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**Recommended Citation**
Pachtman Shetty SL, Meirowitz N, Blitz MJ, Gadomski T, Weinberg CR. Myocardial injury associated with coronavirus disease 2019 in pregnancy. 2020 Jan 01; ():Article 6672 [p.]. Available from: [https://academicworks.medicine.hofstra.edu/articles/6672](https://academicworks.medicine.hofstra.edu/articles/6672). Free full text article.

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Myocardial injury associated with coronavirus disease 2019 in pregnancy

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The authors report no conflict of interest.

Word count: 542
Objective:

Coronavirus disease 2019 (COVID-19) is associated with cardiac injury\textsuperscript{1-3} and bradycardia\textsuperscript{4} in the non-pregnant population. The incidence of these complications in pregnancy is unknown.

The objective of this study was to determine the rate of abnormal serum cardiac biomarkers or bradycardia among pregnant and immediately postpartum women admitted for treatment of severe or critical COVID-19 in a large integrated health system in New York.

Study Design:

This is a retrospective review of all pregnant and immediately postpartum women hospitalized for COVID-19 at 7 hospitals within Northwell Health, the largest academic health system in New York state, from March 1 to April 30, 2020. Women who tested positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by polymerase chain reaction (PCR) assay and who met the National Institute of Health (NIH) criteria for severe or critical illness\textsuperscript{5} were included. Women with a positive PCR test who were admitted for a reason other than treatment of COVID-19 (eg, labor) were excluded. The Northwell Health Institutional Review Board approved the study as minimal-risk research using data collected for routine clinical practice and waived the requirement for informed consent.

Clinical records were manually reviewed. Data collected included demographics, medical comorbidities, pregnancy characteristics, laboratory and imaging results, medications administered, and clinical outcomes. Laboratory and imaging studies were ordered at the
discretion of the attending physician. The primary outcomes evaluated were elevated cardiac
troponins (I, T, or high sensitivity), elevated brain natriuretic peptide (BNP), bradycardia
(defined as < 60 beats per minute, bpm), and maternal heart rate (HR) nadir. Descriptive
statistics were used to characterize the data.

Results:

A total of 31 women met inclusion criteria; 20 (65%) had cardiac biomarkers measured during
hospitalization (Table). Cardiac troponins and BNP were elevated in 22% (n=4/18) and 30%
(n=3/10) of these patients, respectively. Four patients had transthoracic echocardiograms
performed and all were reported as normal. No patients had preexisting cardiovascular disease or
hypertension. Two maternal mortalities in this cohort were previously reported, both patients
had elevated cardiac troponins and one also had an elevated BNP.

The nadir HR ranged from 30-92 bpm and bradycardia occurred in one-third of patients
(n=10/31). Half of women with elevated troponin and three-fourths of women with elevated BNP
had an episode of bradycardia recorded during their hospital course.

Conclusion:

Myocardial injury as demonstrated by abnormal cardiac biomarkers and bradycardia may be
common among pregnant women with severe or critical COVID-19. In this study, one-fifth of
patients who had troponin levels measured were found to have elevations (one-eighth of the
Among patients who had brain natriuretic peptide levels measured, 30% were elevated (10% of the overall study population). One third of women had bradycardia. This study is limited by a small sample size. Laboratory testing and imaging was not uniform due to the retrospective nature of the study. Sampling bias was unavoidable because the decision to measure cardiac markers or perform imaging studies was made by the patient’s care team, based on clinical presentation rather than a formal protocol. Few studies have evaluated the risk of cardiac injury or arrhythmia among pregnant women with COVID-19. It is also unknown whether there are long-term sequelae that affect maternal health or future pregnancy outcomes. This is an important area of focus for future research.
Acknowledgements:

We would like to acknowledge the efforts of the healthcare workers caring for pregnant women during the global COVID-19 pandemic.
References:

1. Liu J, Virani SS, Alam M, Denktas AE, Hamzeh I, Khalid U. Coronavirus disease-19 and cardiovascular disease: A risk factor or a risk marker? Rev Med Virol. 2020:e2172.

2. Ghio S, Baldi E, Vicentini A, et al. Cardiac involvement at presentation in patients hospitalized with COVID-19 and their outcome in a tertiary referral hospital in Northern Italy. Intern Emerg Med. 2020.

3. Lopez-Otero D, Lopez-Pais J, Antunez-Muinos PJ, Cacho-Antonio C, Gonzalez-Ferrero T, Ramon Gonzalez-Juanatey J. [Association between myocardial injury and prognosis of COVID-19 hospitalized patients, with or without heart disease. CARDIOVID registry]. Rev Esp Cardiol. 2020.

4. Capoferri G, Osthoff M, Egli A, Stoeckle M, Bassetti S. Relative bradycardia in patients with COVID-19. Clin Microbiol Infect. 2020.

