
Outcome of babies at 8-12 months old who tested positive for COVID-19 at birth in two tertiary medical centers

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Abstract

Introduction Scant information remains regarding the outcome of babies who tested positive for COVID-19 at birth beyond two months of age. This study determined the outcome of infants at 8-12 months old who tested positive for COVID-19 at birth.

Methods This is a non-concurrent cohort study. A review of medical records at birth and at wellness check at 8-12 months was done. The weight, Z-scores, episodes of upper respiratory tract infection and number of non-routine consults were compared between the babies who tested positive at birth with those whose test was negative for COVID-19. Asymptotic 2-tailed p value = 0.05 determined significance of differences of variables.

Results From August to October 2020, 31 newborns tested positive for COVID-19; 31 tested negative, and all had an unremarkable outcome at birth. Nine (p = 0.001) mothers tested positive for COVID-19. COVID-19 babies weighed statistically significantly less than the non-COVID-19 babies (8.5 ± 0.87 vs 9.7 ± 0.89 kg, p = 0.010) at 8-12 months. There was no statistically significant difference when the z-scores were considered (p = 0.313). As of last wellness check, babies who tested positive at birth had more episodes of upper respiratory tract infections (19.6% vs none, p= 0.010) and non-routine consultations.

Conclusion Twenty nine percent of newborns tested positive if mothers tested positive for COVID-19. At 8-12 months old, babies who tested positive for COVID-19 at birth had more episodes of upper respiratory tract infections.

Key words: Outcome, newborns, COVID-19

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2020 marked the start of the pandemic caused by SARS-CoV-2 or COVID-19, effectively requiring those involved in the care of pregnant women and their newborns to constantly review guidelines to minimize mortality and morbidity in this vulnerable population. The need to recognize that these infants remain at risk can be ascertained from a multinational cohort study of 2130 pregnant women in 18 countries that showed women with COVID-19 were at increased risk of a composite maternal morbidity and mortality index. Newborns of women with COVID-19 had significantly higher severe neonatal morbidity index and severe

perinatal morbidity and mortality index compared with newborns of women without COVID-19.¹

Since COVID-19 is highly transmissible, concern whether current practices of keeping the baby with the mother as much as possible would be advisable as concerns regarding morbidity and mortality remain. Blumberg stated the while these patients appear to have acquired infection either by intrauterine or intrapartum transmission, establishing clear definitions for such transmission is warranted.² Huntley pointed at that early in the pandemic, there has been reassuring data on low rates of maternal and neonatal mortality and vertical transmission with SARS-CoV-2.³

Tran stated while that there is insufficient evidence to suggest vertical transmission between mothers and their newborn infants, transmission may happen after birth from mothers or other caregivers.⁴ Prolonged skin-to-skin contact and early and exclusive breastfeeding remain the best strategies to reduce the risks of morbidity and mortality for both the mother with COVID-19 and her baby.⁴ Ronchi provided evidence on the management of mother-infant dyads with maternal COVID-19 infection and suggested that rooming-in and breastfeeding can be practiced in women who are able to care for their infants.⁵ Although the American Academy of Pediatrics promoted rooming-in and breastfeeding with precautions, social adversity may play a role given that the COVID-19 pandemic has disproportionately affected racial/ethnic minority populations. In addition, it was observed that the specific pathways by which social disadvantage might affect mother-to-child transmission of SARS-CoV-2 include differential access to care and clinician bias.⁶

A year later into the pandemic, there is now considerable information accumulated and shared about the effects of SARS-CoV-2 on pregnant women and their newborns. In contrast, there remains a paucity of information regarding the outcome of babies at eight weeks or older who tested positive for SARS-CoV-2 at birth.¹ Flaherman observed that maternal viral infection in pregnancy and the peripartum and postpartum periods can adversely affect infant outcomes. While studies have reported that maternal SARS-CoV-2 infection increases the risk of preterm birth and can be vertically transmitted, overall risks for infants born to mothers with SARS-CoV-2 are not yet well-described. Current national and international guidelines for the management of infants born to mothers with SARS-CoV-2 are based

on limited data without outcomes reported past the neonatal period.⁷

This study determined the outcome at 8-12 months old of infants who tested positive at birth for SARS-CoV-2 and specifically 1) identified the demographics of the mothers and their infants born from August to October 2020; 2) compared the demographics of mothers who tested positive with those who tested negative, with the outcome of their infants at birth and at 8-12 months old as to body weight and gross developmental outcome; and 3) compared the rate of illnesses and non-routine consultations of babies who tested positive for SARS-CoV-2 at birth with those who tested negative.

