Maternal to fetal transmission of SARS-COV-2 and its association with mode of delivery in a tertiary care hospital

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Abstract:

Objectives: In our study, we aim to determine: a) Transmission rate of SARS-COV-2 in neonates of SARS-COV-2 positive pregnant women. b) Transmission rate in different modes of delivery. **Materials and methodology:** A prospective hospital based study was conducted in Gauhati Medical College and Hospital, Guwahati for a period of six months. A total of 292 COVID -19 positive cases were delivered which includes antenatal patients and all postpartum patients within 14 days of delivery. The test undertaken was RT-PCR for identification of SARS COV-2. All data was analysed by SPSS version 21 and p-value of <0.05 is considered statistically significant. **Results:** In our study, we have seen that 292 pregnant women delivered and out of which 16 had COVID-19 positive neonates that is the transmission rate is 5.48%. 66% were delivered by LSCS and 34% had vaginal delivery. Out of the COVID-19 positive babies, 75% were delivered by caesarean section and 25% were delivered vaginally. **Conclusion:** The high incidence of caesarean section is due to the fact that initially we didn't have enough facility to monitor the antenatal cases. The COVID-19 positive status of the infant does not depend on the mode of delivery.

Keywords: SARS-COV-2, vertical transmission rate, COVID-19 pandemic, birth outcome.

Emerging infections have an important impact on pregnant women and fetuses[1] with increased risk of complication in pregnant women as seen in the 2009 pandemic of H1N1 influenza virus[2] and the zika virus infection [3,4]. As the COVID-19 pandemic has spread across the globe, prevention and control of COVID-19 infection among pregnant women and the potential risk of vertical transmission has become a major concern.

Coronaviruses are single-stranded, nonsegmented, enveloped RNA viruses, which can cause illness that ranges from the common cold to severe and fatal pneumonia [5]. The term coronavirus is derived from the Latin word 'corona' which means crown or halo.

This study can guide us in management of COVID-19 women and help us decide the preferred mode of delivery to minimise the transmission of COVID-19 to newborns.

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In our study, we aim to determine:
a) Transmission rate of SARS-COV-2 in neonates of SARS-COV-2 positive pregnant women.
b) Transmission rate in different modes of delivery

Methodology

Gauhati Medical College and Hospital, Guwahati is a tertiary care centre where complicated cases from the neighbouring districts are referred. A prospective hospital based study was conducted in the Department of Obstetrics and Gynaecology, Gauhati Medical College and Hospital, Guwahati during the period 1st July, 2020 to 31st December, 2020. A total of 292 COVID -19 positive cases delivered which were included in the study.

This is the first attempt to document the maternal to fetal transmission of SARS COV-2 and its association with the mode of delivery in this hospital. The test undertaken for identification of SARS COV-2 was RT-PCR. We had taken nasopharyngeal swab of mothers at the time of admission and their neonate's nasopharyngeal swab was taken within 24 hours of their birth. Repeat swab was taken on day 9 from the time of first swab. However, if the repeat swab test comes out to be positive it is repeated every alternate day until it becomes negative.

Inclusion criteria:
• All antenatal patients with COVID-19 positive status.
• All postpartum patients within 14 days of delivery with COVID-19 positive status.
Exclusion criteria:
• All postpartum patients who present after 14 days of delivery with COVID-19 positive status.
• All patients with abortion with COVID-19 positive status.

All data were analysed using SPSS software version 21. A p-value of <0.05 is considered as statistically significant at 5% level of significance.

Results

The following results and observations were noted in this study -
Total number of deliveries: 292
Number of vaginal deliveries: 100
Number of caesarean section: 192
Number of COVID-19 positive infants: 16

