

Surgical Neonates with Coronavirus Infectious Disease-19 Infection: An Experience with Five Cases at High-volume Tertiary Care Centre of India

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Abstract

Coronavirus infectious disease-19 (COVID-19) has caused serious threat to global health. With progression of time, more and more cases are being reported in paediatric age group. Management of COVID-19-positive neonates with surgical condition is challenging as apart from medical management of COVID-19-induced morbidities, they also require surgical intervention. Various guidelines have been proposed for the management of neonates with coronavirus infection and surgical pathologies. In this original article, we are sharing our experience in managing such neonates. We managed five neonates with different surgical pathologies who were positive for the coronavirus at the time of admission. They received medical management initially. Three of these five neonates were operated after they were negative for the virus. The remaining two patients were operated in positive state due to their condition requiring urgent surgical intervention. All the recommendations as per the COVID-19 protocol were followed. Four of these babies survived. One neonate with the diagnosis of gastroschisis expired during stay in designated COVID-19 neonatal intensive care unit. Authors conclude that COVID-19-positive status of neonates should not scare the health-care workers. COVID-19 positivity in neonates does not alter the outcome.

Keywords: Coronavirus infectious disease-19, neonates, protocol, surgery

INTRODUCTION

Coronavirus infectious disease-19 (COVID-19) caused by severe acute respiratory-coronavirus-2 (SARS-CoV-2) has claimed more than 3.5 million lives and infected more than 175 million populations worldwide.^[1] Developing countries like India have been severely hit by this pandemic since the origin of this virus being notified in China in December 2019. It has caused severe strain on the healthcare delivery system of the entire world including India. Initially, few cases were being reported in paediatric patients.^[2] However, with passage of time, more and more cases are being reported in children with increasing severity. There are speculations that the third wave of this global pandemic is going to severely infect the paediatric population in developing nations. Till now, the theory of vertical transmission of COVID-19 from infected mother to foetus and newborns has been supported by a few literature and case reports. The horizontal transmission, i.e., droplet spread

from asymptomatic infected mother or caregivers to neonates is the only proven mode of transmission. Various guidelines are being prepared to prevent transmission from mother to newborn and management of COVID-19-positive neonates in dedicated nursery and COVID-19 neonatal intensive care unit (NICU).^[3] Surgical neonates with COVID-19 infection are peculiar as they require emergency surgery and post-operative care which has to be provided in a setting in which the available limited resources are better utilised and caregivers are protected from exposure. In this original article, we are sharing our experience with five neonates with surgical conditions who were COVID-19-positive in the first real-time reverse transcriptase-polymerase chain reaction (RT-PCR) test and were managed according to their surgical pathologies [Table 1].

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Table 1: Table showing clinical details and outcome of individual cases

Case	Diagnosis	Sex	Age at presentation (days)	COVID-19 status on the day of admission	COVID-19 status just before surgery	Time interval between positive and negative COVID-19 status (days)	Surgery	Outcome after surgery
Case 1	EA with TEF	Female	2	Positive	Negative	2	End-to-end oesophageal anastomosis	Discharged
Case 2	Low ARM	Male	3	Positive	Positive	2	V-Y anoplasty	Discharged
Case 3	Gastroschisis	Male	1	Positive	Positive	-	Silo bag application	Died
Case 4	EA with TEF	Male	1	Positive	Negative	2	End-to-end oesophageal anastomosis	Discharged
Case 5	Duodenal atresia with pyloric web	Female	5	Positive	Negative		Duodenoduodenal and pylorojejunal anastomosis	Discharged

TEF: Tracheoesophageal fistula, EA: Oesophageal atresia, ARM: And rectal malformation

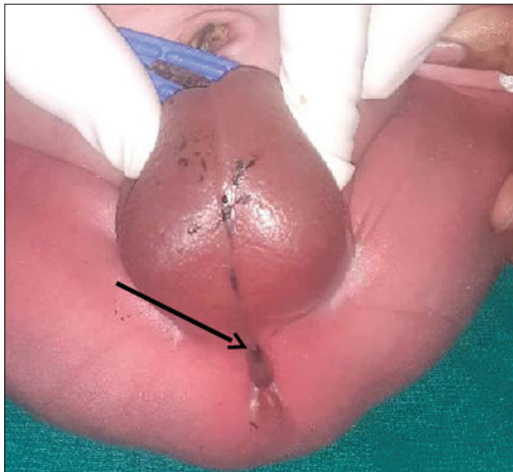


Figure 1: A case of low anorectal malformation with bucket handle skin tag stained with meconium pearl at the tip (black arrow)

