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Original Research Article

Study of the clinical profile and outcome of the neonates born to COVID-19 positive mothers: a tertiary care centre experience from western Uttar Pradesh

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ABSTRACT

Background: A major concern of SARS-CoV-2 infection in pregnancy is its possible effects on newborns. In the context of mother-to-child transmission, some studies have reported that there were no SARS-CoV-2-positive infants born to a cohort of mothers with COVID-19 while others have reported an incidence of as high as 10%. The study is conducted to describe the clinical profile of neonates born to mothers who tested positive for COVID- 19 infection and to determine the association of neonatal COVID 19 status.
Methods: This cross sectional study includes neonates born to COVID 19 positive mothers. Neonates born to mothers who were diagnosed before delivery were tested by RT-PCR within 24 h of birth.
Results: Out of 120 babies born to COVID positive mothers, 5 newborns (4.2%) were found to be COVID positive, diagnosed through RT-PCR. Among COVID positive babies four out of five were symptomatic ($p<0.001$) and required respiratory support in any form ($p=0.001$). All of the COVID positive neonates were discharged, while there was one mortality noted among covid negative babies (0.9%), however there was no statistically significant association between mortality and COVID infection in the neonates ($p=0.498$).
Conclusions: The proportion of covid positive neonates born to COVID-19-positive women were very low (p=4.2). The study supports milder manifestation in COVID-19 infected neonates and risk of transmission of COVID-19 infection from mother to neonate by rooming in and breastfeeding is low.

Keywords: COVID-19, Newborn, RT-PCR, Clinical profile

INTRODUCTION

SARS-CoV-2 viral infection originated from Wuhan, China, and spread to a pandemic across the globe within a few months.[1] A major concern of SARS-CoV-2 infection in pregnancy is its possible effects on newborns. There is now growing evidence demonstrating that a proportion of neonates infected with SARS-CoV-2 have serious presentations resembling multisystem inflammatory syndrome.[2]

Multiple routes of transmission apart from post-partum transmission (horizontal) have been postulated including trans placental in utero, the immediate peripartum period through fetoplacental bleed or amniotic fluid and breast milk.[3] In the context of mother-to-child transmission, some studies have reported that there were no SARS-CoV-2-positive infants born to a cohort of mothers with COVID-19 while others have reported an incidence of as high as 10%.[4,5]

So, the study is conducted to describe the clinical profile of neonates born to mothers who tested positive for COVID-19 infection and to determine the association of neonatal COVID-19 status.

METHODS

This cross-sectional study includes neonates born to COVID-19 positive mothers from 6 May 2020 to 21 January 2022 at S. N. medical college, Agra.

Inclusion criteria

Neonates born to mothers who were tested COVID positive by RT-PCR before delivery or within 24 hours of delivery at S. N. medical college, Agra during study period were included in the study.

Exclusion criteria

Neonates born to COVID positive mother tested by RTPCR but their parents were unwilling to participate in the study were excluded.

The gestational assessment was done by the best estimate of last menstrual period (LMP), first-trimester ultrasound or by Ballard examination (in case LMP and ultrasound both were unavailable). Intrauterine growth status at birth as appropriate for gestation (AGA), small for gestation (SGA) and large for gestation (LGA) assessed by using z scores on intergrowth 21st neonatal anthropometric charts.

All stable neonates born to COVID-19 confirmed mothers were roomed in and breastfeed ensuring all universal and contact precautions against COVID-19 infection. Neonates born to COVID-19 positive mothers and requiring NICU care for any reason (comorbidity like prematurity, low birth weight, or transient tachypnoea of neonate, birth asphyxia) were nursed in separate designated NICU .The protocol for clinical management and investigation of neonates was based on national guidelines and recommendations as per the available evidence at that time.[6] Discharge of the mother neonate dyad was done as per existing national operational guidelines for COVID-19 stable neonates were kept for a minimum of 48 to 72 h and discharged once the mother was afebrile for 3 days.[6] Neonates born to mothers who were tested positive for COVID-19 before delivery were tested within 24 h of birth. Neonates born to mothers detected COVID-19 positive after delivery, during the hospital stay, underwent testing as soon as mother was confirmed positive. Nasopharyngeal samples were taken under strict aseptic precautions, by the paediatric resident, with a postgraduate qualification. Reverse transcriptase polymerase chain reaction (RT-PCR) was the method used to diagnose COVID-19 infection in neonate. Indian council of medical research (ICMR) approved kit was used for the testing.

