RESEARCH PAPER

Clinical Profile of SARS-CoV-2 Infected Neonates From a Tertiary Government Hospital in Mumbai, India

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Objectives: To describe the clinical and laboratory profile of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infected neonates. **Methods:** This is a review of hospital records, conducted in a tertiary care public hospital. Medical records of neonates born from 1 April, 2020 to 31 May, 2020 were reviewed. Women admitted in labor were screened for SARS-CoV-2 infection based on the guidelines issued by Indian Council for Medical Research. Neonates were tested for SARS-CoV-2 infection once mother tested positive, which was after day 2 of life. Demographic, clinical features, laboratory tests and chest radiographs of SARS-CoV-2 infected neonates were reviewed and neonates were telephonically followed up till the age of 2 months. **Results:** Out of 1229 mothers, 185 tested positive (15.05%); 12 neonates (6.48%) tested positive for SARS-CoV-2 infection. All neonates were exclusively breastfed. Symptoms, if any, were mild and self-limiting. Serum lactate dehydrogenase and liver enzymes were elevated. All neonates were healthy and thriving well on follow-up. **Conclusion:** SARS-CoV-2 infected neonates are mostly asymptomatic and thrive well on exclusive breastfeeding.

Keywords: *Breastfeeding, COVID -19, Management, Outcome.*

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Reports of SARS-CoV-2 infections in neonates are still emerging. There is little literature available about the clinical features, outcomes and the mode of transmission of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection in neonates, especially from India. Recently, a meta-analysis has described 58 SARS-CoV-2 positive neonates from across the globe [1]. We present the clinical and laboratory profile of SARS-CoV-2 positive neonates admitted to a tertiary-care public hospital.

METHODS

This was a review of case records of SARS-CoV-2 positive neonates, conducted in a tertiary care hospital in Mumbai, India after obtaining approval from Institutional ethics committee. Medical records of neonates born between 1 April, 2020 and 31 May, 2020 were reviewed. All neonates who tested positive for SARS-CoV-2 infection during the birth-admission or readmitted anytime in the neonatal period were included in the study.

During this period, Indian Council for Medical Research (ICMR) recommended that all pregnant women in labor or who were likely to deliver in the next 5 days, residing in clusters/containment areas or in large migration gatherings, from hotspot districts should be tested for SARS-CoV-2 infection with Real time reverse transcriptase-polymerase chain reaction (RT-PCR) of nasopharyngeal swab, even if asymptomatic [2]. Mothers readmitted for post-partum complications were also tested. Neonates were tested for SARS-CoV-2 by RT-PCR on a nasopharyngeal swab sample if mother tested positive. All babies showing symptoms suggestive of coronavirus disease (COVID-19) were also tested. The usual turnover time for the test was 24 hours, which was the same for mother and baby. All the SARS-CoV-2 positive neonates were retested after 5 days. If negative on repeat testing, they were discharged. Those who continued to test positive on day 5 were discharged on day 10, if asymptomatic, without repeating the test.

Stable neonates, whether positive or negative, were roomed-in with their SARS-CoV-2 positive mothers in a separate COVID postnatal ward as recommended by Federation of Obstetric and Gynaecological Societies of India (FOGSI) and National Neonatology Forum (NNF) guidelines on the management of perinatal SARS-CoV-2 infection [3]. Neonates and mothers were kept on the same bed due to space constraints. Mothers were encouraged to breastfeed immediately after birth and educated about

maintenance of proper hand and respiratory hygiene. Lactation counseling and support were provided in person by a trained counselor. All the neonates were monitored twice daily for development of any COVID related symptoms like fever, hypothermia, respiratory distress, lethargy, cough, rhinorrhea, irritability, rash, diarrhea and feeding intolerance. If the neonates became symptomatic, they were shifted to the isolation area and managed.

Data regarding epidemiologic, demographic, clinical features, laboratory tests and chest radiographs of COVID positive neonates were recorded. Telephonic follow up of these neonates was done till 2 months of age. General health status, need for re-hospitalization, feeding status, weight gain and immunization were enquired about.

