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Original Research Article

Perinatal outcome of neonates born to COVID SARS-CoV-2 positive mothers: a comparative study

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ABSTRACT

Background: The entire world is experiencing a difficult scenario because of COVID-19 infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It is imperative to have comprehensive information on how COVID-19 affects pregnancy-related outcomes when compared to outcomes in uninfected pregnant women.
Methods: Neonates born to SARS-CoV-2 positive mothers were included in the case group (n=127) and neonates born to SARS-CoV-2 negative mothers were included in the control group (n=127) in this prospective comparative study. In both groups, the mothers were matched for age, body mass index (BMI), morbidities, and parity. Neonatal morbidity and mortality in both groups were examined after neonates were monitored for 7 days after delivery.
Results: Neonatal morbidity was more among neonates born to COVID positive mothers ($p<0.05$) but mortality did not show any significant difference. There was statistically significant difference in gestation and birth weight among cases and controls. No neonate born to COVID positive mother was tested positive for COVID by reverse transcriptase-polymerase chain reaction (RT-PCR). Mean APGAR score at 1min was less among neonates born to COVID positive mothers but at 5 minutes it was almost similar among both groups.
Conclusions: According to the study's findings, maternal COVID-19 infection significantly affects perinatal outcomes, neonatal morbidity, birth weight, and neonate gestational age.

Keywords: APGAR score, COVID-19, Neonatal morbidity, Neonatal mortality, SARS-CoV-2

INTRODUCTION

An emerging illness called coronavirus disease 2019 (COVID-19) was identified in people for the first time in December 2019.[1] It can manifest in asymptomatic ways or lead to death.[2] It primarily spreads through respiratory droplets or direct contact, though there is some debate over vertical transmission from mothers to infants.[3,4]

Since pregnant women are also susceptible to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, a considerable number of them are also impacted.[5] Though vertical transmission and complications due to COVID in neonates are rarely reported.[6] It is essential in the understanding the impact of COVID-19 on perinatal and neonatal outcome in order to predict and recommend a management strategy for neonates with COVID-19 infection.

Because there was little information on the effects of this specific virus and a lack of high-quality data early in the pandemic, there was a lot of heterogeneity in neonatal and obstetrical management. Therefore, this prospective comparative study aimed to evaluate the perinatal outcome

of babies born to COVID positive mothers compared to babies born COVID negative mothers.

METHODS

This was a prospective comparative study on neonates born to SARS-CoV-2 positive and negative mothers at JSS Medical Hospital (JSSAHER) Mysuru, Karnataka (tertiary care center) from January 2021 to June 2022 for a period of 18 months. Pregnant mothers were subjected to COVID testing of nasopharyngeal swab by RT-PCR or RAT method. SARS-CoV-2 positive Mothers and Neonates born to them were included in the case group (n=127) and SARS-CoV-2 negative Mothers and Neonates born to them during the same study period were included in the control group (n=127) (total sample size n=254).

Sampling method

Purposive sampling method was used. The diagnostic test was the SARS-CoV-2 reverse transcription-polymerase chain reaction (RT-PCR) test.

As per neonatal intensive care unit (ICU) protocol, nasopharyngeal swabs were taken from the newborns. Detailed history of mothers and neonates was taken and entered in a pretested proforma. Relevant investigations for COVID were done in neonate depending on clinical condition of baby. Mothers and neonates were followed up every day till seven days. The initial sample was taken at delivery and 48 hours later. In both groups, the mothers were matched for age, BMI, morbidities, and parity. Neonatal morbidity and mortality in both groups were examined after neonates were monitored for 7 days after delivery. Consent was obtained from study participants before starting the study. The Ethical clearance was obtained from Institute of JSS hospital before conducting the study.

Data analysis

The statistical package for the social sciences (SPSS) software trial version 22 was used to analyze the data after it was entered into Microsoft excel 2007. Analyses of nominal data were presented as percentages and figures. Standard deviation and mean were used to express continuous data. The appropriate statistical tests (Chi-square test, t test) were used, and p values of 0.05 or higher were deemed significant.

RESULTS

In present study, majority of the mothers in the study population are within 21 to 30 years in both the groups. 'primigravida' with normal BMI were predominant in both the groups. Normal vaginal delivery was more in COVID negative mother group, whereas lower segment caesarean section (LSCS) was more common in COVID positive mother group. There were cases which underwent assisted vaginal delivery among COVID positive maternal population. but the difference between the groups was found to be not significant (Table 1).

Table 1: Characteristics of maternal study population.