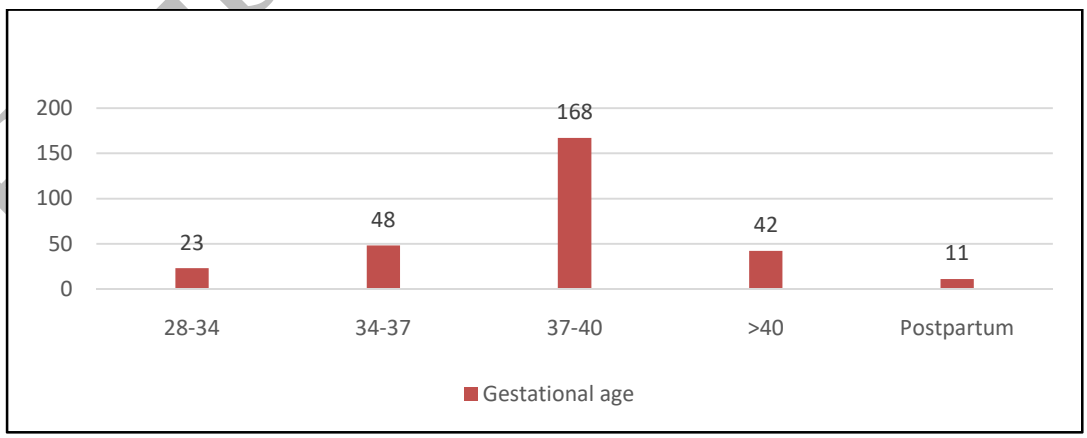

Figure 1: Distribution of COVID-19 positive patients according to duration of pregnancy

Figure 1 depicts that 168 (57.53%) patients delivered between 37-40 weeks gestation followed by 48 (16.43%) patients between 34-37 weeks, 42 (14.38%) patients delivered after the expected date of delivery and 23 (7.87%) patients delivered between 28-32 weeks. For 11 patients, the report came out to be positive only after delivery.

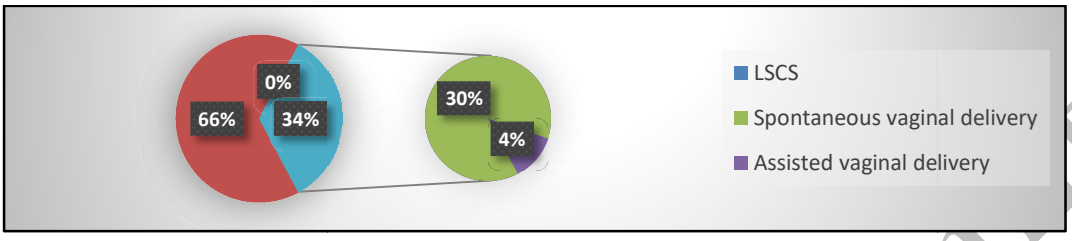

Figure 2: Distribution of COVID-19 positive patients according to mode of delivery

In Figure 2, we can see that 192 (65.75%) of the cases delivered by caesarean section followed by 88 (30.14%) by spontaneous vaginal delivery and 12 (4.11%) by assisted vaginal delivery.

Table 1: Distribution of COVID-19 positive patients according to blood group

Blood group	Number	Percentage
A^+	131	44.86
B^+	42	14.38
AB^+	11	3.78
O^+	102	34.93
A^-	0	0
B^-	2	0.68
AB^-	1	0.34
O^-	3	1.03

Table 1 depicts that 131 (44.86%) patients had blood group A positive followed by O positive which had 102 (34.93%) patients. However, none of them had blood group A negative.

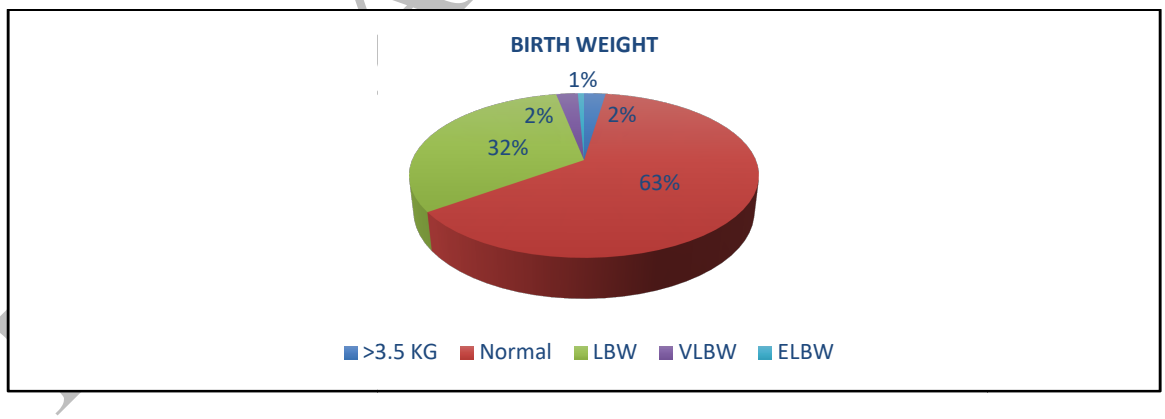

Figure 3: Distribution according to weight of the babies of COVID-19 positive mothers