Methods

This is a non-concurrent cohort study of COVID-19 positive and COVID-19 negative babies born from August to October 2020 in two hospitals who were followed up at 8-12 months. One hospital was a tertiary government medical center and the other was a private tertiary hospital located in the same vicinity. Both hospitals were referral centers for COVID-19 patients. The study was approved by the ethics committees of both hospitals, respectively. Informed consent was obtained from the parents of babies included in the study.

The babies were identified from the census of the Department of Pediatrics of the two hospitals and their records were retrieved. The following data were extracted from the records: maternal data (age, gravida status, parity, manner of delivery); newborn data (birthweight, Ballard score, APGAR scores, Z-score); results of SARS-CoV-2 swab of mothers and their newborns at birth; wellness check by telemedicine at 8-12 months (inquiries if there were illnesses, reminders on breastfeeding and immunization schedule, recording of weight during immunization at local health center and gross developmental milestones), episodes of upper respiratory tract infection (URTI) and number of non-routine consultations. The wellness check by telemedicine is considered standard of care to follow up infants born due to limitations brought upon by the pandemic (such as lack of public transportation, surges of COVID-19 admissions in institutions, among others). Only asymptomatic or well infants were included for “Well-Baby OPD” or wellness check by telemedicine.

Chi-square and t-test were used to determine significant differences between the COVID-19 positive and COVID-19 negative babies at $\alpha = 0.05$ for categorical and continuous variables, respectively. The data were analyzed using SPSS.

Results

The records of 62 newborns were reviewed for this study. There was an equal number of COVID-19 positive and COVID-19 negative babies. As shown in Table 1, the mothers of the two groups were comparable in terms of age, number of pregnancies and parity. Around 30% of mothers of COVID-19 babies tested positive by rt-PCR ($p = 0.001$). A third of the mothers of COVID-19 positive babies underwent cesarean section ($p < 0.001$). Table 2 shows that the sex distribution, birth weights, Z-scores and Ballard scores were similar for the COVID-19 and the non-COVID-19 babies. The APGAR score of the COVID-19 babies was higher at one minute; this was statistically ($p = 0.027$) but not clinically significant. Of the COVID-19 newborns, 22 had cough and colds but had good suck. Based on their medical records, all the

newborns in this study received exclusive breastfeeding during the first six months of life, received their primary series of immunizations on time at the nearest or local health center or facility, and except for a baby with Down syndrome, all were able to achieve their expected gross developmental milestones on time.

As shown in Table 3, the COVID-19 babies weighed statistically significantly less than the non-COVID-19 babies (8.5 ± 0.87 vs 9.7 ± 0.89 kg, $p = 0.010$) at 8-12 months. There was no statistically significant difference when the z-scores were considered ($p = 0.313$). A fifth of the COVID-19 babies had episodes of URTI compared with none in among the non-COVID-19 babies ($p = 0.010$). The common symptoms were cough and colds; none had fever. This led to non-routine consultations in 3 of the 31 COVID-19 babies.

Discussion

Adherence to best practices in managing pregnant women and their newborns is critical in ensuring good outcome: healthy infants. Since the start of

Table 1. Demographic and clinical characteristics of mothers whose babies tested positive for COVID-19 and mothers of babies who tested negative for COVID-19.