Descriptive statistics were used and outcomes expressed as proportions. Calculations were done using Microsoft Excel software.

RESULTS

Out of the total 1229 tested mothers, 185 (15.05%) tested positive for SARS-CoV-2 infection. Three (1.7%) mothers had fever and two of these three also had mild breathless-ness and responded favorably to treatment in the COVID ward (***Fig.* 1**). Twelve neonates (6.48%) tested positive for SARS-CoV-2 infection; 75% of these at 48 to 72 hours of life during the birth-admission. Three neonates were re-admitted with their mothers on day 13, 15 and 20, respectively for maternal complications and tested subsequently. All these neonates were roomed-in with their mothers in the COVID postnatal wards. The clinical and laboratory profile of all the SARS-CoV-2 positive neonates have been summarized in ***Table* I**.

Telephonic follow up was done for all positive infants till 2 months of age. Two infants received their 6-week immunization at 9 weeks, delayed by 3 weeks due to concerns of safety of visiting a health center during the pandemic and lockdown. All positive neonates were healthy, exclusively breastfed at 2 months follow up and did not require re-hospitalization after discharge following their SARS-CoV-2 infection.

Table I Characteristics of SARS-CoV-2 Infected Neonates (*N*=12)

Characteristics	*Value*
Male, *n* (%)	8 (66.6)
Gestation (wk), median (IQR)	38 (37.8, 39.3)
Birthweight (g)^	2734.1 (346)
Caesarean section, *n* (%)	10 (83.3)
APGAR at 1 min, median (IQR)	8 (8, 8.2)
Breastfeeding, *n* (%)	12 (100)
Feeding difficulty, *n* (%)	2 (16.6)
Fever, *n* (%)	3 (25)
Phototherapy, *n* (%)	3 (25)
Pre-ductal SpO_2 (%), median (IQR)	98 (97.7, 98)
Hospitalization (d), median (IQR)	13 (12,14)
*Hemoglobin (g/dL) ^	14.8 (2.4)
*leukocyte count ($\times 10^9$/L) ^	10.5 (3.3)
*Absolute neutrophil count ($\times 10^9$/L) ^	4.6 (1.4)
*Absolute lymphocyte count ($\times 10^9$/L)^	5.02 (1.8)
#AST (IU/L), median (IQR)	75 (65,88)
#ALT (IU/L), median (IQR)	29 (25,39)
#CRP (mg/L), median (IQR)	5 (4.2,7)
#Creatinine (mg/dL), median (IQR)	0.4 (0.3, 0.6)
‡LDH (IU/L), median (IQR)	1462 (1148.2, 1604.5)

*Values in ^mean (SD) or as detailed; Investigation carried out in *11, #9 or ‡8 neonates; No baby had respiratory symptoms or lethargy/ neurological symptoms; AST: Aspartate transaminase, ALT: Alanine transaminase, CRP: C reactive protein, LDH: Lactate dehydrogenase.*