These neonates were born outside our tertiary care centre and were referred to our centre in view of their surgical pathology. Four of these babies survived. One neonate with gastroschisis died on day 3 of life due to respiratory complications.

CASE REPORTS

Case 1

A 2-day-old female child was referred to our centre with the complaint of excessive frothing since birth. She was term born, weighing 2.5 kg at birth. She cried immediately after birth and passed meconium and urine on day 1 of life. An infant feeding tube of 8 Fr was inserted per oral which was seen coiling in the oral cavity. A chest and abdomen radiograph was taken with feeding tube *in situ* which showed coiling of tube in upper part at the level of third thoracic vertebra. Abdomen was filled with gas. With these above findings, a diagnosis of oesophageal atresia (OA) with distal tracheo-oesophageal fistula (TEF) was made. As a part of routine surgical work up in the COVID era, nasopharyngeal swab was sent for RT-PCR after admission in the paediatric emergency. The report was positive for coronavirus. Thereafter, the baby was transferred to the COVID-19 NICU. She was managed with regular oral

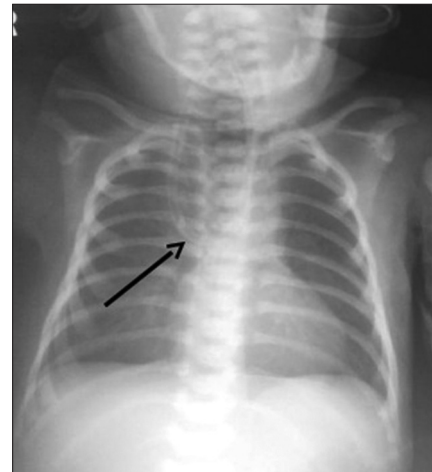


Figure 2: Chest radiograph of a case of oesophageal atresia with tracheo-oesophageal fistula showing coiling of feeding tube at T4-T5 level (black arrow)

suction and intravenous fluids with oxygen support through nasal cannula in view of respiratory distress. The RT-PCR test was repeated again twice, on day 4 and day 6 of life which came out negative on both occasions. Subsequently, baby was operated for EA and TEF with standard open approach. The surgery for OA with TEF is routinely done whenever chest condition of baby improves in the absence of the COVID-19 pandemic. Baby recovered well in post-operative period. She was started on oral feed on post-operative day 6. She was subsequently discharged on full breastfeed on post-operative day 10. Her mother was negative for the virus during the entire course.

Case 2

A 3-day-old male child was brought to paediatric emergency with the complaint of pinpoint anal opening with abdominal distension. On perineal examination, there was bucket handle skin tag at the level of anal dimple with pinpoint opening at the tip of skin tag which was stained with meconium pearl [Figure 1]. On the basis of clinical findings, a diagnosis of low anorectal malformation with anocutaneous fistula was made. As a part of COVID-19 protocol, nasopharyngeal swab

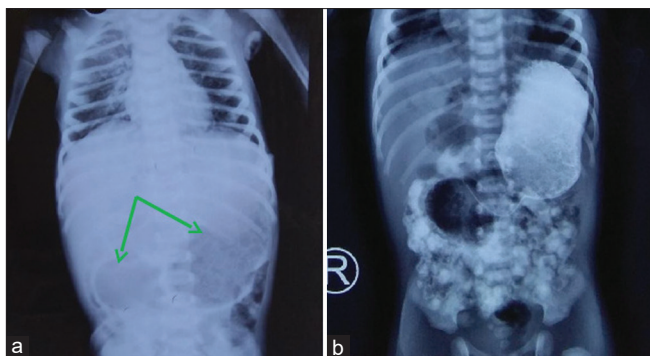


Figure 3: (a) Plain abdominal radiograph showing double bubble sign with distended stomach and first part of duodenum (green arrows). (b) Upper GI contrast study showing massively dilated stomach and first part of duodenum with passage of contrast in distal gut