Characteristic n (%)	COVID-19 positive babies n = 31	COVID-19 negative babies n = 31	p-value*
Age (years) (mean \pm SD)	28.2 \pm 7.3	27.2 \pm 6.6	0.564
Gravida			
1st pregnancy	9 (29.0%)	15 (48.4%)	0.078
2-4 pregnancies	16 (51.6%)	15 (48.4%)	
> 4 pregnancies	6 (19.4%)	1 (5.2%)	
Parity			
1st parity	9 (29.0%)	16 (51.6%)	0.086
2-4th parity	17 (54.8%)	14 (45.2%)	
> 4 parity	5 (16.1%)	1 (3.1%)	
Manner of delivery			
NSD	20 (64.5%)	31 (100.0%)	< 0.001
CS	11 (35.5%)	0 (0.0%)	
COVID-19 RT-PCR results			
Positive	9 (29.0%)	0 (0.0%)	0.001
Negative	22 (71.0%)	31 (100.0%)	

*Chi-square/t-test

NSD – normal spontaneous delivery; CS – cesarian section

Table 2. Demographic and clinical characteristics of babies who tested positive for COVID-19 and babies who tested negative for COVID-19 at birth.

Characteristic n (%)	COVID-19 positive n = 31	COVID-19 negative n = 31	p-value*
Birth weight (kg) (mean ± SD)	2.82 ± 0.56	2.9 ± 0.41	0.530
SGA	6 (19.4%)	4 (12.9%)	0.497
AGA	24 (77.4%)	24 (77.4%)	
LGA	1 (3.2%)	3 (9.7%)	
Z-score			0.327
Above 2	1 (3.2%)	0 (0%)	
Below -2	4 (12.9%)	3 (9.7%)	
Below -3	2 (6.5%)	0 (0%)	
Median	24 (77.4%)	28 (90.3%)	
Ballard score (weeks)	38.52	38.52	1.000
APGAR (Mean)			0.027
1 minute	8.77	8.48	
5 minutes	9	9	
Sex			0.799
Male	16	15	
Female	15	16	

* Chi-square/t-test

SGA – small for gestational age; AGA – appropriate for gestational age; LGA – large for gestational age

Table 3. Demographic and clinical characteristics of babies who tested positive for COVID-19 and babies who tested negative for COVID-19 at birth on wellness check at 8-12 months old.

Characteristic n (%)	COVID-19 positive n = 31	COVID-19 negative n = 31	p-value*
Age (months) at wellness check			0.010
8-9 months	8 (25.8%)	0 (0.0%)	
10- 11 months	10 (32.3%)	15 (48.4%)	
> 11 months	13 (41.9%)	16 (51.6%)	
Weight (kg)	8.5 ± 0.87	9.7 ± 0.89	< 0.001
Z-score			0.313
Below -2	1 (3.2%)	0 (0.0%)	
Median	30 (96.8%)	31 (100.0%)	
Illness (URTI)			0.010
None	25 (80.6%)	31(100.0%)	
URTI	6 (19.6%)	0 (0.0%)	
Non- routine consultations			0.076
No	28 (90.3%)	31 (100.0%)	
Yes	3 (9.7%)	0 (0.0%)	

* Chi-square/t-test

URTI – upper respiratory tract infection

the pandemic, guidelines have become the lifeline of daily clinical practice, including that of a mother previously identified as COVID-19 positive or under investigation for COVID-19 is asymptomatic or paucisymptomatic at delivery, rooming-in is feasible, and direct breastfeeding is advisable under strict measures of infection control.^{2,5}

In this study, mothers who tested positive for COVID-19 at birth posed a significantly higher risk for their newborns to test positive to COVID-19. Potential mechanisms of maternal transfer of SARS CoV-2 to the infant have been proposed: 1) intrauterine transmission through transplacental hematogenous spread or viral particles in amniotic fluid that are ingested or inhaled by the fetus; 2) intrapartum transmission after exposure to maternal infected secretions or feces around the time of birth; and 3) postpartum transmission from an infected mother, family member, or health care worker (probably the most likely mode of pre-vaccine transmission). Transmission from an infected mother is more likely from respiratory secretions and less likely from breast milk. Among the three mechanisms, intrauterine transmission is the least likely.⁸

