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**INCIDENCE OF VERTICAL TRANSMISSION OF COVID-19 TO THE
NEONATE DURING THE THIRD TRIMESTER IN A TERTIARY CARE
HOSPITAL**

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ABSTRACT

Background:

The evidence for vertical transmission of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is not well established yet. There is a need for more data in order to establish the risk of vertical transmission of SARS-CoV-2.

Aims and Objectives:

To estimate the incidence rate of vertical transmission of coronavirus disease 2019 (COVID-19) to the neonate during the third trimester in a tertiary care hospital.

Material and methods:

This is a retrospective observational study of pregnant women diagnosed with COVID-19 during the third trimester through positive SARS-CoV-2 real-time reverse transcription-polymerase chain reaction (SARS-CoV-2 rRT-PCR) test, who delivered at Krishna Institute of Medical

Sciences, Karad between May 1st, 2020, and April 31st, 2021 to evaluate the risk of vertical transmission. Evidence of vertical transmission was assessed in the neonate through a SARS-CoV-2 rRT-PCR test, with nasopharyngeal and oropharyngeal swab samples collected from the neonates after 24 hours of birth. Evaluation of perinatal and neonatal outcomes was also done.

Results:

234 neonates born to COVID-19–positive mothers, who delivered within 7 days of testing positive for COVID-19 were evaluated. Nasopharyngeal and oropharyngeal swabs of 2(0.8%) newborns tested positive for COVID-19: both at 24 hours of life. 131 patients (56%) delivered by cesarean section; 67 newborns (29%) had low birth weight 38(16.2%) were preterm; and 32(13.6%) required neonatal intensive care unit admission, reflecting an increased incidence of cesarean delivery and low birth weight but no neonatal mortality. All neonates remained asymptomatic on follow-up.

Conclusion:

The risk of vertical transmission of COVID-19 is almost negligible. COVID-19 did not increase adverse neonatal outcomes, although data from larger trials is required to confirm our findings.

INTRODUCTION

With the evolving, dynamic COVID-19 pandemic and the new data popping up, though minimal, the risk of vertical transmission cannot be dismissed. Further, the effects of COVID-19 on perinatal outcomes are also uncertain. Few studies found increased incidence of preterm labor, cesarean delivery, low birth weight and NICU admission rate [1, 2]. Some studies showed the risk of vertical transmission while others refuted the same [3-6]. Bearing in mind the scarcity of evidence, we conducted this observational study to resolve various questions.

AIMS AND OBJECTIVES:

To estimate the incidence rate of vertical transmission of coronavirus disease 2019 (COVID-19) to the neonate during the third trimester in a tertiary care hospital

MATERIAL AND METHODS:

Study design: Retrospective Observational Study

Study population/subjects: Pregnant women diagnosed with COVID-19 during the third trimester through positive SARS-CoV-2 real-time reverse transcription-polymerase chain reaction (SARS-CoV-2 rRT-PCR) test, who delivered at Krishna

Institute of Medical Sciences, Karad between May 1st, 2020, and April 31st, 2021.

Inclusion criteria:

Symptomatic/asymptomatic pregnant women diagnosed with COVID-19(SARS-CoV-2 rRT-PCR confirmed) during the third trimester.

Exclusion criteria: Patients with COVID-19 disease (not confirmed with SARS-CoV-2 rRT-PCR), patients in first and second trimester, postpartum patients and incomplete medical records.

Study setting: Krishna Institute of Medical Sciences, Karad (Tertiary care center)

Study duration: May 1st, 2020 to April 30th, 2021.

Sample size: 234

METHOD:

This is a retrospective observational study of pregnant women diagnosed with COVID-19 during the third trimester through positive SARS-CoV-2 real-time reverse transcription-polymerase chain reaction (SARS-CoV-2 rRT-PCR) test, who delivered at Krishna Institute of Medical Sciences, Karad between May 1st, 2020, and April 31st, 2021.

All pregnant patients who got admitted to our institute were being tested for COVID-19 irrespective of symptoms as per regional guidelines. The report was given on the same day. Maternal demographic data was

obtained from the medical records of study subjects. It included maternal age, ethnicity, socioeconomic status, education, obstetric score, period of gestation at delivery, and medical comorbidities such as hypertension, diabetes, asthma, thyroid disorders, heart disease, tuberculosis. History, examination findings and laboratory parameters suggestive of COVID-19 like fever, cough, breathlessness, loose stools, vomiting, complete blood count (CBC), temperature greater than 98.6-degree Fahrenheit, CRP, D-dimer, Serum Ferritin, Chest X-ray and HRCT results were noted. Pregnancy outcomes included time, mode of delivery, meconium-stained liquor and indication for cesarean delivery. Neonatal outcomes included birth weight, APGAR score at 1 and 5 mins, NICU admission rate, birth asphyxia and neonatal death. The patients were treated in accordance with the national COVID-19 guidelines. To assess the risk of vertical transmission, RTPCR test of the neonate was done at 24hours of birth. For newborns with negative test results, parents were counseled and were given the option of rooming in. The nasopharyngeal and oropharyngeal swab samples of neonates who were roomed-in were again tested for COVID-19 at the time of discharge. Follow up of all neonates was done till they got

discharged or till 2 weeks after delivery whichever was later.

