Characteristics of patients with multi-system inflammatory syndrome in children (MIS-C) by disease severity: the experience of a medium-sized children's hospital

Introduction

March 2020 saw the first case of COVID-19 in the United States, subsequently leading to significant changes both for the US healthcare system but also society in general.[1] One month later, the first case of MIS-C was identified to be a post-infectious systemic inflammatory syndrome with the potential to cause severe morbidity and mortality in children. Initially described using a cohort of eight patients determined to have a Kawasaki disease-like illness called "pediatric inflammatory multisystem syndrome," MIS-C is now defined by the CDC as meeting specific clinical criteria followed by either laboratory or epidemiologic linkage criteria as listed below:[2]

1. Clinical criteria: all of the following in the absence of a more likely diagnosis – fever > 38.0C, clinical severity resulting in hospitalization or death, evidence of systemic inflammation with CRP > 3.0mg/dL, and new onset manifestations in two organ systems including cardiovascular, gastrointestinal, hematologic, or mucocutaneous.
2. Laboratory criteria: detection of COVID-19 via PCR or antigen test within 60 days of diagnosis or detection of COVID-19 antibodies
3. Epidemiologic Linkage Criteria: close contact with a known or suspected patient with COVID-19 in the preceding 60 days.[3]

Because of MIS-C's novelty and rarity, it was initially characterized through expert opinion along with preliminary studies. Studies have used a combination of clinical and laboratory criteria to better characterize MIS-C severity of illness, however many of these studies have conflicting results – contributing to a knowledge gap in understanding MIS-C severity.[4,5,6,7]

Methods

Data was collected through a retrospective chart review of all MIS-C patients admitted to St. Christopher's Hospital for children from April 2020 to April 2022. Patients were excluded from the laboratory analysis if they did not receive any lab-work associated with their admission. Statical analyses were completed using ANOVA and Chi Squared tests on SPSS software. Mild to Moderate illness was defined by requiring hospitalization without a PICU stay, and severe illness was defined by requiring a PICU stay.

Results

Eighty one patients were included in this study. Of the clinical, laboratory, and demographic characteristics studied, elevated d-dimer ($p < 0.001$) and troponin ($p < 0.001$), decreased platelet count ($p = 0.035$) and hemoglobin ($p = 0.004$), and increased BMI ($p = 0.009$) were all statistically significantly

associated with severe MIS-C disease. Patients with severe MIS-C were also more likely to have a prolonged hospital stay ($p < 0.001$). Other clinical, laboratory, and demographic characteristics such as PT, PTT, fibrinogen, CRP, ferritin, lymphocyte count, BNP, age, and race were not found to have any statistically significant distinction between mild to moderate and severe MIS-C.

Conclusions

Many clinical, laboratory, and demographic characteristics are associated with worse MIS-C disease severity. Additional studies are needed to further elucidate important clinical, laboratory, and demographic relationships with MIS-C disease severity.

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