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A marked decrease in preterm deliveries during the coronavirus disease 2019 pandemic

OBJECTIVE: Previous studies comparing the coronavirus disease 2019 pandemic period with prepandemic periods reported either no change or a decrease in extremely preterm birth (PTB) rates during the pandemic.1,2 These studies evaluated a limited number of potential PTB confounders and a short pandemic period. We aimed to determine the change in the PTB rate and neonatal outcomes during the pandemic period compared with that in the prepandemic periods by evaluating multiple obstetrical characteristics during more than 3 pandemic months.

STUDY DESIGN: We compared maternal, obstetrical, and neonatal outcomes of singleton pregnancies at the Sheba Medical Center, Israel, during 3 periods: from March 20, 2020 (date of implementation of governmental state of lockdown), to June 27, 2020 (group 1); a parallel period in 2019 (group 2); and parallel annual periods in 2011–2019 (group 3) (Table 1). We also compared maternal and pregnancy characteristics during the pandemic and corresponding prepandemic periods in 2019 between pregnancies complicated by PTB at <34 0/7 and ≥34 0/7 weeks’ gestation (Table 2). Multivariate

| Characteristic | COVID-19 period (n = 2594) | Preparandemic period (2019; n = 2742) | OR (95% CI)a | P value | Preparandemic-matched period (2011–2019; n = 28,686) | OR (95% CI)a | P value |
|---------------|--------------------------|-------------------------------------|--------------|---------|-----------------------------------------------|--------------|---------|
| Maternal characteristics | | | | | | | |
| Age, y | 32.00±5.40 | 32.00±5.10 | — | .329 | 32.00±5.10 | — | .018 |
| Prepregnancy BMI, kg/m² | 23.50±4.60 | 23.60±4.70 | — | .285 | 23.30±4.40 | — | .011 |
| Predelivery BMI, kg/m² | 28.20±4.50 | 28.40±4.50 | — | .119 | 28.20±4.40 | — | .381 |
| Weight gain, kg | 13.00±5.40 | 13.00±5.90 | — | .190 | 13.00±5.50 | — | .001 |
| Immigrant | 387 (14.90) | 440 (16.00) | — | .257 | 4772 (16.60) | 0.88 (0.79–0.99) | .024 |
| Smoking | 107 (4.10) | 117 (4.30) | — | .796 | 1386 (4.80) | — | .106 |
| Parity | 1.00±1.50 | 1.00±1.60 | — | .584 | 1.00±1.40 | — | .001 |
| Nulliparous | 877 (33.80) | 952 (34.70) | — | .484 | 10,271 (35.80) | 0.92 (0.85–0.99) | .042 |
| Previous cesarean delivery | 425 (16.40) | 457 (16.70) | — | .781 | 4551 (15.90) | — | .489 |
| Positive SARS-CoV-2 test | 13 | — | — | — | — | — | — |
| Assisted reproductive technology | 221 (8.50) | 238 (8.70) | — | .835 | 2082 (7.30) | 1.19 (1.03–1.39) | .018 |
| Diabetes | 297 (11.40) | 285 (10.40) | — | .216 | 2615 (9.10) | 1.28 (1.14–1.47) | <.001 |
| Hypertensive disease | 117 (4.50) | 125 (4.60) | — | .932 | 1118 (3.90) | — | .125 |
| Hemoglobin before delivery, g/dL | 12.19±1.10 | 11.98±1.10 | — | <.001 | 11.92±1.10 | — | <.001 |
| Hemoglobin of <11.0 g/dL before delivery | 357 (13.80) | 5289 (18.40) | 0.87 (0.63–0.79) | <.001 | 503 (18.30) | 0.71 (0.61–0.82) | <.001 |
| Platelets before delivery, K/µL | 201.00±57.20 | 211.00±59.90 | — | <.001 | 205.00±57.10 | — | <.001 |
| White blood cell count before delivery, K/µL | 10.90±3.00 | 11.10±3.30 | — | .264 | 11.40±3.20 | — | <.001 |
TABLE 1
Comparison of maternal, obstetrical, and delivery characteristics and neonatal outcomes between the pandemic (March 2020 to June 2020) and prepandemic periods (from March 2019 to June 2019) (continued)