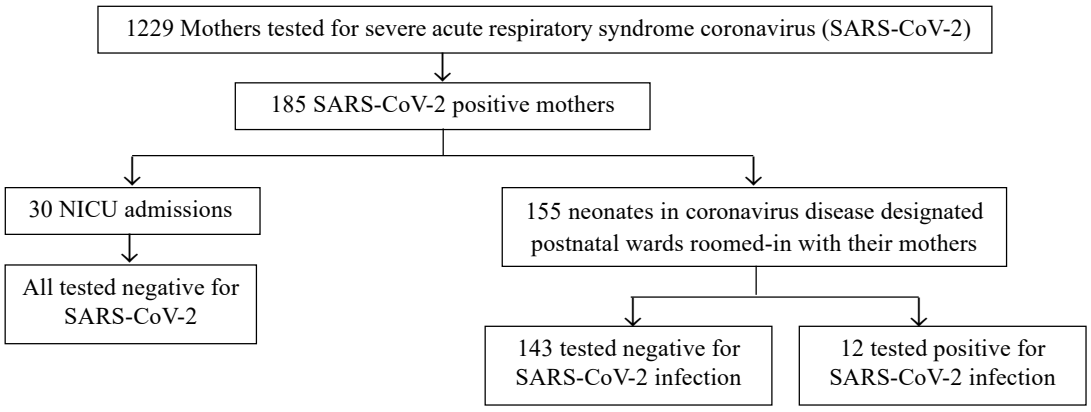

Fig. 1 *Flowchart showing patients during the study period.*

WHAT THIS STUDY ADDS?

- The clinical features of SARS-CoV-2 infection in neonates are mostly mild/asymptomatic, and such mother-baby dyad can be successfully roomed-in and breastfed.

Thirty (16.2%) neonates required NICU admission for neonatal problems and all of them tested negative for SARS-CoV-2 infection. The remaining 143 (77.2%) neonates tested negative and continued to be roomed-in with their mothers.

DISCUSSION

This is one of the earliest reported cohorts of COVID positive neonates from India. The exact incidence of SARS-CoV-2 infection in neonates is largely unknown. The proportion of SARS-CoV-2 positive neonates in our study was 6.5% as compared to 3.9% in a meta-analysis of 58 neonates [1].

Although a few authors have reported vertical transmission in neonates, there is still controversy regarding the same [4]. To prove intra uterine viral infection, testing of RT-PCR assay on tissue samples derived from placenta, amniotic fluid, cord blood and neonatal pharyngeal swab in the immediate post-partum period is required [5]. In our study, the maternal reports were available after 24 to 48 hours of delivery. Hence 50% neonates were tested at 48 hours, 25% neonates at 72 hours and the three re-admitted neonates were tested between 13-20 days. The median gestational age was 38 weeks in this study and the ratio of male to female was 2:1, similar to that described by Bernardo, *et al*. [6].

Mode of delivery does not impact transmission of the infection to the baby [3]. Still, the caesarean section rates have been found to be higher among SARS-CoV-2 infected mothers, and in our study too it was 83.3%. Respiratory problems requiring ventilation have been reported as the most common presenting symptom amongst SARS-CoV-2 positive neonates [1]. However, none of babies in this cohort had respiratory symptoms. We found mild and self-limiting symptoms in our cohort, with 3 neonates having fever. However, two out of these three neonates also had feeding difficulties and excessive weight loss, which responded to improved feeding practices and supplementary feeding with expressed breast milk. Hence, these could be cases of dehydration fever and may not be related to SARS-CoV-2 infection. One neonate had mild fever, which could not be attributed to any cause, therefore we presumed that the fever was caused by SARS-CoV-2 infection.

Very few studies have described laboratory abnormalities in SARS-CoV-2 positive neonates. The study by Henry, *et al*. [7] in pediatric COVID patients described lymphopenia, raised liver enzymes and raised LDH levels as the common lab abnormalities. Raised LDH levels in adult studies on SARS CoV-2 infection suggest greater severity of illness [8]. In our study, marked elevation of LDH levels and mild transaminitis were observed in the SARS-CoV-2 positive neonates. However, the significance of raised liver enzymes and LDH in neonates is yet to be understood. Bernardo, *et al.* [6] has reported radiological abnormalities in 44% of SARS-CoV-2 positive neonates but we did not find any radiological abnormalities in our study. Current evidence does not recommend any blood or radiological investigations in any asymptomatic SARS-CoV-2 positive neonates.

The World Health Organization and most professional bodies recommend rooming-in of asymptomatic mother-baby dyad, exclusive breastfeeding and maintaining a distance of 6 feet between them [3,9,10]. All stable neonates in our study were not only roomed in but also bedded in with their mothers and exclusively breastfed. Maintaining a distance of 6 feet was not possible due to lack of space in our hospital. In the study by Salvatore, *et al*. [11], despite rooming in, there was no horizontal transmission of SARS-CoV-2 infection as these babies were kept in Giraffe isolette incubators. Around 6.5% of our neonates had possible horizontal trans-mission due to prolonged close contact with their SARS-CoV-2 positive mothers during bedding in.