Data were extracted from the patient records and included address, age, gestational age, comorbidities, symptoms at onset, the outcome of pregnancy and information on neonates (including birth weight, Apgar score, perinatal complications and clinical course during the hospital stay. Data analysis was done by statistical package for social sciences (SPSS) software version 24.0. P value was calculated using Chi-square test for categorical variables and by independent t test for continuous variables and value<0.05 was considered as statistically significant.

The study was approved by institutional ethical committee as per letter number SNMC/IEC/THESIS/2023/154.

RESULTS

Majority of the neonates (89.2%) were born at term (gestation age >37 weeks). The proportion of late preterm births (gestational age between 34 to 36+6 weeks) was 5% and moderate preterm (gestational age between 32 to 33+6 weeks) was 5.8%. The proportion of male and female babies was almost equal (52.5% males and 47.5% females), with a male to female ratio of 1.1:1. There were no early preterm deliveries among the COVID infected mothers. Out of the 120 newborns, 22.5% presented to the hospital with symptoms suggestive of COVID infection. Among these newborns, 21.7% presented with respiratory distress, 4.2% were in shock, 1.7% were found to have apnea. Lethargy and jaundice were noted in 7.5% and 8.3% babies respectively (Table 1).

Among the 120 mothers, 63.3% were aged between 20-24 years, while 34.2% were in the age group of 34.2%. Almost two-third of the mothers were primigravida (62.5%). More than three-fourth of the mother gave birth through LSCS (78.3%), while the remaining underwent normal vaginal delivery (21.7%). Although all mothers included were COVID positive confirmed by RT-PCR, only 48.3% of them were symptomatic (Table 2).

Out of 120 babies born to COVID positive mothers, 5 newborns (4.2%) were found to be COVID positive, diagnosed through RT-PCR (Figure 1).

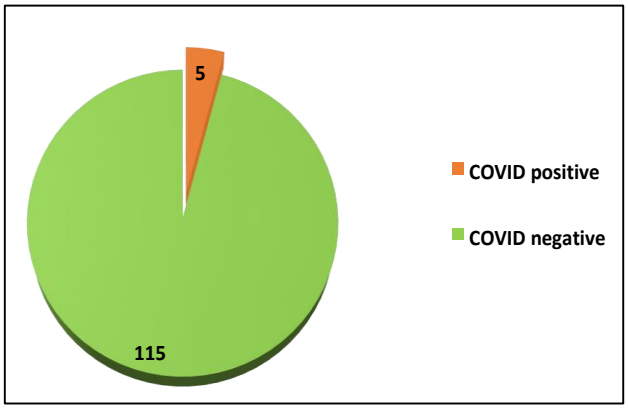

Figure 1: Distribution of newborns according to COVID RTPCR results, (n=120).

Proportion of males among COVID positive babies and COVID negative babies 60% and 52.2% respectively. However, differences in gender distribution between COVID positive babies and COVID negative babies was

comparable (p=0.732). Although proportion of term births in COVID negative babies was 90.4% and that among COVID positive babies was 60%, difference not statistically significant (p=0.098). On a similar note, mean gestational age also comparable between COVID positive babies and COVID negative babies (p=0.480). All cases of COVID infection found among babies who had low birth weight. Also, mean birth weight of COVID positive babies (1.9 kg) significantly lower than that of COVID negative babies (2.7 kg) (Table 3).

The mean maternal age was 25.4 (±4.6) years for COVID positive babies and 24.1 (±2.3) years for COVID negative babies. There was no statistically significant difference in the terms of maternal age between the two groups (p=0.556).

Similarly, 2 groups were comparable in terms of gravida (p=0.906) and mode of delivery (p=0.309) (Table 4).

All of the COVID infected babies had an associated history of maternal symptoms suggestive of COVID (p=0.018). Among COVID positive babies four out of five were symptomatic (p<0.001) and required respiratory support in any form (p=0.001). The mean duration of hospital stay was significantly higher among the COVID positive babies (5.8 days) as compared in COVID negative babies (2.2 days), (Table 5). All of the COVID positive neonates were discharged, while there was one mortality noted among covid negative babies (0.9%), however there was no statistically significant association between mortality and COVID infection in the neonates (p=0.498), (Table 6).

Table 1: Distribution of newborns according to their birth characteristics and neonatal symptoms at presentation, (n=120).