In figure 3 , we can see that 183 (63%) patients delivered babies weighing between 2.5-3.5 kg followed by 93 (32%) babies weighing between 1.5-2.5 kg.6 (2%) of the babies weighed 1-1.5 kg. 3 (1%) of the babies weighed less than 1 kg and 7 (2%) of the babies weighed more than 3.5 kg.

Table 2: Distribution of the sixteen COVID-19 positive neonates		
Characteristic	**Number**	**Percentage**
Labour	7	43.75
Mode of delivery		
Vaginal	4	25.00
Caesarean section	12	75.00
Infant sex		
Male	9	56.25
Female	7	43.75
Mortality	1	6.25

Table 2 depicts that out of the sixteen COVID-19 positive babies, 7 (43.75%) of them went into labour. 12 (75%) were delivered by caesarean section and 4 (25%) were delivered vaginally. One of the COVID-19 positive babies expired due to neonatal sepsis.

Transmission rate of COVID-19 in neonates = number of COVID 19 infected new-born/total number of deliveries = 16/292 = 0.0547
Transmission rate of COVID-19 in neonates delivered by vaginal delivery = 4/100 =0.04
Transmission rate of COVID-19 in neonates delivered by caesarean section = 12/192 = 0.0625

Table 3: Association between mode of delivery and COVID-19 positive status of infant			
Neonates	**LSCS**	**Vaginal delivery**	**Significance**
COVID-19 (+)	12	4	p = 0.422
COVID-19 (-)	180	96	

From the table we can see that the p value is 0.422 (> 0.05). Thus, there is no association between mode of delivery and positivity of infant and we can conclude that the COVID-19 positive status of the infant does not depend on the mode of delivery.

Discussion

In our institute, we have seen that 292 pregnant women delivered and out of which 16 had COVID-19 positive neonates that is the transmission rate is 5.48%. Fenizia et al found that the vertical transmission rate was 6.4% for COVID-19 disease [6]. However, the other studies like M Karimi Zarchi et al[7] and Yang et al [8] could not find evidence of vertical transmission. This could be due to smaller population studied in the previous studies.

The incidence of preterm births is normal population is 9.6% [9], whereas in COVID-19 cases it is seen that 24.31% delivered preterm neonates which is 2.5 times more that the general population. Psychological duress of the patient may be one of the causes of preterm births. Yang et al also found increase in preterm births [8].

The incidence of caesarean section, spontaneous vaginal delivery and assisted vaginal delivery in our institute is 48.9%, 46.72% and 4.38% respectively. However, in COVID-19 positive patients 66% were delivered by LSCS, 30% underwent spontaneous vaginal delivery and 4% had assisted vaginal delivery. The high incidence of caesarean section is due to the fact that initially we didn't have enough facility to monitor the antenatal cases and we were afraid of the respiratory complications of the mother, hence we terminated before the patients went to labour. Yang et al [8] also found high rate of caesarean section in COVID-19 positive patients.

Most of the COVID-19 positive mothers (63%) delivered babies with normal weight. This is so because peak in the cases occurred in our institute during August and September and most probably the virus couldn't affect the baby at genetic level.

In general, the most common blood group is O positive (incidence 37.12%) and the incidence of "A" positive is 22.88%. However, in COVID-19 affected antenatal cases 44.86% had "A" positive blood group compared to 34.93% percent of "O" positive people. This means that the "A" positive people are at high risk of infection.

In our study, we found that the p-value for positivity of infant is 0.422 (> 0.05) and hence there is no association between COVID-19 positive status of infant and the mode of delivery.

Conclusion

In our study, we have seen that there is higher incidence of caesarean section in COVID-19 positive patients and there is no association between mode of delivery and positivity of the infant.

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Conflict of interest: None. **Disclaimer:** Nil.