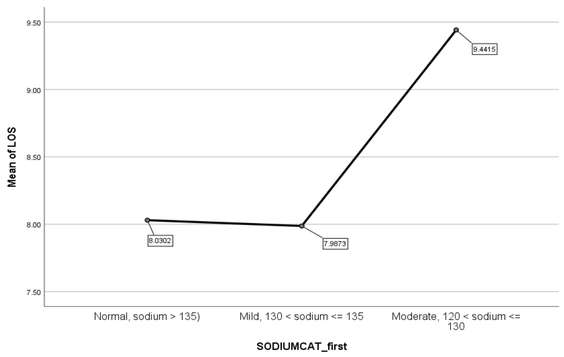
Materials & Methods

- After obtaining appropriate institutional review board (IRB) approval, a retrospective chart review was conducted from 03/01/2020 to 06/01/2021. The hospitals included in the data collection were Henry Ford Jackson, Henry Ford Hospital, Henry Ford Macomb, Henry Ford West Bloomfield.
- **Inclusion criteria**: individuals more than 18 years of age, positive COVID-19 PCR on presentation, requirement of inpatient admission
- **Exclusion criteria**: individuals less than 18 years of age, incarcerated, and pregnant patients
- Performance analytics and improvement (PAI) tool was used to extract patient records
- The patients were categorized based on their admission sodium values into the following groups: normal sodium (>=136 mEq/L), mild hyponatremia (131 to 135 mEq/L), moderate hyponatremia (121 to 130 mEq/L), and severe hyponatremia (<=120 mEq/L)
- Primary and secondary outcomes calculated were hospital mortality and length of stay
- IBM SPSS software was used to perform the data analysis. Chi-square tests and ANOVA tests were run to evaluate these outcomes
- Data for 2561 patients was extracted using the above method. 14 cases with severe hyponatremia were not included because of the small case count and its minute impact on the analysis and the interpretation of the results. 2547 patients were analyzed in this study.

Results

- The percentage of in-hospital mortality in patients with normal sodium, mild hyponatremia, and moderate hyponatremia was found to be 8.7% (109/1260), 8.9% (84/945), and 15.8% (54/342) respectively; with Chi-Square p-value of <0.001 among these individual groups
- Hospital length of stay of groups with normal sodium, mild hyponatremia, and moderate hyponatremia was 8.03, 7.99, and 9.44 days, respectively, with ANOVA F-Test P-value of 0.012
- Regression analysis with stepwise variable selection was performed for age, BMI, presentation temperature, presentation systolic blood pressure, and vaccination status which determined Chi square value <0.001 for all of them





Conclusions

- Admission hyponatremia of <130 mEq/L in COVID-19 patients is associated with higher in-hospital mortality and longer length of stay
- Hence, admission sodium level may be used as a prognosticating factor and a possible variable in future COVID-19 treatment trials

References

[1] Khidir RJY, Ibrahim BAY, Adam MHM, et al.. Prevalence and outcomes of hyponatremia among COVID-19 patients: A systematic review and meta-analysis. Int J Health Sci (Qassim). 2022 Sep-Oct;16(5):69-84.

[2] Atila C, Monnerat S, Bingisser R, et al. Inverse relationship between IL-6 and sodium levels in patients with COVID-19 and other respiratory tract infections: data from the COVIVA study. Endocr Connect. 2022 Sep 26;11(10):e220171. doi: 10.1530/EC-22-0171.

[3] Nikkhoo B, Mohammadi M, Hasani S, et al. Elevated interleukin (IL)-6 as a predictor of disease severity among Covid-19 patients: a prospective cohort study. BMC Infect Dis. 2023 May 9;23(1):311. doi: 10.1186/s12879-023-08294-w.

Acknowledgements or Contact

- Authors would like to acknowledge the staff involved in the Research and Sponsored Programs at Henry Ford Jackson Hospital for preparation of the research protocol, facilitating IRB approval, performing data collection, and statistical analysis
- Author contact information:
  Harjinder Singh
  Email: hsingh8@hfhs.org
  Twitter: @hpsharjinder