ORIGINAL RESEARCH

A study on the outcome of newborns, born to admitted SARS-COV-2 positive pregnant mothers in a tertiary care hospital

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ABSTRACT
Background: The Coronavirus Disease 2019 (COVID-19) has been declared as a pandemic by the World Health Organization (WHO)**.** Due to changes in the immunological and circulatory parameters, pregnant women are susceptible to the COVID-19 infection. Neonates born to these mothers are also at risk of infection and may have adverse outcomes due to the infection**.**
Materials and Methods: This was a descriptive study conducted among newborns of 138 COVID-19 positive pregnant mothers admitted in the Department of Pediatrics, Niloufer hospital, Hyderabad, India from 1 May 2020 to 1 May 2021. In this study the clinical profile correlating with lab diagnosis of COVID-19 by the reverse transcription-polymerase chain reaction (RT-PCR) and outcome of babies born to COVID-19 positive mothers was evaluated in detail.
Results: In the present study, total 140 babies were born to 138 mothers (137 single ton pregnancies and one triplet), out of which 5 (3.57%) were tested positive for COVID-19. About 91(65%) babies did not have any kind of risk factors, 40(30%) were admitted in Neonatal intensive care unit (NICU) and survival rate of babies was 130 (92.85%).
Conclusion: Timely detection and intervention of COVID-19 will reduce obstetric complications and will improve maternal and fetal outcome.
Keywords: COVID-19, pandemic, pregnant, neonates, polymerase chain reaction

Introduction

COVID-19 has rapidly spread across the world by highly transmissible virus called Severe Acute Respiratory Syndrome Coronavirus 2 [SARS-CoV-2]. It is a single-stranded RNA virus, belonging to the family Coronaviridae.[1] Following severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV), SARS-CoV-2 is the third type of coronavirus gave rise to serious pneumonia.[2,3] On March 11th 2020, COVID-19 was declared as pandemic by WHO. All age groups are susceptible, but elderly and people with comorbid conditions mostly developed a serious disease.The morbidity and mortality of COVID-19-positive pregnant women remains unclear. A more detailed study of at-risk populations indicates pregnant women may be of concern.[4,5,6] Though children are likely to have less severe clinical symptoms when infected, the probable harm of the disease remains mostly unknown in neonates. In the largest pediatric study to date, more than 90% of children were asymptomatic to moderately ill. However, severe to critical cases were more in infants, compared to 1-15 years age children indicating infants may be at higher risk than previously thought.[1]The reason why children are less affected by SARS-CoV-2 than adults remain uncertain. Some studies showed that children who had taken combination vaccination within the third month of life had less severe infections than those whose immunization was delayed, maybe due to vaccination-related nonspecific enhancement of immunological activity. Furthermore, children's immune system is in the developing stage, so not yet able to start a cytokine storm as in adults.[7] moreover, another important reason for infants being at higher risk was

due to the effects of maternal COVID-19 infection on pregnancy outcome rather than transmission of SARS-CoV-2 infection to the neonate from mother during or after the delivery. So, monitoring pregnancy outcomes is very important in this scenario.

Aims and Objectives

The present study was done to evaluate the demographic characteristics and outcome of the newborn babies born to COVID -19 positive pregnant mothers.

Materials and Methods

The present descriptive study was conducted in the Department of Paediatrics, Niloufer hospital, Hyderabad. 138 COVID-19 positive antenatal mothers admitted were enrolled into the study after taking the informed consent.A detailed clinical history for every case was taken from the patient using the questionnaire. All the lab investigations were done and findings were noted. In this study, lab diagnosis of COVID-19 by PCR was done as per the national expert committee testing guidelines, antenatal testing was done if the mother admitted for delivery resided in any of the containment zones or if the mother had any of the symptoms suggestive of COVID-19 infection and all the babies born to covid-19 positive mothers were also tested within 24hrs of birth as per national guidelines.[8,9] for COVID-19 testing nasopharyngeal swabs were collected under strict aseptic precautions, after cleaning the site. COVID-19 infection in mothers and neonates was diagnosed by Reverse transcriptase-polymerase chain reaction (RT-PCR). Indian Council of Medical Research (ICMR) approved Lab Gun kit was used for the testing. Labgenomics manufactured this kit. Cycle threshold (Ct) value 36 for RDRp and ORF and 35 for E gene, were taken as the detection limit for RT-PCR.[8] Statistical analysis of data was done by the SPSS software.

Ethical committee approval

The study was approved by the Institutional Ethics Committee vide letter number IEC/OMC/2021/M-No (01) /Acad-03.

Results

Of the total 10045 deliveries during the study period 138 (1.37%) were confirmed COVID-19 positive by RT-PCR. The mean age of the mothers was 24.22 years and the mode of delivery was lower segment caesarean section (LSCS) in 94 (68.11%). The rest of the 44 (31.88%) were normal vaginal deliveries. About 52(37.69%) mothers had pregnancy-associated risk factors. There was no mortality among the mothers in the present study.

Table 1: Sociodemographic characteristics of COVID-19 positive mothers.