| Characteristic | COVID-19 period (n = 2594) | Prepandemic period (2019; n = 2742) | OR (95% CI) | P value | Prepandemic-matched period (2011–2019; n = 28,686) | OR (95% CI) | P value |
|----------------|-----------------------------|-----------------------------------|-------------|---------|-----------------------------------------------|-------------|---------|
| Fibrinogen before delivery, mg/dL | 474.00±100.90 | 468.00±96.90 | — | .298 | 446.00±84.90 | — | <.001 |
| Delivery characteristics | | | | | | | |
| Induction of labor | 295 (11.40) | 286 (10.40) | — | .270 | 2793 (9.70) | 1.19 (1.05–1.35) | .007 |
| Intrapartum fever | 35 (1.30) | 30 (1.10) | — | .396 | 281 (1.00) | | .071 |
| Gestational age at delivery, wk | 39 1/7±1 6/7 | 39 0/7±2 0/7 | — | .004 | 39 1/7±2 1/7 | | .684 |
| <37 0/7 | 174 (6.70) | 220 (8.00) | — | .066 | 2060 (7.20) | | .370 |
| <34 0/7 | 32 (1.20) | 74 (2.70) | 0.45 | <.001 | 592 (2.10) | 0.60 (0.41–0.85) | .004 |
| <32 0/7 | 20 (0.80) | 45 (1.60) | 0.47 | <.001 | 379 (1.30) | 0.58 (0.37–0.92) | .017 |
| Spontaneous delivery | 1746 (67.30) | 1812 (66.10) | — | .352 | 19,961 (69.60) | 0.90 (0.82–0.98) | .014 |
| Operative vaginal delivery | 187 (7.20) | 197 (7.20) | — | .972 | 1735 (6.00) | 1.22 (1.04–1.43) | .018 |
| Cesarean delivery | 661 (25.50) | 733 (26.70) | — | .299 | 6990 (24.40) | | .206 |
| Intrapartum cesarean delivery | 277 (41.60) | 325 (44.30) | — | .366 | 3083 (44.10) | | .276 |
| Neonatal outcomes | | | | | | | |
| Birthweight, g | 3230±511 | 3196±544 | — | .020 | 3205±533 | — | .026 |
| Composite neonatal outcome | | | | | | | |
| Stillbirth | 22 (0.80) | 22 (0.80) | — | .853 | 290 (1.00) | | .424 |
| Death in 30 d | 3 (0.10) | 4 (0.10) | — | 1.0 | 23 (0.10) | — | .427 |
| Mechanical ventilation | 24 (0.90) | 23 (0.80) | — | .736 | 271 (0.90) | — | .922 |
| Hypoxic-ischemic encephalopathy | 2 (0.10) | 2 (0.10) | — | 1.0 | 27 (0.10) | — | 1.0 |
| Convulsions | 1 (0.01) | 5 (0.20) | — | .220 | 25 (0.10) | — | .720 |
| Asphyxia | 0 (0.00) | 1 (0.01) | — | 1.0 | 32 (0.10) | — | .108 |
| 1-min Apgar score of <5 | 9 (0.30) | 13 (0.50) | — | .469 | 193 (0.70) | 0.51 (0.26–1.01) | .060 |
| 5-min Apgar score of <7 | 8 (0.30) | 8 (0.30) | — | .911 | 113 (0.40) | — | .502 |
| Neonatal intensive care unit admission | 78 (3.00) | 123 (4.50) | 0.66 | <.001 | 1048 (3.70) | — | .091 |

Data are presented as mean±standard deviation or number (percentage).
OR was calculated only for significantly different categorical variables.
Apgar, appearance, pulse, grimace, activity, and respiration; BMI, body mass index; CI, confidence interval; COVID-19, coronavirus disease 2019; OR, odds ratio, SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

a Prepandemic data were compared with COVID-19 period data. b SARS-CoV-2 infection was evaluated only during the COVID-19 pandemic. During the study period, only women from endemic areas or women with symptoms of COVID-19 were screened for infection. c Composite neonatal outcome consisted of the occurrence of any of the following: stillbirth, neonatal death during the first 30 days, mechanical ventilation, hypoxic-ischemic encephalopathy, convulsions, asphyxia, 1-minute Apgar score of <5, 5-minute Apgar of <7, and neonatal intensive care unit admission.

