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1-1-2022

COVID-19 is associated with early emergence of preeclampsia: results from a large regional collaborative

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Recommended Citation

Hasbini YG, Goyert G, Tarca AL, Keerthy M, Jones T, Thiel L, Green PM, Youssef Y, Townsel C, Vengalil S, Paladino P, Wright A, Ayyash M, Vadlamudi G, Szymanska M, Sajja S, Sterenberg G, Baracy M, Grace K, Houston K, Norman J, Gudicha DW, Sokol RJ, Bahado-Singh R, and Hassan SS. COVID-19 is associated with early emergence of preeclampsia: results from a large regional collaborative. Am J Obstet Gynecol 2022; 226(1):S594-S595

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Table: Demographic Characteristics

Characteristic	Frequency (%)
<i>n</i>	398
Age (mean±std)	27.9±6.8
Race/Ethnicity	
Black	131 (33%)
White	12 (3%)
Hispanic	253 (64%)
Other	2 (1%)
Nulliparity	131 (33%)
BMI (mean±std)	34.0±7.6
BMI categorical	
<25	27 (7%)
25-<30	84 (21%)
30-<35	129 (32%)
35-<40	80 (20%)
≥ 40	78 (20%)
Chronic HTN	30 (8%)
Gestational HTN	95 (24%)
Diabetes	
GDM	38 (10%)
Pregestational	9 (2%)

BMI: Body Mass Index; HTN: hypertension; GDM gestational diabetes mellitus; std: standard deviation

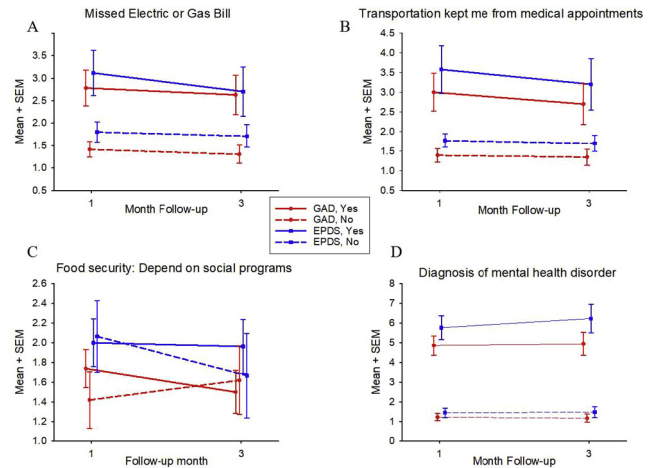


Figure 1. Differences in mean GAD and EPDS scores based on social determinants of health. Mean GAD (red lines) and EPDS (blue lines) scores were higher in individuals who (A) missed an electric or gas bill (solid lines; $p < 0.001$, $p = 0.02$ respectively); B) missed medical appointments due to lack of transportation (solid lines; $p = 0.003$, $p = 0.003$ respectively); C) not different in individuals who depended on social programs for food (solid lines; $p = 0.48$, $p = 0.90$); D) higher for individuals with a diagnosed mental health disorder (solid lines; $p < 0.001$).

931 COVID-19 is associated with early emergence of preeclampsia: results from a large regional collaborative



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OBJECTIVE: To examine the relationship between COVID-19 and preeclampsia (PreE) in a large, diverse population.

STUDY DESIGN: The COVID-19 in Pregnancy and The Newborn: State of Michigan Collaborative established a database of pregnant patients admitted to 14 institutions in Southern Michigan. Patients with COVID-19 (cases) were matched to 2 or 3 non-COVID patients (controls) on the same unit within 30 days of each case. Relative Risks (RR) were calculated using robust Poisson regression models with adjustment for covariates. Chi-squared test for trend was used to assess the increase in risk with the severity of disease.

RESULTS: 369 cases and 1,090 controls were delivered between March - October 2020. An increased risk of PreE (RR=1.8), driven almost entirely by an increase in preterm PreE (pretermPreE) (RR=2.85) was observed in COVID pregnancies (Table 1), with a dose-response relationship with symptomatology and severity (Table 2). The associations between COVID-19 disease and PreE or pretermPreE were independent of other risk factors, as demonstrated by the minimal changes in RR after adjustment for confounders (Table 1). However, African American (AA) COVID patients experienced pretermPreE 1.9 times more than COVID patients of other races (10.1 vs 5.3), an increase not observed in control patients. The strength of the association for COVID with PreE was comparable to the association of PreE with chronic hypertension and nulliparity (data not shown). Increasing symptoms and severity of COVID-19 were associated with an increased risk for PreE with placental lesions, even after adjustment for relevant covariates (Tables 1 & 2). Non-PreE COVID patients had an increased trend of placental lesions compared to non-COVID patients, reaching significance for intravillous thrombin.