Characteristic	Value (n=138)	Percentage (%)
Age of the mother		
≤ 20 years	21	15.21
21-25 years	72	52.17
26-30 years	39	28.26
> 31 years	6	5.34
Locality		
Urban	88	63.76
Rural	50	36.33

Table 2:Clinical characteristics of COVID-19 positive mothers.

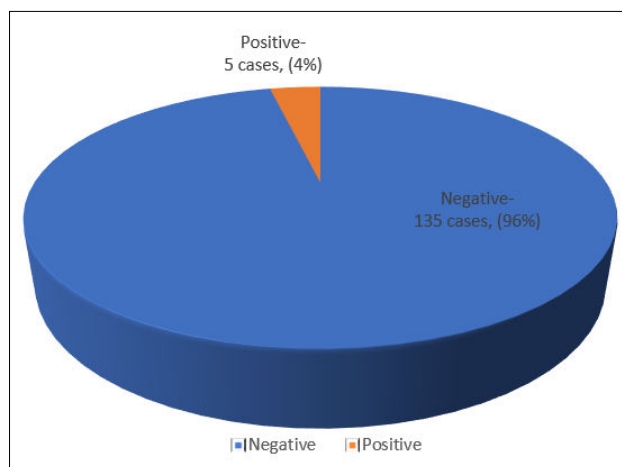| Characteristic	Value (n =138)	Percentage (%)
Gestational age at delivery		
≤ 30 weeks	4	2.89
31-34 weeks	14	10.14
35-36 weeks	38	27.53
≥37 weeks	82	59.42
Mode of delivery		
LSCS	94	68.11
Vaginal delivery	44	31.88
Risk factors of mothers		
None	86	62.31
Gestational Diabetes Mellitus	3	2.17
Hypothyroidism	14	10.14
Oligohydramnios	4	2.89
Polyhydramnios	1	0.72
Pre-eclampsia	30	21.73

Fig1: COVID-19 status of newborn babies

Table 3: Demographic characteristics of babies (n=140) [137 singleton pregnancies+1 triplet]

Characteristics	Value(n=140)	Percentage (%)
Gender of the baby		
Male	75	53.57
Female	65	46.42
Birth weight of the baby		
≤ 1.5 kgs	15	10.71
1.51kg – 2.0 kgs	31	22.14
2.01-2.5 kgs	44	31.42
2.51 – 3.0 kgs	28	20
3.01-3.5 kgs	15	10.71
Not available	7	5
Gestational age at delivery		
Term [≥37 weeks]	82	58.57%
Preterm [<37 weeks]	58	41.42%

Table 4: Clinical characteristics of babies(n=140) [137 singleton pregnancies+1 triplet]

Characteristics	Value (n=140)	Percentage (%)
APGAR Score at 1 min		
≤ 4	3	2.14
5	4	2.85
6	8	5.71
7	117	83.57
NA	8	5.71
APGAR Score at 5 min		
≤ 5	2	1.42
6-8	9	6.42
9	121	86.42
NA	8	5.71
Breast Feeding		
Exclusively Breast Fed	124	88.57
Top Fed	4	2.85
Data not available	12	8.57
Risk factors of the baby		
None	91	65
Intrauterine growth retardation (IUD)	4	2.85
Jaundice	3	2.14
Prothrombin time (abnormalities)	29	20.71
Low birth weight	27	19.28
Respiratory distress	9	6.42

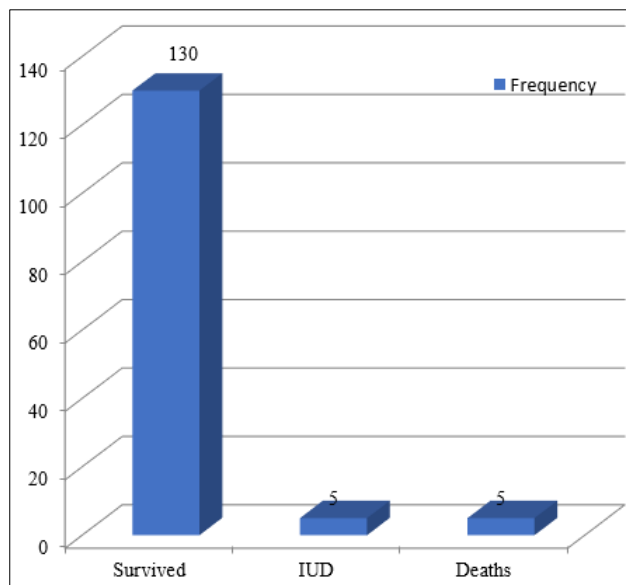| Hypoglycemia	2	1.42
Hypoxic ischemic Encephalopathy	1	0.71
Admission in NICU		
Not required	98	70
≤ 7 days	30	21.42
>7 days	10	7.14

Fig2: Survival status of the babies

In the present study, total 140 babies were born to 138 mothers (137 single ton pregnancies and one triplet), out of which 5 (3.57%) were tested positive for COVID -19. Among these babies 91 (65%) did not have any kind of risk factors, 40 (30%) were admitted in NICU and survival rate was 130 (92.8%).