Hence it made sense to keep newborns together with their mothers as much as possible even if mothers tested positive for COVID-19. It was likewise in the best interest of mothers and their newborns, regardless of the mothers' results for COVID-19 test, to adhere to the WHO recommendation to keep mothers and infants together, and allow direct breastfeeding with careful breast hygiene.⁹ That breastfeeding remains the best option for newborns is the presence of antibodies to COVID-19 found in infants born to mothers with COVID-19 and in the breast milk of mothers with COVID-19.^{4,8} The normal weight of babies included in this study as of last wellness check based on Z-score may be due to the practice of rooming in and early breastfeeding as soon as feasible, and exclusive breastfeeding up to six months old.

Upon discharge from the hospital, the mothers were instructed to avail of the telemedicine services of the Department of Pediatrics since all the infants were considered high-risk regardless of the results of RT-PCR for COVID-19. Since there were several restrictions brought on by the pandemic, wellness check by telemedicine was among the most feasible ways to remind the mothers to sustain exclusive breastfeeding at least for the first six months of life, to go to the nearest health facility/center for

immunizations, as well as to check on the general well-being of the babies.

Evidence of abnormal brain MRI findings was noted in neonates with COVID-19, though there were no signs of abnormal growth development among them.¹⁰ At present, it cannot be concluded that the abnormal brain MRI findings were caused by SARS-CoV-2; therefore, the neonates born to mothers with COVID-19 may be followed-up as per routine health care schedule but their routine neurodevelopmental surveillance should be evaluated by further study.¹⁰ This is the main reason why the neurodevelopmental outcome of these babies remains a concern. While babies in this study did not undergo cranial MRI and thus there is no information on the status of their brains, all had normal gross developmental milestones or outcomes as of their last wellness check. There was one baby who tested positive for COVID-19 at birth and was diagnosed to have Down syndrome. COVID-19 infection has not been considered a risk factor for Down Syndrome.

Early in the pandemic, there has been reassuring data on low rates of maternal and neonatal mortality and vertical transmission of SARS-CoV-2. The preterm birth rate of 20% and the cesarean delivery rate exceeding 80% seems related to geographic practice patterns not related to SARS-CoV-2.³ This is reflected in current data showing that although a significant number of mothers who tested positive for COVID-19 underwent cesarean section ($p < 0.001$), the rate of cesarean section done in both institutions did not increase compared to previous years ($< 35\%$).

Recognizing that SARS-CoV-2 is highly transmissible, questions persisted on whether current practices of keeping the baby with the mother as much as possible would be advisable as concerns regarding morbidity and mortality remain. Flaherman stated that infant outcomes after maternal SARS-CoV-2 infection are not well-described. In a prospective US registry of 263 infants, maternal SARS-CoV-2 status was not associated with low birthweight, difficulty of breathing, apnea, or upper or lower respiratory infection through 8 weeks of age.⁷ Beyond 8 weeks old, there is a lack of data regarding the outcome of babies born during the pandemic and more data is needed especially on babies who tested positive for COVID-19 at birth.

As of last wellness check, a significant finding among the babies in this study is that those who tested positive for COVID-19 at birth had more

episodes of URTI as compared to those who tested negative. Babies who tested positive for COVID-19 at birth likewise, had more non-routine consultations although the difference was not statistically significant when compared to those who tested negative at birth, consistent with the findings of Angelidou.⁶ The findings emphasize the importance of both biological and social factors in perinatal SARS-CoV-2 infection outcomes. Newborns exposed to SARS-CoV-2 were at risk for both direct and indirect adverse health outcomes, supporting efforts of ongoing surveillance of the virus and long-term follow-up.⁶

Twenty nine percent of newborns tested positive for COVID-19 if mothers tested positive compared to none among the COVID-19 negative mothers. At 8-12 months old, babies who tested positive on RT-PCR at birth had more episodes of URTI (19.6%). It is recommended that close follow-up of neonates who tested positive to COVID-19 be done up to one year and even beyond to monitor their growth and development, enhance sustained breastfeeding, ensure timely immunizations as well as to facilitate their prompt access to health care.

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