Variables	Maternal study population				P value
	COVID		Non-COVID		
	N	%	N	%	
Age (in years)					
19 to 20	8	6.3	6	4.7	0.7
21 to 25	51	40.2	51	40.2	
26 to 30	44	34.6	43	33.9	
31 to 35	20	15.7	19	15.0	
36 to 40	4	3.1	6	4.7	
>40	0	0.0	2	1.6	
Parity					
Primi	69	54.3	66	52.0	0.7
Multi	58	45.7	61	48.0	
BMI categories					
Normal	55	43.3	65	51.2	0.09
Overweight	26	20.5	32	25.2	
Obese	46	36.2	30	23.6	
Mode of delivery					
Normal vaginal	51	40.2	60	47.2	0.2
Assisted/LSCS	76	59.8	67	52.8	

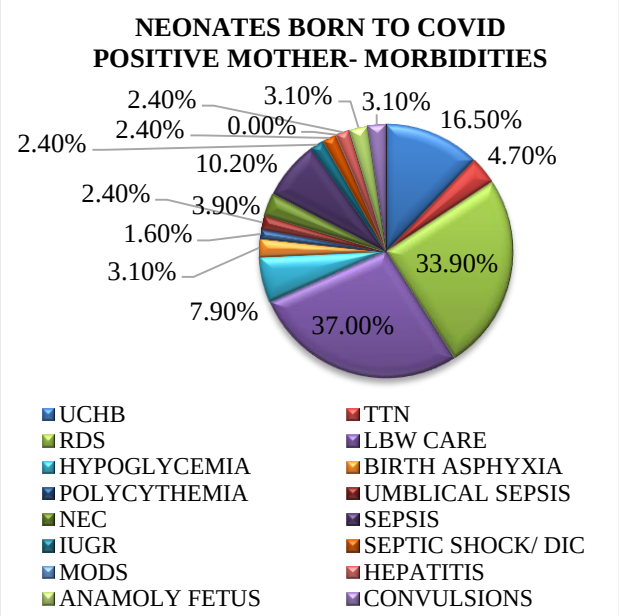

Figure 1: Morbidity pattern neonates born to COVID positive mothers.

Mean birth weight of non-COVID population was higher than COVID study population (2.6 kg >2.19), and the difference in birth weight between the groups was found to be significant. Mean APGAR score at 1minute was lesser among neonates born to COVID positive mothers, but at 5 minutes it was almost similar among both the

groups. The difference in APGAR scores between the groups were not found to be significant. Positive pressure ventilation for neonatal resuscitation was required more in neonates born to COVID mothers and intubation was little more required among neonates born to non-COVID mothers. But the difference in neonatal resuscitation between the group was not found to be significant (Table 1).

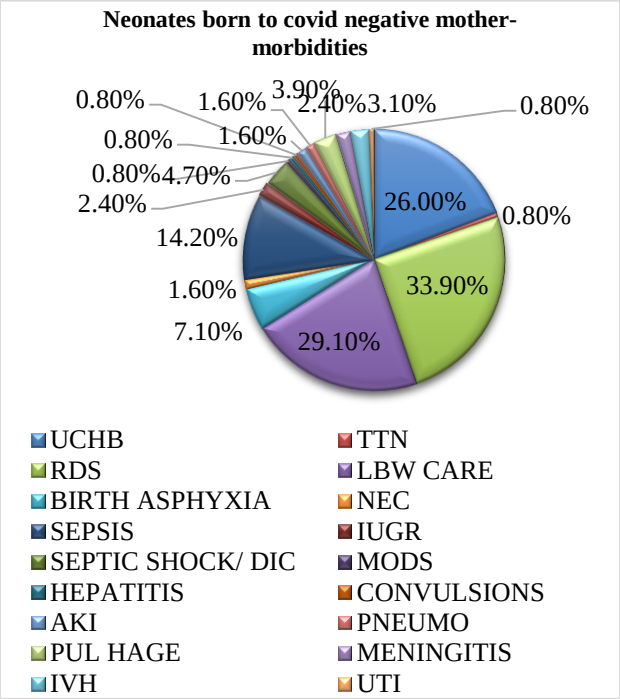

Figure 2: Morbidity pattern neonates born to COVID negative mothers.

Table 2: Neonatal outcome-birth weight, APGAR, neonatal resuscitation.

Neonatal outcome	Mean	SD	P value
Birth weight			
Non-COVID	2.6	0.72	<0.05
COVID	2.19	0.81	
APGAR			
1 min			
COVID	7.33	1.316	0.2
Non-COVID	7.5	1.321	
5 min			
COVID	8.54	1.24	0.9
Non-COVID	8.53	1.271	
Neonatal resuscitation	**COVID, N (%)**	**Non-COVID, N (%)**	
Cried after birth	110 (86.60)	110 (86.60)	0.9
PPV	14 (11.00)	10 (7.90)	
Intubation	3 (2.40)	7 (5.50)	

Intra uterine deaths were only seen in neonates delivered to COVID positive mothers (n=8). Morbidity was higher among neonates born to COVID positive mothers when compared with neonates born to non-COVID mothers (78% >52%). The difference in neonatal morbidity between the groups was found to be statistically significant. Among morbidities low birth weight (LBW) and respiratory distress (RDS) was common among both the groups (Figures 1 and 2). Neonatal mortality among neonates born to COVID and non-COVID mothers were almost equal in present study (3.1 versus 3.9) (Table 3).