There is no conclusive evidence that the virus is transmitted through breastmilk [12,13]. Also, the benefits of breastfeeding far outweigh the negligible risk of transmitting the virus. In our center, we counselled and encouraged mothers to follow strict hand hygiene and respiratory hygiene all the time, especially while breastfeeding, but the exact compliance was not studied.

The limitations of our study were its retrospective design and small number of subjects. The manifestations in SARS-CoV-2 positive preterm neonates and those born to severely symptomatic mothers is not known and needs to be further explored. Exclusive breastfeeding is an integral part of neonatal care and has to be strongly promoted.

Ethics clearance: Institutional Ethics Committee Human

Research, Lokmanya Tilak Municipal Medical College and General Hospital; No: IEC/28/20 dated June 11, 2020.
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REFERENCES

1. Dhir SK, Kumar J, Meena J, Kumar P. Clinical features and outcome of SARS-CoV-2 infection in neonates: A systematic review. J Trop Pediatr. 2020;0:1-14.
2. Indian Council for Medical Research. Testing strategy [Internet]. Accessed August 16, 2020. Available from *https://www.icmr.gov.in/cteststrat.html*
3. Chawla D, Chirla D, Dalwai S, *et al*. Perinatal-Neonatal Management of COVID-19 Infection - Guidelines of the Federation of Obstetric and Gynaecological Societies of India (FOGSI), National Neonatology Forum of India (NNF), and Indian Academy of Pediatrics (IAP). Indian Pediatr. 2020;57:536-48.
4. Kotlyar A, Grechukhina O, Chen A, *et al*. Vertical transmission of COVID-19: A systematic review and meta-analysis. Am J Obstet Gynecol. 2020, Jul 31. [Epub ahead of print]
5. Wang C, Zhou YH, Yang HX, Poon LC. Intrauterine vertical transmission of SARS-CoV-2: What we know so far. Ultrasound Obstet Gynecol. 2020;55:724-25.
6. De Bernardo G, Giordano M, Zollo G, *et al*. The clinical course of SARS-CoV-2 positive neonates. J Perinatol. 2020, Jul 6. [Epub ahead of print]
7. Henry B, Benoit S, de Oliveira MH, *et al*. Laboratory abnormalities in children with mild and severe coronavirus disease 2019 (COVID-19): A pooled analysis and review. Clin Biochem. 2020;81:1-8.
8. Henry B, Aggarwal G, Wong J, *et al*. Lactate dehydrogenase levels predict coronavirus disease 2019 (CoVid - 19) severity and mortality: A pooled analysis. Am J Emerg Med. 2020;38:1722-26.
9. WHO. Breastfeeding advice during COVID-19 outbreak [Internet]. Accessed August 16, 2020. Available from *http://www.emro.who.int/nutrition/nutrition-infocus/breastfeeding- advice-during-CoVid-19-outbreak.html*
10. UNICEF. Breastfeeding during the CoVid-19 pandemic [Internet]. Accessed August 16, 2020. Available from *https://www.unicef.org/eap/breastfeeding-during-CoVid-19*
11. Salvatore CM, Han JY, Acker KP, *et al*. Neonatal management and outcomes during the COVID-19 pandemic: An observation cohort study. Lancet Child Adolesc Health. 2020 Jul 23. [Epub ahead of print].
12. Wang S, Guo L, Chen L, *et al*. A case report of neonatal 2019 coronavirus disease in China. Clin Infect Dis. 2020;71:853-57.
13. Chen Y, Peng H, Wang L, *et al*. Infants born to mothers with a new coronavirus (COVID-19). Front Pediatr. 2020; 8:1-5.