Clinical Characteristics of COVID-19 Waves in the Southeastern United States: A Retrospective Study

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Background

- Since the start of the SARS-CoV-2 (COVID-19) pandemic, there have been distinct peaks of case counts, hospitalizations, morbidity, and mortality, that chronologically look like waves.
- Each wave has been associated with specific variants of the original virus:
  - Alpha (B.1.17) variant – Identified in U.K. in September 2020 [1]
  - Beta (B.1.351) variant – Identified in South Africa in May 2020 [2]
  - Gamma (P.1) variant – Identified in Brazil in November 2020 [3]
  - Delta (B.1.617.2) variant – Identified in India in October 2020 [4]
  - Omicron (B.1.1.529) variant – Identified in Botswana in November 2021 [5]
- In the US, few studies thus far have attempted to document the variance in characteristics between the resurgences of these variants we have seen.

Objective

- To evaluate patient demographics, clinical characteristics, and outcomes of individuals hospitalized due to COVID-19 pneumonia during three distinct waves of the current pandemic in the Southeastern region of the United States.

Methods

Wave Definitions

- Wave 1: March 1, 2020 – May 30, 2021: WT and initial variants
- Wave 2: June 1, 2021 – November 30, 2021: Delta variant
- Wave 3: December 1, 2021 – February 28, 2022: Omicron variant

Patient Population

- Patients aged 18 years and older, admitted to a participating hospital in the Southeastern United States, between March 1, 2020, through February 28, 2022
- Must have admitting diagnosis of COVID-19 Pneumonia along with laboratory confirmed SARS-CoV-2 infection

Assessed Outcomes

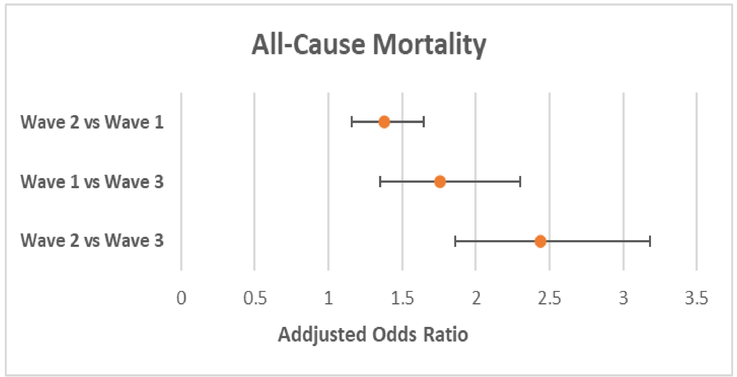
- Primary Outcome: All-cause mortality
- Secondary Outcomes: Length of stay, ICU admission, mechanical ventilation requirement, secondary adverse events (AKI, VTE, pneumothorax, pericardial disease)

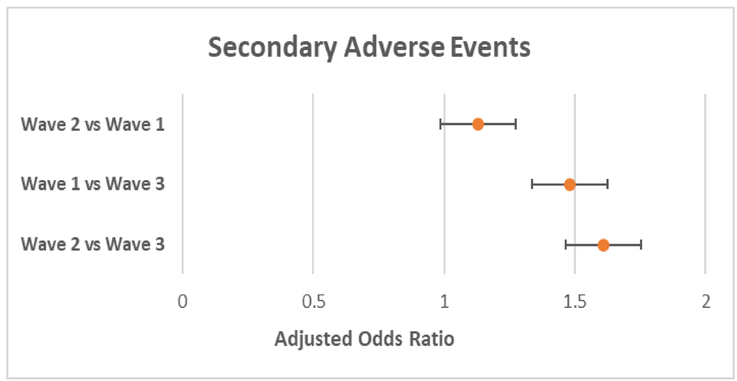
Statistical Analysis

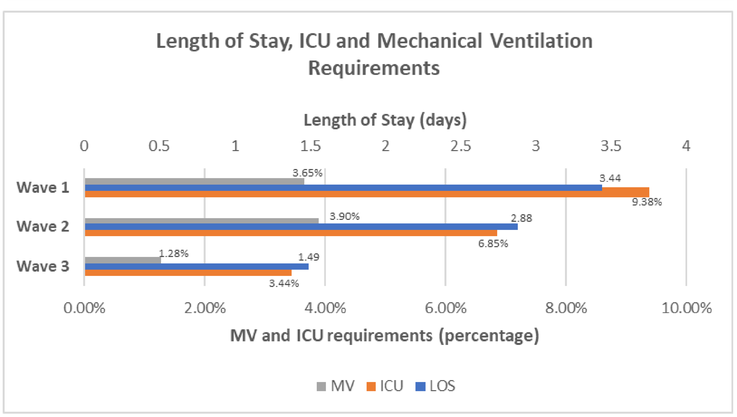
- Descriptive statistics were used for patient characteristics and comorbidities along with multivariate comparisons for the above including comorbid conditions and outcomes
- Logistic regression models were used to identify all-cause mortality, LOS, and MV requirements
- Adjusted odds ratio, p values, were obtained
- LOS analysis was performed with a linear regression model

Results

Demographics and Clinical Composition				
	Total	Wave 1	Wave 2	Wave 3
Age (Mean)	51.2	54.04	48.9	49.3
Sex (Male)	54.9%	53.7%	53.9%	58.8%
Sex (Female)	45.0%	46.3%	46.0%	42.2%
Obesity	45.6%	46.9%	46.0%	42.5%
HTN	18.1%	23.0%	16.5%	11.3%
T2DM	13.3%	17.4%	11.0%	8.8%
HLD	15.8%	20.6%	12.6%	11.5%
CKD	5.7%	7.5%	4.1%	4.5%
CAD	7.4%	9.6%	5.7%	5.7%
CHF	3.7%	4.4%	3.0%	3.2%
COPD	6.8%	8.4%	5.5%	5.6%







Discussion

- This retrospective analysis of three distinct waves of the ongoing COVID-19 pandemic appears to show that, when compared to the initial two waves of the pandemic, the third wave was characterized by an overall healthier population, with:
  - Lower all-cause mortality,
  - Lower overall length of stay,
  - Less requirements for mechanical ventilation and ICU admission,
  - Less secondary outcomes,
- Our hypothesis is that these findings may be due to the development and implementation of the vaccine, as well as likely evolution of SARS-CoV-2 to a lesser virulent strain.
- Furthermore, it appears that the second wave, characterized by the Delta variant, resulted in the most morbidity and mortality thus far, consistent with other historical pandemics such as the 1918 Influenza pandemic where the second wave was also the most fatal [6].
- Few other studies have specifically looked at clinical differences among variants but of the limited available data, similar findings regarding the delta variant have been observed [7].
- More research is needed to delineate the changes in virulence of evolving SARS-CoV-2 variants.

Conclusion

- The most recent wave of the COVID-19 pandemic, due to the Omicron variant, was characterized by an overall healthier population with overall mortality, length of stay, need for mechanical ventilation and ICU admission, along with lower likelihood of secondary adverse events.
- These are encouraging findings as it appears to show ongoing transition to lesser virulent strains of SARS-CoV-2.

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This research was supported (in whole or in part) by HCA Healthcare and/or an HCA Healthcare affiliated entity. The views expressed in this publication represent those of the author(s) and do not necessarily represent the official views of HCA Healthcare or any of its affiliated entities.

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