was sent for RT-PCR test on the day of admission. This was reported positive. As the baby had gross abdominal distension, he was planned for emergency surgery for low anorectal malformation. He was operated under COVID-19 protocol taking all the precautionary measures within 24 h of admission. V-Y anoplasty was performed. A repeat RT-PCR which was sent after surgery after the 5th day of arrival, and he was reported negative. He was then managed in neonatal nursery of paediatric surgery department. His mother was tested negative for COVID-19 during the same time. The baby was started on breastfeed on the second post-operative day. Subsequently, he was discharged on full feed on day 4 after surgery.

Case 3

A 1-day-old female child was brought to the paediatric emergency with the complaint of protrusion of bowel loops through a defect in the abdominal wall at the level of the umbilicus just right to it. On clinical examination, entire small bowel loops with stomach and ileocaecal junction along with ascending and transverse colon were visible outside the abdominal cavity. There was a small defect of 2 cm × 2 cm at the level of the umbilicus just right to it. A silo bag was applied bedside taking all the precautionary measures as the COVID status of the baby was not known and mother was negative for the same. A nasopharyngeal swab was sent simultaneously for RT-PCR which came out to be positive. Thereafter, the baby was shifted to a dedicated NICU for COVID-19-positive neonates. There, she was intubated in view of shock and falling oxygen saturation level. However, she died on day 3 of life. The cause of death was respiratory distress and multiorgan failure due to ongoing sepsis.

Case 4

A 1-day-old male child was brought to paediatric emergency of our tertiary care centre with the complaint of excessive frothing since birth and inability to pass feeding tube orally. A diagnosis of oesophageal atresia with tracheo-oesophageal fistula was made following a chest and abdomen radiograph which showed coiling of feeding tube at the level of fourth-fifth thoracic vertebra [Figure 2]. A nasopharyngeal swab was

sent for RT-PCR on the day of admission as a part of routine evaluation. It was reported to be positive. Thereafter, the baby was shifted to the COVID-19 NICU. He was managed with frequent oral suctioning in a prone-lateral position and administration of intravenous fluids. The RT-PCR test was repeated after 48 h which came out to be negative. It was repeated again next day which was negative. The baby was operated on day 5 of life after two consecutive tests were reported negative. Post-operative period was uneventful. He was subsequently discharged on day 15 of life after establishing full oral feed.

Case 5

A 5-day-old female child was brought to paediatric emergency department with the complaints of regurgitation of feed since birth. She was delivered full term by caesarean section. She cried immediately after birth and weighed 2.26 kg. Her mother was detected to be COVID-19 positive 5 days after delivery. For the above complaints, baby was admitted to NICU. Two days later, the baby was tested positive for COVID-19. The test was repeated again 1 day later which was again reported as positive. She was then shifted to COVID-19 NICU where the baby was initially managed with intravenous fluids and nasogastric decompression. The nasogastric aspirate was bilious in nature. On abdominal examination, there was upper abdomen distension with vague cystic lump of size approximately 4 cm × 3 cm palpable in right hypochondrium. Plain abdominal radiograph revealed distended stomach and duodenum with presence of distal gas shadow [Figure 3a]. Ultrasonography of abdomen revealed a well-defined echogenic lesion within the second part of duodenum, measuring 2.5 cm × 2 cm with no internal calcifications or cystic changes. An upper gastrointestinal contrast study was obtained to confirm the diagnosis. It revealed massively dilated stomach and the first part of duodenum with passage of contrast distally, thereby giving impression of duodenal web (Type 1 duodenal atresia) [Figure 3b]. A repeat RT-PCR done after the 6th day of COVID-19-positive status of the baby and it turned out to be negative. The baby was then planned for exploratory laparotomy, and after confirming the diagnosis of duodenal atresia, duodeno-duodenal anastomosis was performed. A nasogastric tube was then tried to negotiate beyond the pylorus up to the duodenal anastomosis, but it was stuck at the pylorus giving an impression of pyloric obstruction. Thereafter, a pylorojejunal anastomosis was performed. The patient was kept on continuous nasogastric aspiration postoperatively. She was started on oral feed on post-operative day 6 which she tolerated well. She was discharged subsequently after establishing full oral breastfeed.

