**Title: Distribution and Determinants of COVID-19 in Brazos County, Texas: A Cross-Sectional Study (2020-2022)**

**Introduction**

The coronavirus disease 2019 (COVID-19) pandemic has imposed a significant global health burden since its emergence. While national-level data have guided policy, regional-level analyses are essential for tailoring public health interventions. Brazos County, Texas, home to a diverse and dynamic population, experienced distinct patterns in COVID-19 incidence, hospitalization, and mortality. Understanding the demographic and clinical characteristics of affected individuals and the risk factors associated with severe outcomes is crucial for informed decision-making at the local level.

This study aims to describe the distribution of COVID-19 cases in Brazos County between 2020 and 2022 and to identify the demographic and clinical determinants of hospitalization and death. By leveraging local surveillance data, we assess how factors such as age, sex, race, travel history, and symptom presentation influence disease severity.

**Methods**

This was a cross-sectional study using confirmed COVID-19 case data collected by Brazos County Health Department from 2020 through 2022. The dataset included individual-level demographic and clinical information, including age, sex, race, travel history, symptom presence, hospitalization status, and death outcomes.

Data cleaning involved removing observations with missing values and standardizing variable categories. Age was categorized into five groups: 0–17, 18–24, 25–39, 40–64, and 65+. Sex was restricted to male and female. Race categories included White, Black (African American), Hispanic, Other, and Unknown. Binary variables were created for hospitalization, death, travel history, and symptom presence.

Descriptive statistics were generated to compare characteristics of hospitalized and non-hospitalized patients. Logistic regression models were used to assess adjusted odds ratios (OR) and 95% confidence intervals (CI) for factors associated with hospitalization and death. Statistical significance was set at p<0.05.

**Results**

Table 1 presents the distribution of key variables stratified by hospitalization status. Among hospitalized patients, the mean age was 63.2 years compared to 31.0 years among those not hospitalized. Most hospitalized cases were aged 65+ or 40–64, whereas non-hospitalized cases were largely aged 18–24 and 25–39. There were slightly more males (50.6%) than females (49.4%) among hospitalized patients. White (44.2%), Hispanic (41.3%), and Black (21.8%) individuals constituted the majority of hospitalized cases.

In the multivariable logistic regression model (Table 2), increasing age was strongly associated with hospitalization. Compared to the 18–24 age group, the odds of hospitalization were 6.25 times higher in those aged 25–39 (95% CI: 3.91–9.99), 19.68 times higher in those aged 40–64 (95% CI: 12.67–30.56), and 84.95 times higher in those aged 65+ (95% CI: 54.30–132.88). Black and Hispanic patients had significantly increased odds of hospitalization compared to White patients (OR: 3.04 and 1.63, respectively). Travel history was associated with lower odds of hospitalization (OR: 0.58, 95% CI: 0.38–0.90).

Table 3 shows the adjusted odds ratios for COVID-19-related death. Advanced age was the most powerful predictor of mortality. Compared to individuals aged 18–24, the adjusted odds of death were 17.08 (95% CI: 2.20–132.42) for those aged 25–39, 114.99 (95% CI: 15.92–829.78) for those aged 40–64, and 831.29 (95% CI: 115.10–5999.99) for those aged 65+. Females had lower odds of death than males (OR: 0.69, 95% CI: 0.51–0.93), while Black patients had more than twice the odds of death compared to White patients (OR: 2.05, 95% CI: 1.33–3.16). Travel history remained a protective factor against death (OR: 0.38, 95% CI: 0.15–0.93).

**Discussion**

Our findings confirm that age is the most critical predictor of both hospitalization and death due to COVID-19, aligning with global trends [1,2]. The dramatically increased odds among those aged 65 and above underscore the need for targeted protection and prioritization of healthcare resources for older adults [3]. Racial disparities were evident, with Black and Hispanic patients at greater risk for severe outcomes, possibly reflecting underlying social determinants of health, including access to care, occupational exposure, and comorbidities [4,5].

The observation that travel-history was associated with reduced odds of hospitalization and death may reflect behavioural or socioeconomic factors not captured in our dataset. Individuals who travelled may have had better access to healthcare, earlier detection, or healthier baseline status. Further investigation is warranted to interpret this association.

This study is limited by its cross-sectional nature and reliance on surveillance data, which may be affected by underreporting or misclassification. Nevertheless, the dataset provides a robust local snapshot of the COVID-19 burden and associated risk factors.

**Conclusion**

This cross-sectional analysis of COVID-19 cases in Brazos County, Texas, highlights key demographic and clinical factors associated with hospitalization and death. Advanced age, Black race, and Hispanic ethnicity were consistently linked to higher odds of severe outcomes, while female sex and travel history were associated with lower odds. These findings reinforce the need for targeted public health interventions to protect vulnerable populations during infectious disease outbreaks.

**References**

1. Centers for Disease Control and Prevention (CDC). Risk for COVID-19 Infection, Hospitalization, and Death By Age Group. Updated August 2022. https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-age.html
2. World Health Organization (WHO). WHO Coronavirus (COVID-19) Dashboard. https://covid19.who.int/
3. CDC. People with Certain Medical Conditions. https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html
4. Millett GA, Jones AT, Benkeser D, et al. Assessing differential impacts of COVID-19 on Black communities. Annals of Epidemiology. 2020;47:37–44.
5. Webb Hooper M, Nápoles AM, Pérez-Stable EJ. COVID-19 and racial/ethnic disparities. JAMA. 2020;323(24):2466–2467.