

Pregnancy Outcomes and Neonatal Complications in Asymptomatic Deliveries Complicated by COVID-19

Rachel E. Lee¹, Shruti Yarra¹, Justin To¹, David Garry² and Ivan M. Ngai^{1*}

¹Department of Obstetrics and Gynecology, Flushing Hospital Medical Center, Flushing NY, USA

²Department of Obstetrics and Gynecology, Stony Brook University Hospital, Stony Brook, NY, USA

*Corresponding author: Ivan M. Ngai, Department of Obstetrics and Gynecology, Flushing Hospital Medical Center, Flushing NY, USA, E-mail: ingai@jhmc.org

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Abstract

Background: This study aims to compare pregnancy outcomes and neonatal complications in asymptomatic COVID-19 positive pregnancies and COVID-negative pregnancies.

Methods and findings: This was a retrospective cohort study of patients in an urban community hospital. Institutional review board approval was obtained. Asymptomatic COVID-19 positive and COVID-negative pregnant patients who were admitted for delivery were identified via electronic medical records from April to May 2020. Cases were confirmed with nasopharyngeal polymerase chain reaction. Maternal and neonatal outcomes and complications were collected. Continuous variables were compared with Student t-test and dichotomous variables with chi square analysis with statistical significance considered at $p < .05$.

Results and discussion: 43 COVID-19 positive and 225 negative patients met criteria. The incidence of asymptomatic COVID-19 maternal infection at the time of delivery was 16% (43/268). 25.6% of asymptomatic COVID-19 patients developed symptoms during the intrapartum period. There was no significant difference in maternal demographics. There was no significant difference in maternal outcomes on admission such as estimated blood loss, indication for cesarean section, cesarean section incidence rate, maternal length of stay, maternal fever, or lymphocyte count. However, significant differences were noted in WBC count, cough, shortness of breath, gastrointestinal symptoms, initial oxygen saturation, and oxygen requirement. There was no significant difference in neonatal outcomes including birth weight, preterm delivery rate, respiratory distress syndrome, and NICU admission rate, but there was a significant difference in neonatal length of stay.

Conclusion: No significant differences were observed in mode of delivery or neonatal outcomes. Given the ongoing pandemic, this study may guide us in counseling patients.

Keywords: COVID-19; Pregnancy outcomes; Neonatal complications

Introduction

The current COVID-19 pandemic has been associated with a rapid increase in cases and deaths worldwide since its first outbreak in Wuhan, China, in December 2019 [1], with over 3 million individuals affected as of May 2020 [2]. However, published data on COVID-19 and pregnancy are limited, with no more than 50 reported cases total [1,3]. Pregnancy is known as a period at higher risk for the consequences of respiratory infections and severe pneumonia [3]. In a systematic review of pregnant women with COVID-19, a total of 9.3% of COVID-19 admissions were sent to the ICU and 5.4% required mechanical ventilation [3]. Thus, it is paramount to screen for COVID-19 in pregnant women.

The effects of COVID-19 on several pregnancy and neonatal parameters remain unknown [1-4, 6]. However, prior studies documented high rates of cesarean delivery, preterm delivery, fetal distress, and stillbirth, in addition to maternal pneumonia and multi-organ failure [1-5,7]. Clearly, COVID-19 has the potential to cause significant complications in pregnancy. However, how to test pregnant patients and particularly how to counsel patients that are asymptomatic but COVID-19 positive is unclear. There is no consensus regarding screening in the pregnant population; at the same time, it is generally recommended to implement screening with the increasing availability of treatment and tests [1,8,9]. Our institution has mandated screening of all women presenting to our labor and delivery unit for admission. Given the lack of published literature on asymptomatic patients, this study aims to compare pregnancy outcomes and neonatal complications of COVID-19 negative pregnant patients and asymptomatic COVID-19 positive pregnant patients.

Methods

This was a retrospective cohort study of patients in an urban community hospital. Institutional review board approval was obtained. Asymptomatic COVID-19 positive and COVID-negative

pregnant patients who were admitted for delivery were identified via electronic medical records from April to May 2020. Cases were confirmed with nasopharyngeal polymerase chain reaction. Exclusion criteria included symptomatic women who tested positive for COVID-19 on admission, deliveries less than 20 weeks of gestational age, and patients who did not deliver in our institution. Patients were divided into an asymptomatic COVID-19 positive cohort or a COVID negative cohort. Asymptomatic was defined as having no documented fever, chills, Shortness Of Breath (SOB), gastrointestinal symptoms, anosmia, or ageusia on admission for delivery. Patient variables and demographics were collected. The primary endpoints were maternal outcomes such as mode of delivery, estimated blood loss, and length of stay. Neonatal outcomes reviewed included birth weight, preterm delivery, and Neonatal Intensive Care Unit (NICU) admissions. Continuous variables were compared with Student t test and dichotomous variables with chi square analysis with statistical significance considered at $p < 0.05$.

