Elevated procalcitonin levels guide clinicians in antibiotic use for suspected bacterial infections. Early in the pandemic, these levels were also used with regularity in COVID-19 patients to assess for co-infection. Electronic medical records were interrogated in a cohort of hospitalized adults with COVID-19 (n=78) who experienced moderate and severe disease as defined by the Yale Impact Score (NCT05603677). Antibiotics were administered to 47.4% of all patients enrolled while the rate of bacterial co-infection in this patient population was 18.7%. Hospitalized patients with severe COVID-19 had significantly higher procalcitonin levels than those with moderate disease. Of the 55 participants with procalcitonin levels, 30 (55%) were given antibiotics while 25 (45%) were not, and only 8 patients had clinical documentation of bacterial co-infection, confirmed by blood, respiratory, or urine culture positivity. The results from this study show that in the setting of COVID-19 infection, procalcitonin is more closely linked to viral disease severity and less associated with bacterial co-infection. Procalcitonin as a prognostic tool for infection, elevated procalcitonin, complications, and the use of antibiotics (N = 55) were checked for the distributional assumption of normality. A natural log transformation was applied to procalcitonin which improved the distribution. If procalcitonin was < 0.06 then procalcitonin was assigned a value of 0.059 so that a natural log transformation could be performed. Independent samples T-tests were used to test for a difference in procalcitonin levels between those with moderate disease and those with severe disease. ANOVA was used to test the relationship of procalcitonin with BMI groups: underweight/normal, overweight and obese [30].

The secondary study endpoint was the incidence of bacterial co-infection in the setting of primary SARS-CoV-2 infection. Diagnosis of bacterial co-infection was determined by any indication of bacterial growth in blood, respiratory or urine cultures or stool culture for C.diff/Colitis. Continuous data were checked for the distributional assumption of normality. A natural log transformation was applied to procalcitonin which improved the distribution and was designated as LnProcalcitonin. If procalcitonin was < 0.06 then procalcitonin was assigned a value of 0.059 so that a natural log transformation could be performed. Independent samples T-tests were applied to continuous variables. Independent T-tests were used to test for a difference in procalcitonin levels between those with moderate disease and those with severe disease. ANOVA was used to test the relationship of procalcitonin with BMI groups and a Tukey transformation could be performed. Independent samples T-tests were used to test for a difference in procalcitonin levels between those with moderate disease and those with severe disease. ANOVA was used to test the relationship of procalcitonin with BMI groups.

Methods

Data for this study were obtained from hospitalized participants who were admitted during the acute stage of infection and enrolled in the Northern Colorado Coronavirus Biorepository.

The primary study endpoint was the relationship between procalcitonin elevation and disease severity. Procalcitonin elevation was defined as any value greater than 0.15 ng/mL (per UCH lab reference range). We tested for independent correlations between procalcitonin and body mass index (BMI), and age. ANOVA was used to test for differences in procalcitonin across BMI groups: underweight/normal, overweight and obese [30].

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Results

To better understand the connection between procalcitonin elevation and COVID-19 disease course, this study examined the procalcitonin levels of hospitalized COVID-19 patients during acute stages of infection and for correlations with disease severity, antibiotic use, and rate of bacterial co-infection.

Abstract

There were significant differences in procalcitonin and Lprocalcitonin (natural log) levels between those with moderate and severe disease (p = 0.0380 and p = 0.0480, respectively). The rate of confirmed co-infections was 7(12.7%) out of N = 55. Six out of the 7 with confirmed co-infections received antibiotics

Discussion

• The rate of co-infection in this patient population was low (12.7%) while over half of the cohort received an antibiotic (52%). Out of an N=55, 24 (50%) of patients without a documented coinfection received an antibiotic.

• Our findings are consistent with the previously observed overuse of antibiotics in hospitalized COVID-19 patients. This core finding supports the use of antibiotic stewardship during admission and hospitalization of COVID-19 patients. Although antibiotics are a life-saving therapy in cases of bacterial infection, unnecessary usage can place the patient at risk for opportunistic infections, which may further complicate the disease course.

• Procalcitonin is typically a helpful diagnostic measure in predicting bacterial infection, though the findings described herein demonstrate that this may not be the case for COVID-19 patients. Thus, the prescription of antibiotics in this patient population should consider procalcitonin levels within a broader clinical picture that includes temperature curve, white blood cell count, blood cultures, patient history, and physical exam.

Conclusions