CONCLUSION: COVID-19 is significantly associated with early emergence of PreE, independent of known risk factors other than AA race. Our study shows that among patients predisposed to PreE, COVID-19 impacts PreE severity in that it leads to pretermPreE. Further studies on COVID-19 and PreE, with a focus on racial disparities, is warranted.

Table 1: Crude and adjusted relative risk carried by COVID19 for preeclampsia related outcomes.

	No COVID % (n)	COVID % (n)	p	RR	aRR	Adjusted for
PreE	8.7(95)	15.7(58)	0.000147	1.8(1.33-2.45)	1.69(1.26-2.26)	age, BMI, insurance, Nulliparous, HistPTD, CHTN, Twins
Preterm_PreE	2.7(29)	7.6(28)	4.90E-05	2.85(1.72-4.73)	2.48(1.48-4.17)	insurance, Nulliparous, HistPTD, CHTN, Diabetes, Substance, Twins
Term_PreE	6.1(66)	8.1(30)	0.164123	1.34(0.89-2.03)	1.3(0.85-2)	age, BMI
PreE_Lesions	2.9(32)	6.5(24)	0.002512	2.22(1.32-3.71)	1.97(1.14-3.4)	insurance, Nulliparous, HistPTD, CHTN

Covariates included as fixed effects in the Poisson models are listed for each outcome. RR: relative risk; aRR: adjusted relative risk; CHTN: chronic hypertension; HistPTD: history of preterm delivery; PreE: preeclampsia; Preterm_PreE: preeclampsia with delivery <37 weeks; Term_PreE: preeclampsia with delivery >=37 weeks; PreE_Lesions: Preeclampsia involving any placental lesions

Table 2. Relation between COVID19 (a) symptoms and (b) severity and the rate of PreE, PretermPreE, PreE with Lesions.

(A) Covid 19 symptoms and PE, PPE, and PE with lesions

Outcome	% Of Non-Covid who experienced outcome (n)	% Of Covid Asymptomatic who experienced outcome (n)	% Of Covid Symptomatic who experienced outcome (n)	p Trend
PreE	8.7(95)	14.2(33)	18.4(25)	6.45E-05
Preterm_PreE	2.7(29)	5.2(12)	11.8(16)	3.32E-07
Term_PreE	6.1(66)	9(21)	6.6(9)	0.342
PreE_Lesions	2.9(32)	6(14)	7.4(10)	0.0019

(B) COVID 19 Severity and PreE, PretermPreE, and PreE with lesions

	No Covid % (n)	Covid Asymptomatic % (n)	Covid Mild/Moderate % (n)	Covid Severe % (n)	p Trend
PreE	8.7(95)	14.2(33)	18.5(22)	17.6(3)	8.62E-05
Preterm_PreE	2.7(29)	5.2(12)	10.9(13)	17.6(3)	1.26E-07
Term_PreE	6.1(66)	9(21)	7.6(9)	0(0)	0.470135
PreE_Lesions	2.9(32)	6(14)	8.4(10)	0(0)	0.005155

The p-value represents significance from a chi-squared test for trend in proportions.

932 Risk of severe acute maternal morbidity according to gestational age at delivery in twin pregnancies

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OBJECTIVE: Gestational age at delivery minimizing fetal and neonatal mortality in twin pregnancies seems to be 37 weeks of gestation. Our objective was to assess the so far unexplored association between gestational age at delivery and severe acute maternal morbidity (SAMM) in women with twin pregnancies.

STUDY DESIGN: We conducted a secondary analysis of the JUMODA cohort, a national, prospective, population-based study of twin pregnancies in France, from February 2014 through March 2015. We excluded women who delivered before 32 weeks of gestation, women with fetal death or medical termination of either twin, women with antepartum SAMM and those with antepartum conditions responsible for a postpartum SAMM. The primary outcome was a composite of postpartum SAMM. The exposure of interest was gestational age at delivery. We assessed the association between gestational age at delivery and SAMM by using a multivariable multilevel modified Poisson regression model. Two sensitivity analyses were performed; one assessed the association between gestational age at delivery and severe postpartum hemorrhage and the other was restricted to a low risk population.

RESULTS: Among the 7713 women included, 410 (5.3%) developed postpartum SAMM. The main underlying condition was postpartum hemorrhage (88.5%). In the multivariable analysis, gestational age was significantly associated with the risk of postpartum SAMM ($p < 0.001$). Compared with the reference category of 37 weeks of gestation, the risk of postpartum SAMM was significantly lower for all categories of earlier gestational age at delivery, and not different for categories of later gestational age at delivery (Figure). Sensitivity analyses showed similar results.

CONCLUSION: In twin pregnancies, compared with delivery at 37 weeks of gestation, delivery at earlier gestational ages is associated with a lower risk of postpartum SAMM. However, continuing pregnancy beyond 37 weeks of gestation is not associated with an increased risk of postpartum SAMM.