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Impact of the COVID-19 pandemic on the incidence of prematurity: critical role of gestational age and environment

OBJECTIVE: Data on the incidence of prematurity during the COVID-19 pandemic are contradictory, with some reports showing decreased preterm births and others showing no effect.[1,2] We propose that multiple biologic effects of SARS-CoV-2 infection and environmental changes during the pandemic exert competing effects on the preterm birth rate.

SARS-CoV-2 infection may increase preterm births by increasing preeclampsia and medically indicated preterm births,[3] but its effects on spontaneous preterm births are unknown. Infection is the most commonly identified etiologic contributor to spontaneous preterm births at <28 weeks' gestation.[4] Our preliminary data demonstrated that SARS-CoV-2 placental infection increases the expression of placenta-specific microRNA 519c, which protects against infection-induced preterm birth.[5] Furthermore, environmental effects of the COVID-19 pandemic (lockdowns, quarantine, decreased travel) may decrease pathogen exposures that can trigger infection-induced preterm birth.[6] Therefore, the effects of the COVID-19 pandemic on the rates of prematurity likely reflect a balance between increased preeclampsia-induced preterm births and decreased infection-induced spontaneous preterm births.

New York was the first epicenter of the COVID-19 pandemic in the United States. The prevalence of SARS-CoV-2 infection exploded in March 2020, with a surge in the urban center. Lockdowns were initiated in all jurisdictions by mid-March. We compared the incidence of extreme prematurity (with and without preeclampsia) in 2020 with that of 2019 in a large cross-sectional study of hospitals in the New York City area.

STUDY DESIGN: Data were collected from urban medical centers (New York University Tisch Hospital, Lenox Hill Hospital, Montefiore Medical Center, Mount Sinai Hospital) and suburban medical centers (New York University Langone Hospital—Long Island, Long Island Jewish Medical Center,

TABLE 1
Number and rates of preterm deliveries in 2019 and 2020

	2019		2020			
Variables	N	Rate/1000	N	Rate/1000	Difference (95% CI)	*P* value
Deliveries	63,327	—	62,020	—	−1307	.0002
Delivery <35 wk	2255	35.6	2153	34.7	−0.9 (−1.9 to 0.1)	.08
Delivery 28−35 wk	1900	30.0	1864	30.1	0.1 (−0.9 to 1.0)	.9
Delivery <28 wk	355	5.6	289	4.7	−0.9 (−1.3 to −0.6)	<.0001
With preeclampsia	44	123.9	52	179.9	56.0 (28.0−83.0)	<.0008
COVID-19 positive	—	—	1870	30.15	—	—

CI, confidence interval.

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TABLE 2
Number and rate of preterm deliveries at urban and suburban hospitals

Variables	Urban 2019 N	Urban 2019 Rate/1000	Urban 2020 N	Urban 2020 Rate/1000	Difference (95% CI)	*P* value
Total deliveries	35,466	—	33,471	—	—	—
Delivery <35 wk	1311	37.0	1269	37.9	0.9 (−0.5 to 2.4)	.2
Delivery 28—35 wk	1103	31.1	1091	32.6	1.5 (0.2—2.8)	.03
Delivery <28 wk	208	5.9	178	5.3	−0.5 (−1.1 to 0.0)	.06
With preeclampsia	21	101.0	28	157.3	56.3 (22.2—88.6)	.001
COVID-19 positive	—	—	1344	40.2	—	—
Suburban						
Total deliveries	27,861	—	28,549	—	—	—
Delivery <35 wk	944	33.9	884	30.9	−2.9 (−4.4 to −1.5)	.0001
Delivery 28—35 wk	847	30.4	812	28.4	−2.0 (−3.4 to −0.6)	.06
Delivery <28 wk	97	3.5	72	2.5	−1.4 (−2.0 to −0.8)	<.0001
With preeclampsia	23	156.5	24	216.2	59.8 (11.5—105.7)	.01163
COVID-19 positive	—	—	526	18.4	—	—

CI, confidence interval.

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North Shore University Hospital, Westchester Medical Center, and Stony Brook University Hospital) in New York. Rates of prematurity with and without preeclampsia were compared using the inverted skew-corrected score test for binomial distributions and Poisson regression.

RESULTS: Total deliveries decreased from 63,327 in 2019 to 62,020 in 2020, with a SARS-CoV-2 positivity rate of 30.1 per 1000 (Table 1). Extreme prematurity (<28 weeks' gestation) decreased from 5.6 to 4.7 per 1000 deliveries in 2020 ($P<.0001$), but the rate of moderate prematurity (28—35 weeks' gestation) did not change. Preeclampsia increased in 2020, from 123.9 to 179.9 per 1000 in mothers who delivered at <28 weeks' gestation.

At the suburban sites, overall prematurity dropped significantly (33.9 to 30.9/1000, $P=.0001$), primarily driven by decreased rates of extreme prematurity (3.5 to 2.5/1000, $P<.0001$). In contrast, at urban sites, total and extreme prematurity did not significantly decrease, and moderate prematurity increased (31.1 to 32.6/1000, $P=.03$). The rates of SARS-CoV-2 positivity were significantly higher in urban than in suburban sites (40.2 vs 18.4/1000, $P<.0001$) (Table 2).

CONCLUSION: In 2020, the COVID-19 pandemic in New York was associated with an overall decreased rate of extreme preterm births (<28 weeks' gestation) despite an increased rate of preeclampsia. This is consistent with the fact that extreme preterm births usually occur spontaneously secondary to infection. Decreased intrapartum infection was likely related to both the environmental effects of lockdowns and possible biologic effects of SARS-CoV-2 infection on the placenta. In contrast, the rates of moderate prematurity (>28 weeks' gestation) did not decrease. This is most likely related to the relative impact of increased preeclampsia and other medical indications for preterm delivery. Conflicting results in earlier reports may be related to the diversity in the gestational ages and the contributing etiologic factors for preterm birth in the studied population.

The effects of the pandemic in New York were different in urban and suburban populations. Total prematurity decreased at suburban sites, driven by significant decreases in extreme prematurity. In contrast, at urban sites, total and extreme prematurity remained unchanged, and moderate prematurity increased. It is possible that lockdowns were less effective in the urban locations, as demonstrated by the increased prevalence of COVID-19 infection. Our findings highlight the importance of providing socioeconomic data in reports on the population effects of the pandemic. ■

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