For statistical analysis, continuous variables were described as mean (standard deviation) or median (interquartile range). Categorical variables were represented as frequencies with proportions. We used software EpiInfo 7.2 (CDC, Atlanta, GA, USA) for analysis of data.

RESULTS:

We conducted a retrospective observational study of 234 pregnant patients diagnosed with COVID 19 to evaluate the risk of vertical transmission of COVID 19 to the neonate. Nasopharyngeal and oropharyngeal swabs of 2(0.8%) newborns tested positive for COVID-19: both at 24 hours of life. The observations of the study are presented below.

Out of 234 pregnant COVID patients, 131 patients (56%) delivered by cesarean section while 103 patients (44%) delivered by vaginal. The mode of delivery for covid19 positive neonates was cesarean (**Table 1**).

Out of 131 LSCS, 41(31.3%) were done for fetal distress, 35(26.8%) were for previous LSCS. The indication of LSCS for covid19 positive neonates was fetal distress (**Table 2**).

Out of 234 covid19 positive patients, 196 (83.7%) delivered at term while 38(16.2%) delivered before 37 completed weeks of gestation. Both the covid19 positive neonates were born at term (**Table 3**).

Out of 234 covid19 positive patients, 163 (69.7%) had newborns with birth weight >2.5kg, 60(25.6%) had low birth weight and 11(4.7%) had very low birth weight. One of the covid19 positive neonates had birth weight of 2.1kg while the other was 2.8kg (**Table 4**).

Out of 234 covid19 positive patients, 199 (85.1%) had APGAR score of >7 at 1 minute while 35(14.9%) had APGAR score of <7 at 1 minute. Both the covid19 positive neonates had APGAR score of >7 at 1 minute of birth (**Table 5**).

Out of 234 covid19 positive patients' neonates, 208 (88.9%) had APGAR score of >7 at 5 minutes while 26(11.1%) had APGAR score of <7 at 5 minutes. Both the covid19 positive neonates had APGAR score of >7 at 5 minutes of birth (**Table 6**).

Out of 234 covid19 positive patients' neonates, 174 (74.4%) had no adverse outcomes. 27(11.5%) had birth asphyxia and 33(14.1%) got admitted in NICU mainly for birth asphyxia and prematurity. There was no neonatal mortality. All neonates were asymptomatic of covid19.

One of the covid19 positive neonates was admitted to NICU for respiratory distress (Table 7).

122 (52.2%) neonates were roomed in. All neonates were followed up till 2 weeks without any reported adverse outcome.

Table 1: Distribution of the study population according to the mode of delivery

MODE OF DELIVERY	STUDY SUBJECTS					
	PATIENTS WITH COVID19 POSITIVE NEONATES		PATIENTS WITH COVID19 NEGATIVE NEONATES		TOTAL	
	NO.	%	NO.	%	NO.	%
VAGINAL	0	0	103	44.4	103	44
CESAREAN	2	100	129	55.6	131	56
TOTAL	2	100.0	232	100.0	234	100.0

Table 2: Distribution of study population according to the indication of cesarean section

INDICATION OF LSCS	STUDY SUBJECTS					
	PATIENTS WITH COVID19 POSITIVE NEONATES		PATIENTS WITH COVID19 NEGATIVE NEONATES		TOTAL	
	NO.	%	NO.	%	NO.	%
FETAL DISTRESS	2	100	39	30.2	41	31.3
PREVIOUS LSCS	0	0	35	27.1	35	26.8
DTA	0	0	5	3.9	5	3.8
FAILED INDUCTION	0	0	23	17.9	23	17.6
MALPRESENTATION	0	0	16	12.4	16	12.2
CPD	0	0	11	8.5	11	8.3
TOTAL	2	100	129	100	131	100

Table 3: Distribution of study population according to the gestational age at the time of delivery

GESTATIONAL AGE AT THE TIME OF DELIVERY (IN WEEKS)	STUDY SUBJECTS					
	PATIENTS WITH COVID19 POSITIVE NEONATES		PATIENTS WITH COVID19 NEGATIVE NEONATES		TOTAL	
	NO.	%	NO.	%	NO.	%
<34	0	0	0	0	0	0
34-36.6	0	0	38	16.3	38	16.2
37-42	2	100	194	83.7	196	83.8
>42	0	0	0	0	0	0
TOTAL	2	100	232	100	234	100

Table 4: Distribution of study population according to the birth weight of the neonate

BIRTH WEIGHT OF THE NEONATE (IN KGS)	STUDY SUBJECTS					
	PATIENTS WITH COVID19 POSITIVE NEONATES		PATIENTS WITH COVID19 NEGATIVE NEONATES		TOTAL	
	NO.	%	NO.	%	NO.	%
>2.5	1	50	162	69.9	163	69.7
1.5-2.5	1	50	59	25.4	60	25.6
<1.5	0	0	11	4.7	11	4.7
TOTAL	2	100.0	232	100.0	234	100.0