Parameters	N (%)	Variables
Gestation age at birth		
≥37 weeks (term baby)	107 (89.2)	Mean (± SD)-37.5 (±1.7)
34 to 36+6 weeks (late preterm)	6 (5.0)	Minimum-32 weeks
32 to 33+6 weeks (moderate preterm)	7 (5.8)	Maximum-40 weeks
Birth weight (kg)		
>2.5	74 (61.7)	Mean (± SD)-2.6 (±0.6)
1.5-2.5	39 (32.5)	Minimum-1.2 kg
1-1.5	7 (5.8)	Maximum-3.8 kg
Gender		
Male	63 (52.5)	
Female	57 (47.5)	
APGAR score at 1 minute		
<4	4 (3.3)	
4-6	5 (4.2)	
>6	111 (92.5)	
Delivery room resuscitation		
Required*	23 (19.2)	
Not required	97 (80.8)	
Neonatal clinical findings		
Symptomatic	27 (22.5)	
Asymptomatic	93 (77.5)	
Neonatal clinical signs°		
Respiratory distress	26 (21.7)	
Shock	5 (4.2)	
Apnea	2 (1.7)	
Lethargy	9 (7.5)	
Juandice	10 (8.3)	

*Includes initial steps (n=18), intubation (n=3) and positive pressure ventilation (n=2), ° More than one clinical sign may be present in a single newborn.

Table 2: Distribution of newborns according to their maternal characteristics and maternal symptoms at presentation, (n=120).

Parameters	N (%)	
Maternal age (In years)		
20-24	76 (63.3)	Mean (± SD)-24.1 (±2.4)
25-29	41 (34.2)	Minimum-20 years
≥30	3 (2.5)	Maximum-34 years

Continued.

Parameters	N (%)
Gravida	
Primigravida	75 (62.5)
Multigravida	45 (37.5)
Mode of delivery	
Normal vaginal delivery	26 (21.7)
Lower segment caesarean section	94 (78.3)
Maternal clinical findings	
Symptomatic	58 (48.3)
Asymptomatic	62 (51.7)

Table 3: Comparison of the neonatal characteristics between COVID positive and the COVID negative babies, (n=120).

Parameters	COVID positive, (n=5) (%)	COVID negative, (n=115) (%)	P value*
Gender			
Male	3 (60.0)	60 (52.2)	0.732
Female	2 (40.0)	55 (47.8)	
Gestation age at birth			
>37 weeks	3 (60.0)	104 (90.4)	0.098
34 to 36+6 weeks	1 (20.0)	5 (4.3)	
32 to 33+6 weeks	1 (20.0)	6 (5.2)	
Mean gestational age	36.4 (±3.3)	37.6 (±1.6)	0.480
Birth weight (kg)			
>2.5	0 (0.0)	74 (64.3)	0.001
1.5-2.5	3 (60.0)	36 (31.3)	
1-1.5	2 (40.0)	5 (4.3)	
Mean birth weight	1.9 (±0.4)	2.7 (±0.5)	0.003
APGAR score at 1 minute			
<4	1 (20.0)	3 (2.6)	0.018
4-6	1 (20.0)	4 (3.5)	
>6	3 (60.0)	108 (93.9)	
Delivery room resuscitation			
Required	3 (60.0)	20 (17.4)	0.018
Not required	2 (40.0)	95 (82.6)	

Values are represented as n (%) or mean (±SD). *P value was calculated using Chi-square test for categorical variables and by independent t-test for continuous variables and value<0.05 was considered as statistically significant.

Table 4: Comparison of maternal parameters between COVID positive and COVID negative babies (n=120).

Parameters	COVID positive, (n=5) (%)	COVID negative, (n=115) (%)	P value*
Mean maternal age (in years)	25.4 (±4.6)	24.1 (±2.3)	0.556
Gravida			
Primigravida	3 (60.0)	72 (62.6)	0.906
Multigravida	2 (40.0)	43 (37.4)	
Mode of delivery			
NVD	2 (40.0)	24 (20.9)	0.309
LSCS	3 (60.0)	91(79.1)	

Values are represented as n (%) or mean (±SD). *P value was calculated using Chi-square test for categorical variables and by independent t-test for continuous variables and value <0.05 was considered as statistically significant.

Table 5: Comparison of clinical findings, respiratory support and duration of hospital stay between COVID positive and COVID negative babies, (n=120).

Parameters	COVID positive, (n=5) (%)	COVID negative, (n=115) (%)	P value*
Maternal clinical findings			
Symptomatic	5 (100.00)	53 (46.1)	0.018
Asymptomatic	0 (0.00)	62 (53.9)	

Continued.