Meyer. Preterm deliveries during the coronavirus disease pandemic. Am J Obstet Gynecol 2021.
regression analysis was performed to study independent factors associated with PTB. The institutional review board approved this study (7068-20-SMC; March 30, 2020).

RESULTS: There were 2594 deliveries during the pandemic period (group 1) and 2742 and 28,686 deliveries in the prepandemic periods (groups 2 and 3, respectively). Maternal and obstetrical characteristics did not differ between groups 1 and 2. Predelivery hemoglobin levels were higher in the pandemic period. PTB rate at <34 0/7 weeks’ gestation was significantly lower in the pandemic period than in the parallel period (group 2) (odds ratio [OR], 0.45; 95% confidence interval [CI], 0.30–0.68; P<.001), as was the rate of composite neonatal outcome (OR, 0.76; 95% CI, 0.59–0.96; P=.023). Age, body mass index, parity, diabetes rates, and hematologic characteristics differed between groups 1 and 3 with significantly higher predelivery hemoglobin levels in group 1. PTB rate at <34 0/7 weeks’ gestation was lower in the pandemic period (OR, 0.60; 95% CI, 0.41–0.85; P=.004). On multivariate regression analysis, childbirth during the pandemic period was independently associated with a decreased risk of delivery at <34 0/7 weeks’ gestation (adjusted OR, 0.29; 95% CI, 0.15–0.56; P=.001).

CONCLUSION: We observed more than 50% reduction in the rate of PTB at <34 0/7 weeks’ gestation, possibly resulting in improved neonatal outcomes.

Explanations for the lower PTB rate include reduced iatrogenic PTBs, avoidance of infections, or reduced stress level related to the lockdown policy. Another suggested etiology is heme oxygenase-1 (HO-1) induction, caused by relative hypoxia resulting from wearing a face mask during the pandemic period. HO-1 enhances hemoglobin production and has been shown to reduce spontaneous PTB rates. However, the clinical significance of hemoglobin level differences is questionable.

### TABLE 2

Comparison of maternal, obstetrical, and delivery characteristics and neonatal outcomes between pregnancies complicated by PTB at <34 0/7 and ≥34 0/7 weeks’ gestation during the pandemic (March 2020 to June 2020) and prepandemic periods (from March 2019 to June 2019)

| Characteristic                          | Delivery at <34 0/7 wk (n=106) | Delivery at ≥34 0/7 wk (n=5230) | OR (95% CI) | P value | aOR (95% CI) | aP value |
|-----------------------------------------|---------------------------------|---------------------------------|-------------|---------|--------------|----------|
| Age, y                                  | 32.00±7.30                      | 32.00±5.40                      | —           | .430    | —            | —        |
| Prepregnancy BMI, kg/m²                 | 23.10±3.90                      | 23.60±4.60                      | —           | .396    | —            | —        |
| Predelivery BMI, kg/m²                  | 26.20±4.50                      | 28.40±4.50                      | —           | <.001β  | —            | —        |
| Weight gain, kg                         | 9.00±3.60                       | 13.00±5.70                      | —           | <.001β  | 0.93 (0.90–0.97)c <.001β |
| Immigrant                               | 13 (12.3)                       | 814 (15.6)                      | —           | .353    | —            | —        |
| Smoking                                 | 8 (7.5)                         | 216 (4.1)                       | —           | .082    | —            | —        |
| COVID-19 period                         | 32 (30.2)                       | 2562 (49.0)                     | 0.45 (0.29–0.68) | <.001β | 0.29 (0.15–0.56) <.001β |
| Parity                                  | 1.00±1.60                       | 1.00±1.50                       | —           | .509    | —            | —        |
| Nulliparous                             | 45 (42.5)                       | 1784 (34.1)                     | —           | .073    | —            | —        |
| Previous cesarean delivery              | 23 (21.7)                       | 859 (16.4)                      | —           | .148    | —            | —        |
| Assisted reproductive technology        | 21 (19.8)                       | 438 (8.4)                       | 2.70 (1.66–4.40) | <.001β | 3.57 (1.92–6.61) <.001β |
| Diabetes                                | 11 (10.4)                       | 571 (10.9)                      | —           | .860    | —            | —        |
| Hypertensive disease                    | 8 (7.5)                         | 234 (4.5)                       | —           | .132    | —            | —        |
| Hemoglobin before delivery, g/dL        | 11.23±2.20                      | 12.10±1.10                      | —           | <.001β  | —            | —        |
| Hemoglobin of <11 g/dL before delivery   | 33 (31.1)                       | 827 (15.8)                      | 2.40 (1.58–3.65) | <.001β | 2.89 (1.64–5.10) <.001β |
| Induction of labor                      | 26 (24.5)                       | 555 (10.6)                      | 2.73 (1.74–4.29) | <.001β | 3.41 (1.90–6.43) <.001β |
| Intrapartum fever                       | 2 (1.9)                         | 63 (1.2)                        | —           | .372    | —            | —        |