Table 5: Distribution of study population according to APGAR Scores at 1 min

APGAR SCORES (AT 1 MINUTE)	STUDY SUBJECTS					
	PATIENTS WITH COVID19 POSITIVE NEONATES		PATIENTS WITH COVID19 NEGATIVE NEONATES		TOTAL	
	NO.	%	NO.	%	NO.	%
<7	0	0	35	15.0	35	14.9
>7	2	100	197	85.0	199	85.1
TOTAL	2	100.0	232	100.0	234	100.0

Table 6: Distribution of study population according to APGAR Scores at 5 mins

APGAR SCORES (AT 5 MINS)	STUDY SUBJECTS					
	PATIENTS WITH COVID19 POSITIVE NEONATES		PATIENTS WITH COVID19 NEGATIVE NEONATES		TOTAL	
	NO.	%	NO.	%	NO.	%
<7	0	0	26	11.2	26	11.1
>7	2	100	206	88.8	208	88.9
TOTAL	2	100.0	232	100.0	234	100.0

Table 7: Distribution of study population according to adverse neonatal outcome

ADVERSE NEONATAL OUTCOMES	STUDY SUBJECTS					
	PATIENTS WITH COVID19 POSITIVE NEONATES		PATIENTS WITH COVID19 NEGATIVE NEONATES		TOTAL	
	NO.	%	NO.	%	NO.	%
NO ADVERSE OUTCOME	1	50	173	74.5	174	74.4
BIRTH ASPHYXIA	0	0	27	11.6	27	11.5
NICU ADMISSION	1	50	32	13.7	33	14.1
NEONATAL DEATH	0	0	0	0	0	0
SYMPTOMS OF COVID19	0	0	0	0	0	0
TOTAL	2	100.0	232	100.0	234	100.0

DISCUSSION:

PRETERM BIRTH

In the present study, 16.2% of the study subjects had preterm delivery. This result is consistent with the study done by Melo *et al* [13]. They observed 16.6% incidence of preterm births.

Study by Smith *et al.* [2] found 63.8% incidence of preterm birth and attributed that to viremia.

LSCS RATE

In the present study, 56% delivered by cesarean section.

In a study done by Yan *et al.* [3] they found the rate of cesarean section to be 85.9% which was similar to the high rates of 78.7% to 100% found in other studies. [1, 11, 12, 14].

According to current guidelines, cesarean delivery should be done only for absolute or

relative obstetrical indications and not for COVID-19 per say. No mode of delivery has shown superiority over the other with regards to neonatal outcome. [7, 15, 16] Therefore the rate of Cesarean section is declining which in our study was 56%. This is similar to the results of study by Salvatore *et al.* [9] who found an even lesser rate of 44%.

VERTICAL TRANSMISSION RATE:

In the present study, the incidence rate of vertical transmission of COVID-19 to the neonate was 0.8%.

Centers for Disease Control and Prevention reported an incidence of 2.6% of neonatal COVID-19 [17].

In a study done by Knight *et al.* [10] they found the incidence rate of vertical transmission to be 4.6%.

In their study, they used only nasopharyngeal swab to assess the risk of vertical transmission like most other studies whereas we have used oropharyngeal swabs as well.

LOW BIRTH WEIGHT:

In the present study, 25.6% had low birth weight and 4.7% had very low birth weight. These results are consistent with a study done by Trocadero *et al.* [26]. Their review of 8 studies involving 95 COVID-19

diagnosed pregnant women and 51 neonates reported 20% low birth weight.

Salvatore *et al.* [9] observed 13% neonates with low birth weight.

In another review by Juan *et al.* [27], consecutive case series, there were 3.6% low birth weight babies (221 neonates)

BIRTH ASPHYXIA:

In the present study, 11.5% had birth asphyxia.

Trocadero *et al.* [26]. review of 8 studies involving 95 COVID-19 diagnosed pregnant women and 51 neonates reported no case of birth asphyxia.

APGAR SCORES:

In our study we found 88.9% had APGAR score of >7 at 5 minutes.

This was in accordance

NICU ADMISSION RATE:

In the present study, 14.1% got admitted in NICU mainly for birth asphyxia and prematurity.

These results are consistent with findings of study conducted by Salvatore *et al.* [9] They recorded 15% NICU admission.

NEONATAL MORTALITY:

In our study, there was zero neonatal death. Similar results were observed Salvatore *et al.*

Juan *et al.* [27] found 0.4% neonatal deaths.

The results of our study suggest that COVID-19 has not worsened adverse perinatal outcomes. Majority of neonates in various studies, even those who were COVID positive remained asymptomatic and had no severe neonatal complications.

The strengths of our study include a good sample size and follow-up of neonates for the COVID-19 symptoms. Also, antibody testing may have added to the evidence related to vertical transmission though the possibility is trivial. Further, the findings in our study may not be generalized as it is a single center study.

Conclusion:

The risk of vertical transmission of COVID-19 is almost negligible. COVID-19 did not increase adverse neonatal outcomes, although data from larger trials is required to confirm our findings.

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