Parameters	COVID positive, (n=5) (%)	COVID negative, (n=115) (%)	P value*
Neonatal clinical findings			
Symptomatic	4 (80.00)	22 (19.1)	<0.001
Asymptomatic	1 (20.00)	93 (80.9)	
Respiratory support			
Required	4 (80.00)	23 (20.0)	0.001
Not required	1 (20.00)	92 (80.0)	
Mean duration of hospital stay	5.8 (±3.4)	2.2 (±2.4)	0.002
Comorbidities			
Birth asphyxia	2 (40.0%)	4 (3.47%)	<0.001
RDS	2 (40.0%)	9 (7.82%)	
Shock	2 (40.0%)	2 (1.73%)	
Prematurity	2 (40.0%)	10 (8.69%)	
Meconium	1 (20.0%)	1 (0.86%)	
Aspiration syndrome			
Neonatal sepsis	1 (20.0%)	1 (0.86%)	
Jaundice	1 (20.0%)	10 (8.69%)	

Values are represented as n (%) or mean (±SD). *P value was calculated using Chi-square test for categorical variables and by independent t-test for continuous variables and value <0.05 was considered as statistically significant.

Table 6: Comparison of neonatal outcome between COVID positive and COVID negative babies, (n=120).

Outcome	COVID positive, (n=5) (%)	COVID negative, (n=115) (%)	P value*
Discharged	5 (100.0)	114 (99.1)	0.498
Death	0	1 (0.9)	

*P value was calculated using Chi-square test and value <0.05 was considered as statistically significant.

DISCUSSION

Among the 120 Covid positive mothers, 63.3% were aged between 20-24 years, while 34.2% were in the age group of 25 to 29 years. Almost two-third of the mothers were primigravida (62.5%). Although all the mothers included were COVID positive confirmed by RT-PCR, only 48.3% of them were symptomatic showing symptoms such as cough, cold, fever, myalgia, nausea, malaise, anosmia, and ageusia. Unlike our study, SARS-CoV-2 positive mothers were asymptomatic in Kumari et al and very few mothers were symptomatic in Kumar et al (5.42%), and Kalamdani et al (1.62%).[7-9] However the majority of mothers were symptomatic in a study by Anand et al. which is comparable to our study (73.5%).[10]

More than three-fourth of the mother gave birth through LSCS (78.3%), while the remaining underwent normal vaginal delivery (21.7%). The caesarean birth rate was also found higher in Kumari et al (71.43%), Nambiar et al (72.33%).[4,11] The most common indication of LSCS in our study was fetal distress similar to Nanawati et al.[5]

Majority of the neonates (89.2%) were born at term (gestation age >37 weeks). The preterm birth rate in our study is (10.8%) compared to our study lower rate in Malik et al (4.78%).[12] Hence COVID-19 infection in mother is not associated with preterm delivery (p=0.6). Out of 120 babies born to COVID positive mothers, 5 newborns (4.2%) were found to be COVID positive, diagnosed through RT-PCR which is comparable with multicentric study from Oncel et al (3.3%) but higher neonatal infectivity was found in Nanavati et al, Nambiar et al with neonatal infectivity being 14.40% ,13.55%, respectively.[5,11,13]

In our study 80% of covid positive neonates were symptomatic unlike other studies Singh et al (n=2), Sehra et al (n=5), all infected neonates were asymptomatic, whereas rate of symptomatic cases in Malik et al, Nanavati et al were 30.30%, 27.78% respectively.[5,14,15] In our study the proportion of babies necessitating delivery room resuscitation was significantly higher among COVID positive babies than that among COVID negative babies (p=0.018) but there was no effect on mortality compared to non-infected neonates, which is similar to a multicentric study done by national neonatology forum COVID-19 registry of India.[6]

Limitations

We acknowledge that the major limitation of this study is the lack of formal and serial evaluation of all the biosamples (amniotic fluid, placenta, newborn blood and cord blood both for RT-PCR and serology) needed for accurate diagnosis and international classification of COVID-19 infection in neonates. Placenta and fetal samples, amniotic fluid, umbilical cord blood and breast

milk could not be tested for the COVID-19 in the current study. Therefore, the vertical transmission also remains underestimated in our study. Similarly, the effect of COVID-19 infection on accurate diagnosis of the one neonatal death remains uncertain.

CONCLUSION

Neonates born to mothers with confirmed COVID-19 infection about 77.5% babies were asymptomatic. The proportion of COVID positive neonates born to COVID-19-positive women was very low (p=4.2). Majority of the neonates (89.2%) were born at term (gestation age >37 weeks). Hence COVID-19 infection in mother is not associated with preterm delivery. In our study the proportion of babies necessitating delivery room resuscitation was significantly higher among COVID positive babies than that among COVID negative babies (p=0.018). Long term effects of COVID-19 on neonates need to be studied. Follow-up of all COVID infected children whether symptomatic or not is needed to look for long term complications like MIS-C.

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