Table 3: Neonatal outcome – morbidity and mortality.

Perinatal outcome	COVID		Non-COVID		P value
	N	%	N	%	
IUD	8	6.3	0	0	<0.05
Neonatal morbidity	99	78.0	66	52.0	<0.05
Neonatal mortality	4	3.1	5	3.9	>0.05

DISCUSSION

Pregnancy changes the body's immune system and general response to viral infections, which occasionally results in more severe symptoms. Early in the pandemic, there was a significant amount of variation in obstetrical and neonatal therapy because of a lack of knowledge about the effects of this unique virus and poor data available in countries like India. Hence present longitudinal study was aimed to determine perinatal outcome of babies born to COVID positive mothers compared to babies born COVID negative mothers in a tertiary care center (JSS hospital Mysuru) for a period of 18 months. In present study, COVID positive and negative mothers were matched in terms of age, trimester, parity and BMI so that outcomes can be comparable.

India's average childbearing age in 2020 was 27.4 years, according to the World Data Atlas, which is similar to present study where maternal age group of both the study groups was between 21 to 30 years (74%).[7] In the current study, normal vaginal deliveries were more prevalent than caesarean deliveries in the non-COVID group. Within the COVID study cohort, there were more instances of assisted vaginal birth including LSCS. Though it was not found to be significant, but supported by a meta-analysis (Debrabandere et al) done to determine the mode of delivery in pregnant women with COVID-19 during pandemic, which showed 'COVID-19 statuses alone became a common indication for cesarean delivery.[8] A systematic review of 19 researches from different nations around the world revealed a pooled percentage of 84% of LSCS among moms who tested positive for COVID which is almost equal to our study.[9]

Mean birth weight of neonates born to non-COVID maternal population was significantly higher than neonates

born to COVID maternal population, in the present study (2.1 kg <2.6 kg). A multinational cohort study done by Giuliani et al not only showed low birth weight, but also preterm delivery prevalence more among COVID study population which is consistent with our study.[10] On the contrary, in an Indian study, low birth weight prevalence did not show significance difference among neonates born to COVID infected and non-infected mothers.[11]

At 1 and 5 minutes after birth, a baby is subjected to the quick APGAR test. How well the infant tolerated labor and delivery is assessed after one minute. The 5-minute score demonstrates to the medical professional how well the infant is doing outside of the mother's womb. Overall, it states the status of the neonate. Positive pressure ventilation and Intubation were applied frequently (13.4%) for neonatal resuscitation in COVID study population than non-COVID (though it was not significant). Neonatal resuscitation by various methods was done in in almost 10% COVID study population in both first wave and second wave in India according to a recent study, which is consistent with our study.[11] Relative risk of 'need for resuscitation', 2 times higher in SARS-CoV-2 positive neonates when compared to negative neonates in study done by Kiran et al which was based on National Neonatology Forum (NNF) India COVID-19 registry.[12]

Neonatal morbidity (78%) was significantly higher among COVID study population when compared with non-COVID study population but mortality (10%) was almost equal. Pooled prevalence of neonatal mortality according to a study done by Panda et al was 12.64% in babies born to COVID mothers which is consistent with present study.[13]

According to a study conducted on 706 pregnant women with and 1424 pregnant women without a COVID-19 diagnosis, women who tested positive had a greater risk of maternal morbidity and newborn mortality (RR=22) and RR=1.59, respectively.[15]

Severe perinatal mortality and morbidity index was found to be twice (RR=2.14) higher among women with COVID-19 which supports present study. Similar findings were also observed in a UK national cohort study, where the risk of neonatal adverse outcomes was higher (OR=1.42), the need for intensive neonatal care was higher (adjusted OR=1.24), and for prolonged neonatal admission after birth (adjusted OR=1.61) were significantly higher for neonates whose mothers had laboratory-confirmed SARS-CoV-2 infection.[16] On the other hand, in their study neonatal mortality was also higher among positive mothers, which is not coinciding with our study.

In present study there were eight IUDs in case group whereas there were no IUDs in the control group which is found to be statistically significant, this is supported by as case series done in California.[17]

Limitations

Small sample size, hence results may not be generalized. Also, long-term neurodevelopmental outcomes could not be studied as neonates were only followed up for a week.

CONCLUSION

The study concluded that maternal COVID-19 infection has significant impact on perinatal outcome, neonatal morbidity, birth weight and gestational age of neonate.

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