Results

43 asymptomatic COVID-19 positive patients and 225 negative patients met the inclusion criteria. Thus, the incidence of asymptomatic COVID-19 maternal infection at the time of delivery was 16%(43/268). There were no significant differences between the cohorts in terms of demographics (Table 1).

	COVID-19 Positive (n=43)	COVID-19 Negative(n=225)	p-value
Age (years)	29.37 ± 5.43	29.77 ± 5.77	p=0.67
BMI (kg/m ²)	30.4 ± 5.8	29.8 ± 5.4	
BMI>30 kg/m ²	19(44%)	94 (42%)	p=0.50
Multiparous	24(56%)	132 (59%)	p=0.85
Race/Ethnicity			p=0.90
African American	4(9%)	14 (6%)	
White	1(2%)	5 (2%)	
Hispanic	20(47%)	91 (40%)	
Asian	17(40%)	108 (48%)	
Mixed	1(2%)	6 (3%)	
Maternal hypertension	5(12%)	20 (9%)	p=0.57
Maternal diabetes mellitus	8(19%)	33 (15%)	p=0.51

Continuous variables are mean ± SD. Categorical variables are n (%).

Table 1: Maternal demographics.

Table 2 shows significant differences in multiple intrapartum variables. All COVID-19 positive patients were asymptomatic on initial presentation for obstetrical indications, but had high rates of developing COVID-19 symptoms (11 of 43 patients) and requiring O2 supplementation during their admission. Maternal outcomes were overall similar between the cohorts including

cesarean delivery rate. Indications for cesarean section were also analyzed, including breech/mal-presentation, arrest of labor, elective repeat, history of cesarean section in labor, failed induction of labor, non-reassuring fetal heart rate tracing remote from delivery, suspected macrosomia, elective primary, and pre-eclampsia; no significant differences were noted ($p=0.85$).

	COVID-19 Positive (n=43)	COVID-19 Negative (n=225)	p-value
Intra-partum Variables			
Initial WBC count	8.93 ± 2.47	10.23 ± 3.04	p=0.009
Initial Lymphocyte count (%)	20.52 ± 6.84	19.51 ± 7.08	p=0.39
Maternal fever during admission	4(9%)	10(4%)	p=0.19
Maternal cough	8(19%)	3(1%)	p<0.0001
Maternal SOB	3(7%)	2(1%)	p=0.007
Maternal GI symptoms	1(2%)	0(0%)	p=0.02
Initial O2 sat (%) on room air	97.53 ± 2.46	98.12 ± 1.44	p=0.03
Lowest O2 sat (%) in room air	96.13 ± 2.35	96.39 ± 1.69	p=0.40
Maternal supplemental O2	5(12%)	38(17%)	p<0.0001
Outcomes			
Gestational age at delivery (weeks)	38.33 ± 2.28	38.80 ± 1.36	p=0.07
EBL at delivery (mL)	466.27 ± 207.51	509.41 ± 244.17	p=0.28
Cesarean birth	19(44%)	104(46%)	p=0.81
Maternal Length of Stay (days)	3.20 ± 1.08	3.29 ± 0.94	p=0.58

Continuous variables are mean ± SD. Categorical variables are n (%). WBC: White Blood Cell; EBL: Estimated Blood Loss; O2: Oxygen

Table 2: Maternal intrapartum variables and outcomes.

Table 3 reviews neonatal outcomes. There were no significant differences in the incidence of preterm delivery rates, Respiratory Distress Syndrome (RDS), number of fetuses, and NICU admission rates. In our dataset, there was one set of twins in the COVID-19 group, but no significant difference between the groups was seen ($p=0.2$). A statistical difference was noted in the newborn length of stay, which was longer in the COVID-19 positive group ($4.95 ± 9.3$ versus $2.70 ± 2.6$ days; $p < .001$).

Outcome	COVID-19 Positive	COVID-19 Negative (n=225)	p-value
Birth weight (g)	3123.8 ± 617.57	3212.06 ± 485.29	p=0.30

Preterm delivery rate (<37 weeks)	4(9%)	11(5%)	p=0.25
Newborn Length of Stay (days)	4.95 ± 9.33	2.70 ± 2.55	p=0.002
NICU admission	15(35%)	54(24%)	p=0.14
Multiple gestations	1(2%)	0(0%)	p=0.02
Respiratory Distress Syndrome	4(9%)	18(8%)	p=0.78
NICU: Neonatal Intensive Care Unit			

Table 3: Neonatal outcomes.