DISCUSSION

Coronavirus infection caused by SARS-CoV-2 has posed serious threat to global health since its first case being reported from Wuhan, China in December 2019. Till now, more than 175 million populations have been infected globally with more than 3.5 million casualties. Developing nations like India have

been badly hit by this virus exposing already ailing healthcare system. Initially, few cases were reported in children but with passage of time, more and more cases of COVID-19 in children and newborn are being reported.^[4,5] The exact mode of transmission from infected mother to newborn is still not known. Various theories about vertical transmission and intra-uterine transmission have been proposed.^[6] However, horizontal transmission through droplet spread is still the best understood mode of transmission from infected mother to baby as asymptomatic mother is in close contact with baby and can spread the virus to the newborn.^[7] There is strong evidence that asymptomatic carriers of coronavirus are common.^[8] These asymptomatic carriers are a major risk of spread to neonates. In this case series, in all but one, mothers were negative for the coronavirus when the babies were detected positive for the same. There is high likelihood that these neonates have caught the virus from asymptomatic mother or the healthcare personnel during the process of delivery or evaluation.

The management of COVID-19-positive neonates with surgical condition becomes challenging as they require close monitoring and urgent surgical management. Moreover, they have an immature immune system which makes them more prone to rapid progression of respiratory distress. Ma *et al.* proposed a recommendation for perinatal and neonatal surgical management in ongoing COVID-19 pandemic.^[9] According to this recommendation, neonates who are positive for SARS-CoV-2 should be immediately transferred to a dedicated institution dealing with COVID-19 cases. A dedicated NICU for these neonates is mandatory to nurse them in ideal condition and simultaneously preventing other neonates from exposure. Healthcare personnel working in these dedicated NICUs should wear protective equipment. In our series also, all the neonates were initially transferred to a dedicated NICU after they were tested positive for the coronavirus. As far as the clinical symptoms of COVID-19 in neonates are considered, mostly they are asymptomatic or mildly symptomatic. Symptoms may range from fever with cough to gastrointestinal symptoms such as vomiting and diarrhoea. Most of them recover within 1–2 weeks after onset of disease. Very few of them progress to respiratory distress.^[10]

RT-PCR of nasopharyngeal swab is used to diagnose COVID-19 in most of the cases.^[11] The severity of the infection can be determined by various inflammatory markers such as serum level of procalcitonin, interleukins, lactate dehydrogenase, ferritin and d-dimer.^[12] A computed tomography scan of chest also helps in monitoring the progress of the disease.^[13]

According to the available epidemiological data, incubation period of COVID-19 ranges from 1 to 14 days but most commonly from 3 to 7 days.^[14] In this series, the neonates were tested positive for COVID-19 at age ranging from 1 to 5 days. It is to be mentioned here that, in our institute, all surgical neonates are being evaluated for pre-operative COVID-19 status irrespective of COVID status of mother during the pandemic. Fortunately, after being initially positive for the

virus, four of these babies become negative on subsequent RT-PCR done at interval of 48 and 72 h. Three of these neonates were operated upon only after being reported negative on two subsequent RT-PCR done at interval of 24–48 h. One neonate was operated in positive state following all the COVID-19 protocol, the reason being gross abdominal distension. The other case with the diagnosis of gastroschisis was operated bedside with the application of silo bag and shifted to a designated NICU for COVID-19 neonates. We operated three of these neonates only after getting a negative RT-PCR report as they could be managed preoperatively in COVID-19 NICU without any worsening of symptoms. Amongst them, two were cases of OA with tracheo-oesophageal fistula which could be managed by frequent oral suction, nursing in prone and lateral position and intravenous fluids and antibiotics. One case was having a diagnosis of duodenal atresia which could be managed initially by nasogastric decompression and intravenous fluids and antibiotics.