5. National Institutes of Health. COVID-19 Treatment Guidelines Panel. Coronavirus Disease 2019 (COVID-19) Treatment Guidelines Web site. https://www.covid19treatmentguidelines.nih.gov/. Published 2020. Accessed September 23, 2020.

6. Blitz MJ, Rochelson B, Minkoff H, et al. Maternal mortality among women with coronavirus disease 2019 admitted to the intensive care unit. Am J Obstet Gynecol. 2020;223(4):595-599 e595.
### Table: Characteristics of patients with normal and abnormal cardiac markers:

| Characteristic                        | Patients with normal cardiac biomarkers (n = 13) | Patients with elevated cardiac biomarkers (n = 7) |
|---------------------------------------|-------------------------------------------------|--------------------------------------------------|
| Maternal age (years) ≥ 35 years       | 33 ± 4.4                                        | 32 ± 4.5                                         |
|                                       | 2 (15.4%)                                       | 3 (42.9%)                                        |
| Race or Ethnicity                     |                                                 |                                                 |
| Caucasian                             | 5 (38.5%)                                       | 2 (28.5%)                                        |
| African American                      | 2 (15.4%)                                       | 0                                                |
| Hispanic                              | 6 (42.8%)                                       | 0                                                |
| Asian                                 | 0                                               | 3 (42.8%)                                        |
| Other/Unknown/Multiracial             | 0                                               | 2 (28.5%)                                        |
| Multiparous                           | 9 (69.2%)                                       | 7                                                |
| Parity of 3 or more                   | 3 (23.1%)                                       | 2 (28.5%)                                        |
| BMI prepregnancy (kg/m²) ≥ 30 kg/m²   | 34.7 ± 6.7                                      | 32.5 ± 6.0                                       |
|                                       | 8 (61.5%)                                       | 5 (71.4%)                                        |
| Medical comorbidities                 |                                                 |                                                 |
| Hypertension                          | 0                                               | 0                                                |
| Diabetes                              | 0                                               | 1 (14.3%)                                        |
| Asthma                                | 1 (7.7%)                                        | 1 (14.3%)                                        |
| Pre-existing cardiac disease          | 0                                               | 0                                                |
| Pregnancy complications               |                                                 |                                                 |
| Gestational diabetes                  | 1 (7.7%)                                        | 0                                                |
| **Gestational hypertension or preeclampsia** | 3 (23.1%) | 2 (28.5%) |
| **COVID-19** | | |
| Gestational age at hospitalization, wk | 33.5 [10.8] | 34.5 [4.5] (1 postpartum) |
| **Reported symptoms** | | |
| Fever, subjective or measured | 9 (69.2%) | 6 (85.7%) |
| Cough | 8 (61.5%) | 6 (85.7%) |
| Dyspnea | 9 (69.2%) | 6 (85.7%) |
| Nausea or diarrhea | 1 (7.7%) | 1 (14.3%) |
| Other | 0 | 1 (14.3%, abdominal pain) |
| **Medications** | | |
| Hydroxychloroquine | 11 (84.6%) | 3 (42.8%) |
| Corticosteroids | 5 (38.5%) | 4 (57.1%) |
| Remdesivir | 0 | 2 (28.5%) |
| Interleukin Inhibitors | 1 (7.7%) | 3 (42.8%) |
| Convalescent plasma | 0 | 1 (14.3%) |
| **Vital signs** | | |
| Parameter                                      | Cases | Percentage |
|-----------------------------------------------|-------|------------|
| **Temperature, ≥100.4F or 38.0C**             | 6     | 42.8%      |
| **Max heart rate, >100 beats per minute**     | 10    | 76.9%      |
| **Min heart rate, <60 beats per minute**      | 6     | 42.8%      |
| **Respiratory rate, >30 breaths per minute**  | 4     | 30.7%      |
| **Oxygen saturation (minimum), % ≤93%**       | 11    | 84.6%      |
| **Biomarkers**                                |       |            |
| BNP > 300 pg/mL                                | 0     | 0%         |
| hs-Trop > 6 – 14 ng/L                          | 0     | 0%         |
| Troponin T > 0.06 ng/mL                       | 0     | 0%         |
| Troponin I > 0.045 ng/mL                      | 0     | 0%         |
| Echocardiogram                                | 1     | 7.7%       |
| **Number of days admitted to hospital**       | 8     | [11]       |
| **Intensive care unit admission**             | 5     | 38.5%      |
| **Maternal mortality**                        | 0     | 0%         |

Data are presented as n (%), median [interquartile range], or mean ± standard deviation unless otherwise specified.

bpm, beats per minute.

Reference ranges: high sensitivity cardiac troponins < 6 – 14 ng/L, troponin T 0.00 – 0.06 ng/mL, troponin I 0.000 – 0.045, BNP < 300 pg/mL.