Discussion

Pregnant women are most commonly effected group of the people, prone to the COVID-19 infection due to physiological changes in the immunological and vascular system. As a result, neonates born to COVID-19 positive mothers are at a higher risk of infection and may have adverse outcomes. Sutton and colleagues conducted a study on pregnant women in the United States of America and stated that those infected with COVID-19 were more vulnerable to develop severe complications and may need hospitalization, ICU admission and mechanical ventilation. However, they were not at a higher risk for death compared to non-pregnant women of reproductive age group [10] Besides having common sequelae of infectious disease, pregnant women are also at risk of adverse maternal and neonatal complications such as premature birth, spontaneous abortion, intrauterine growth retardation etc.[11] In spite of advancing knowledge about COVID-19 infection there is still lacunae with regards to understanding of perinatal and neonatal COVID-19 infection until now. Perinatal transmission routes of SARS-CoV-2 and correlation between viral load and clinical symptoms in mother and neonate remain uncertain.[8] In a study done by Priyadarshini CB *et al*[12] the mean age of pregnant was 25.98 years, which was similar to the present study. In our study 94(68.11%) of women delivered by caesarean section, few of the caesarean births were done as a precautionary step due to SARS-CoV-2 infection but we cannot definitively say that caesarean section will prevent transmission of COVID-19 from pregnant mother to baby more than vaginal delivery, due to lack of clear information. However, maternal fever and hypoxemia caused by grievous infection can lead to fetal distress, and other complications.[1] Majority caesarean births were seen in many other studies also.[12,13] In contrary, in a study done by Patil *et al*[14], 67% births were by normal vaginal deliveries only. There was no significant association between locality, co-morbidities of pregnant with outcome of pregnancy in our study. There was no mortality among the mothers in our study, but in the study done by Knight M *et al*, the mortality among the mothers was 1%.[13]

In present study, total 140 babies were born to 138 mothers (137 singleton pregnancies and one triplet). Covid-19 infection is transmitted from person to person through droplets, other transmission routes are speculated but not confirmed. Transplacental transmission of infection is not proved yet.[15] So in our study, nasopharyngeal swabs are only collected from newborns for COVID -19 testing by PCR. Out of 140 newborns 5 (3.57%) were tested positive for COVID-19 infection. %. The incidence of COVID-19 among the newborns was 4.9% in a study done by Knight M

et al.[13] In contrast, none of the babies were tested positive in another study.[12] 49(35%) had different kinds of risk factors at birth. Few babies had more than one risk factor also. Birth weight of maximum babies born was between 2-2.5kg which was in accordance with Anand P *et al* study [8] whereas in a study conducted by U P Patil *et al.* mean birth weight was 3.1-3.5kg.[14] 124 (88.57%) newborns were exclusively breastfed, as there is no evidence of SARS-CoV-2 transmission through breastfeeding. Moreover, breastfeeding is encouraged because it also provides nutritional benefits for the child and has a positive association with babies' social and emotional growth.[16] And no case of SARS-CoV2 transmission occurring during the delivery, before or after birth via birth canal, placenta or breastfeeding have been characterized yet.[17,18] Preterm baby was defined as a baby delivered before 37 weeks of gestation.[12] Among 140 babies born in this study, 58[41.42%] were preterm babies and 82 [58.57%] were term babies.In contrast in a study done by Uday P Patil *et al* [14] 91.1% were term babies only. In our study, APGAR Score at 1minute was 7 in 117 (83.57%) babies and at 5 minutes it was 9 in 121(86.42%) and 98 (70%) did not require NICU admission at all. Most of the studies reported low mortality risk in of SARS-CoV2-infected pregnant women as there are only a few cases of pregnant developing respiratory distress.[19] But in few studies, Pneumonia during pregnancy has also been linked to a increased risk of preterm deliveries.[20] However, overall, the expert opinion that the SARS-CoV2 is not an indication of termination of pregnancy.

These parameters were reassuring and showed the maximum number of babies born were doing well indicating good pregnancy outcomes. Among 140 babies born, 130 (92%) survived and 5 (3.57%) were Intrauterine deaths and 5 (3.57%) died after birth. These deaths may be due to immunological reactions, and ill health of the mother due to COVID -19 which affected babies' growth and development in the womb leading to neonatal mortality. The immunological reactions and hypoxic conditions occurring in pregnant due to SARS-CoV-2 infection may cause placental perfusion problems, which may further lead to neonatal adverse events, like respiratory distress, premature birth, and other serious complications in the newborn. So mothers' and infants' condition need to be closely monitored during and after delivery.[21]

Conclusion

Early detection and intervention of COVID-19 will reduce obstetric complications and may be beneficial for improving maternal outcomes. The collection of data about the outcomes of SARS-CoV-2 positive pregnancy is very important to solve many questions about the extent of the impact of infection**.**[4] Long-term follow-up studies on maternal and fetal outcomes must be encouraged in order to help the policymakers build necessary infrastructure facilities for the diagnosis and treatment of this disease.

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