On an average, these neonates became negative for the coronavirus on 5th day of life. As per the available literature, the average duration for getting a negative RT-PCR is 7–14 days.^[15] The possible reasons for early negative report in our series may be low viral load in neonates or fast washout of viraemia. However, this observation needs to be validated by further studies in COVID-19-positive neonates.

CONCLUSIONS

Management of neonates with surgical condition and COVID-19 infection is challenging. There should be a proper protocol to guide the management of these patients. COVID-19-positive status of neonates should not scare the healthcare workers as a risk of transmission is low in the present series. Moreover, the authors opine that COVID-19 positivity does not alter the outcomes in neonates with surgical conditions. However, a larger study is required to validate above observation.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Weekly Epidemiological Update on COVID-19-22 June, 2021. Emergency Situational Updates. 45th ed. WHO Situation Report on COVID-19; 22 June, 2021. Available from: <https://www.who.int/>

- publications/m/item/weekly-epidemiological-update-on-covid-19---22-june-2021 [Last accessed on 2021 Jun 25].
2. Zimmermann P, Curtis N. Coronavirus infections in children including COVID-19: An overview of the epidemiology, clinical features, diagnosis, treatment and prevention options in children. *Pediatr Infect Dis J* 2020;39:355-68.
 3. Anand P, Yadav A, Debata P, Bachani S, Gupta N, Gera R. Clinical profile, viral load, management and outcome of neonates born to COVID 19 positive mothers: A tertiary care centre experience from India. *Eur J Pediatr* 2021;180:547-59.
 4. Zeng L, Xia S, Yuan W, Yan K, Xiao F, Shao J, *et al.* Neonatal early-onset infection with SARS-CoV-2 in 33 neonates born to mothers with COVID-19 in Wuhan, China. *JAMA Pediatr* 2020;174:722-5.
 5. Knight M, Bunch K, Vousden N, Morris E, Simpson N, Gale C, *et al.* Characteristics and outcomes of pregnant women admitted to hospital with confirmed SARS-CoV-2 infection in UK: National population based cohort study. *BMJ* 2020;369:m2107.
 6. Sisman J, Jaleel MA, Moreno W, Rajaram V, Collins RR, Savani RC, *et al.* Intrauterine transmission of SARS-COV-2 infection in a preterm infant. *Pediatr Infect Dis J* 2020;39:e265-7.
 7. Karimi-Zarchi M, Neamatzadeh H, Dastgheib SA, Abbasi H, Mirjalili SR, Behforouz A, *et al.* Vertical transmission of coronavirus disease 19 (COVID-19) from infected pregnant mothers to neonates: A review. *Fetal Pediatr Pathol* 2020;39:246-50.
 8. Wang Y, Liu Y, Liu L, Wang X, Luo N, Li L. Clinical outcomes in 55 patients with severe acute respiratory syndrome coronavirus 2 who were asymptomatic at hospital admission in Shenzhen, China. *J Infect Dis* 2020;221:1770-4.
 9. Ma LS, Zhao YL, Wei YD, Liu C. Recommendations for perinatal and neonatal surgical management during the COVID-19 pandemic. *World J Clin Cases* 2020;8:2893-901.
 10. Wei M, Yuan J, Liu Y, Fu T, Yu X, Zhang ZJ. Novel coronavirus infection in hospitalized infants under 1 year of age in China. *JAMA* 2020;323:1313-4.
 11. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, *et al.* Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020;395:497-506.
 12. Zeng F, Huang Y, Guo Y, Yin M, Chen X, Xiao L, *et al.* Association of inflammatory markers with the severity of COVID-19: A meta-analysis. *Int J Infect Dis* 2020;96:467-74.
 13. Shi H, Han X, Jiang N, Cao Y, Alwalid O, Gu J, *et al.* Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: A descriptive study. *Lancet Infect Dis* 2020;20:425-34.
 14. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, *et al.* Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med* 2020;382:1708-20.
 15. Gupta ML, Gothwal S, Gupta RK, Sharma RB, Meena JS, Sulaniya PK, *et al.* Duration of viral clearance in children with SARS-CoV-2 infection in Rajasthan, India. *Indian Pediatr* 2021;58:123-5.