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Thrombosis and Mortality in Pregnant Patients with COVID-19

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Background

Coronavirus disease-2019 (COVID-19) has become a global pandemic causing respiratory compromise, coagulopathy and renal failure in severe cases. Studies demonstrate a high incidence of venous thromboembolism (VTE), up to 69% in patients with severe COVID-19 infection. Coagulopathy in COVID-19 patients is attributed to excessive inflammation and endotheliopathy. Pregnant patients have approximately a 4-fold increase of VTE incidence. This is in part due to an increase in clotting factors and fibrinogen and a decrease in fibrinolytic activity and protein S. Increased stasis and the presence of acquired and inherited thrombophilias can contribute to increased VTE incidence during pregnancy and postpartum period (PP). Risk factors for thrombosis in pregnancy include African American race, heart disease, diabetes, smoking, multiparity, age >35 years, and obesity. Pregnancy/PP state and COVID-19 infection independently increase the risk of VTE which raises concern for an even higher incidence of thromboembolic events in pregnant/PP patients with COVID-19. Data pertaining to hypercoagulability in COVID-19 infected pregnant patients is currently limited. We conducted this study to evaluate the incidence of thrombosis and mortality in pregnant/PP COVID-19 positive patients.

Methods

A retrospective analysis was performed on all COVID-19 positive hospitalized patients between March 2020-June 2020 at our institution. Pregnant and PP patients were extracted from this cohort and individually chart reviewed by clinicians. Data from the Centers for Disease Control and Prevention on
COVID-19 positive pregnant women in the United States from January 22-July 7, 2020 was utilized for comparison analyses. Statistical analysis was performed with chi-square testing. The incidences of thrombosis and mortality were compared between hospitalized COVID-19 positive pregnant/PP patients and hospitalized adult COVID-19 positive women of childbearing age (18-51 years). A subgroup analysis was performed to evaluate risk factors for thrombosis such as demographics, trimester of pregnancy, and single/multiple gestation (Table 1). Anticoagulation and COVID-19 related therapies administered in this cohort were also studied.

**Results**

Forty-three pregnant/PP COVID-19 positive patients were identified out of 1265 hospitalized COVID-19 positive patients at our institution. Thrombosis (DVT, PE, or stroke) incidence in our cohort was 0%, which was not significantly different compared to 6.12% incidence of thrombosis in hospitalized COVID-19 positive women of childbearing age (\(P = .097\)). The mortality rate of COVID-19 positive pregnant/PP patients was 0%, which was not significantly different compared to the mortality rate of 3.06% in hospitalized COVID-19 women of childbearing age (\(P = .25\)). Further, VTE incidence of 0% in hospitalized COVID-19 positive pregnant/PP patients was not significantly different from the 0.1% incidence of VTE in the non COVID-19 pregnant population in the United States (\(P=.84\)). Lastly, the 0% mortality rate in COVID-19 positive pregnant/PP patients at our institution was no different than the 0.0169% mortality rate of pregnant women without COVID-19 infections in the United States (\(P = .93\)).

**Conclusion**

Our study demonstrates no significant difference in incidence of thrombosis and mortality rate between hospitalized COVID-19 positive pregnant/PP patients and hospitalized COVID-19 positive women of childbearing age. There was also no difference in VTE incidence between hospitalized COVID-19 positive pregnant/PP patients and non COVID-19 pregnant women in the United States. The lack of significant difference in both thrombosis incidence and mortality rate in patients who are both COVID-19 positive and pregnant/PP is reassuring and may imply that pregnancy might play a role in decreasing the inflammatory response of COVID-19. During certain phases of pregnancy a high number of macrophages, natural killer cells, and T regulator cells in the decidua have been identified, which could indicate an overall increased systemic immune response, potentially decreasing the dysregulation of the cytokine storm seen in critically ill COVID-19 patients. However, the systemic immunologic changes in pregnancy and the
postpartum period remain largely unknown and prospective studies are needed to further investigate the
effects of COVID-19 on pregnant patients.

| Demographics | Risk Factors | Hospital Course |
|--------------|-------------|-----------------|
| Age          | Race        | BMI             |
| 84% <35      | 51% Hispanic| 30% Normal      | 4% First | 98% No | 28% D-dimer<6 | 51% Enoxaparin prophylaxis | 2% Remdesivir | 2% Yes |
| 10% AMA* >35 | 44% African American | 26% Overweight | 12% Second | 2% Yes | 12% D-dimer>6 | 2% Heparin prophylaxis | 2% Hydroxychloroquine | 98% No |
| 2% Caucasian | 44% Obese   | 72% Third       | 60% Not checked | 47% None | 2% Tocilizumab |
| 2% Not Reported | 12% Postpartum |                |                |                |                |

*AMA: Advanced Maternal Age
*RRT: Renal Replacement Therapy

Disclosures

No relevant conflicts of interest to declare.

Author notes

* Asterisk with author names denotes non-ASH members.

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