Data are presented as mean±standard deviation or number (percentage).

aOR, adjusted odds ratio; BMI, body mass index; COVID-19, coronavirus disease 2019; OR, odds ratio; PTB, preterm birth.

a aOR following multivariate regression analysis include the following factors: weight gain, COVID-19 period, assisted reproductive technology, hemoglobin before delivery, and induction of labor;

b P<.05; c For every kg increase in weight gain.

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Although a Danish study reported lower rates of PTB at ≤27 6/7 weeks’ gestation during the pandemic, it evaluated only 1 month of the pandemic period and was based on a national registry.1 Another study has found a trend (P = 0.07) toward higher PTB rates during the pandemic.2 However, the sample size was limited, and the prepandemic period comparison was not parallel, potentially introducing seasonal effects.3

Further research is required to better understand the pathogenesis underlying lower PTB rates during the pandemic period.

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Enhanced recovery after cesarean: impact on postoperative opioid use and length of stay

OBJECTIVE: Enhanced recovery after surgery (ERAS) refers to a comprehensive program to improve surgical outcomes.1 ERAS typically includes preoperative health optimization, preoperative patient education, and perioperative interventions to reduce pain, nausea, vomiting, infection, thromboembolism, and overall morbidity. The ERAS Society recently published guidelines for enhanced recovery after cesarean (ERAC).2 ERAC may reduce postoperative opioid use3 and shorten length of stay (LOS),4 although these benefits are not always obtained.5 The purpose of this quality improvement project was to develop, implement, and evaluate an ERAC program at our level 3 community hospital. Several specific goals were prospectively stated: to reduce postoperative opioid use, to promote earlier removal of bladder catheters (a surrogate for mobilization), and to shorten postoperative LOS.

STUDY DESIGN: Preexisting unit standards (applied routinely for virtually all cesarean deliveries) included some typical ERAS components, such as preoperative prophylactic cefazolin, early postoperative feeding, and routine postoperative use of abdominal binder. A bundle of new interventions was phased in from August 2018 to November 2018, as summarized in the Figure. Some interventions became new unit standards: allowing clear liquids until 2 hours before surgery, povidone-iodine vaginal cleansing, intraoperative underpatient warming, postoperative chewing gum to prevent nausea, and a new anesthesia preoperative order set that included routine famotidine and acetaminophen plus optional antiemetics and gabapentin. For patients undergoing spinal anesthesia, the dose of intrathecal morphine was standardized to 150 mcg. A new ERAC postoperative order set was used at individual obstetricians’ discretion. It included prophylactic ketorolac, ibuprofen, and acetaminophen given around the clock; early removal of bladder catheter; and prophylactic antiemetic medications. ERAC patients were offered an optional 30-minute one-on-one teaching session 1 to 3 days preoperatively and a carbohydrate-loading drink (50 g maltodextrin and fructose in 300 cc) 3 to 4 hours preoperatively (except patients with diabetes). The ERAC order set was available for all cesarean deliveries whether or not the patient had a scheduled procedure, preoperative