Discussion

Our study shows that newborns of asymptomatic COVID-19 positive mothers had a higher likelihood of staying in the hospital for a longer period, without a clear etiology. Three COVID-19 positive mothers with neonates had preterm delivery: one neonate was admitted for 42 days with intracranial hemorrhage, another neonate for 15 days with RDS, and the third neonate for 49 days with RDS, hyperbilirubinemia, and retinopathy of prematurity. Among the COVID negative mothers, majority of the extended length of stay neonates were also associated with preterm delivery, except for 1 of 5 neonates. Length of stay ranged from 10 to 23 days in COVID negative mothers, with complications such as hypoglycemia, RDS, transient tachypnea of the newborn, neonatal sepsis, hyperbilirubinemia, and electrolyte disturbances (hypocalcemia, hyponatremia).

Other neonatal outcomes were similar in both cohorts. Importantly, there was no difference noted in preterm birth or neonatal RDS incidence rates when comparing newborns of COVID-19 positive to negative maternal population. Our study also found that asymptomatic COVID-19 positive patients have a high likelihood of becoming symptomatic during their delivery or immediate postpartum period. Our study is one of the largest studies focusing on comparing asymptomatic COVID-19 positive to COVID negative pregnant patients, and adds further information to the emerging literature regarding the effects of COVID-19 on pregnancy outcomes and neonatal complications [1,2,10-13].

Given the limited data that has been published on asymptomatic pregnant patients, it is difficult to compare our findings to the existing literature. However, our findings are consistent with and reaffirm some of the findings reported in the limited existing literature. Our patients who eventually became symptomatic also had common symptoms of cough, shortness of breath, gastrointestinal symptoms, and increased white blood cell counts [3,14]. In a study comparing delivery rates in COVID-19 positive and negative women in Hubei province, there were no significant differences in gestational age of delivery, birth weight, or blood loss, which was also consistent with our study [4].

Some of our findings did not coincide with studies that mainly concentrated on symptomatic COVID-19 positive pregnant patients. Unlike prior studies, we found that obesity (defined as BMI>30) was not associated with COVID-19 severity [15,16]. Additionally, multiple prior studies of symptomatic patients showed multiple pregnancy complications. A report describing 18 pregnancies with COVID-19 shows increased rates of fetal distress and preterm delivery [1]. A systematic review of pregnant women with COVID-19 showed 41% of deliveries occurred before 37 weeks and 15% before 34 weeks [3]. Yet another case series of 13 pregnancies reported that 100% of cases were delivered via cesarean section, of which 50% were emergency cesarean sections due to fetal distress, and 46% of pregnancies had a preterm birth [5]. However, our data shows no difference in preterm delivery rates, cesarean rates, or neonatal complications when focusing on asymptomatic patients. Majority of maternal and neonatal outcomes in the asymptomatic COVID-19 patients are like those of COVID-19 negative patients. Compared with symptomatic COVID-19 patients, asymptomatic COVID-19 patients should be counseled differently regarding possible complications.

To date, multiple studies have noted high cesarean delivery rates in symptomatic COVID-19 pregnancies [5,6]. However, our study showed that the cesarean rate for asymptomatic COVID-19 patients was similar to non-infected patients. We surmise that the high cesarean delivery rates in symptomatic COVID-19 patients are due to poor maternal clinical status and the assumption that either the mother or fetus are hypoxic from COVID-19 respiratory dysfunction, or that immediate delivery of the fetus would help maternal oxygenation and shorten recovery time [17].

Given our institutional policy on screening all third trimester pregnant admissions for obstetric indications, one of the key strengths of our study was our ability to know the COVID status of all patients during the study period. Although this retrospective cohort study is one of the largest pertaining to asymptomatic COVID patients, the sample size is relatively small. Other limitations include its retrospective design. Additionally, COVID-19 screening only became available in April, limiting our data collection period to 2 months. In the future, we feel that similar analyses could be performed with data from multiple facilities to increase the sample size and include other neonatal complications associated with preterm delivery (i.e., necrotizing enterocolitis, intracranial hemorrhage, or cerebral palsy). A more long-term study is warranted and could look at postpartum patients after discharge from the hospital, including the rate of readmission or COVID-19 re-infection. Additionally, long-term follow up for neonates born to COVID-19 positive mothers should be studied, particularly for infants that required prolonged hospital stay after birth.

Conclusion

In conclusion, asymptomatic COVID-19 positive patients' pregnancy and neonatal outcomes are similar to those of COVID non-infected patients. However, asymptomatic mothers have a high rate of developing symptoms requiring oxygen supplementation. Neonatal outcomes are similar except for

length of hospital stay, likely associated with complications from preterm birth. Given the ongoing pandemic and the risk of repeat COVID-19 surges, this study may help guide us in counseling patients during the antepartum period.

Data Availability

The data will be available on request through contact to request data from the corresponding author.

Competing Interests

The authors declare that no competing interests exist regarding the publication of this paper.

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