ORIGINAL ARTICLE

Comparison of Obstetric Outcomes in First and Second COVID-19 Waves: Analysis from a COVID-19-dedicated Tertiary Care Hospital

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Abstract

Introduction: The physiological changes in the respiratory and cardiovascular systems in the immunosuppressed state of pregnancy may exacerbate clinical features and deteriorate outcomes due to COVID-19 infection. We aimed to compare the maternal and neonatal adverse effects in the first and second COVID-19 waves.

Methodology: This study was a prospective cohort study conducted in a tertiary care COVID-19-dedicated hospital. In total, 104 (group A) and 96 (group B) COVID-19-positive pregnant women admitted during the first and second waves, respectively, were included in the study. Data on baseline variables, associated comorbidities, clinical presentations, management strategies, and neonatal and maternal outcomes were collected and compared using parametric and nonparametric tests and analyzed.

Results: Around 2.08% in group A and 6.72% in group B of COVID-19-infected pregnant women, respectively, had moderate-to-severe disease and required intensive care unit stay. Almost 1.04% in group A and 3.84% in group B had maternal mortality, 13.4% and 19.8% babies of groups A and B required admission in neonatal intensive care units, and 8.6% and 7.3% of newborns in groups A and B had COVID-19-positive reports by reverse transcriptase polymerase chain reaction (RT-PCR) at birth, respectively. Of them, 2.1% newborns in group B had RT-PCR positive on day 7 of life and beyond, whereas none had positive RT-PCR reports on 7 days and beyond in group A.

Conclusion: Dreadful maternal outcomes like requirement of ICU and mechanical ventilator and persistence of neonatal infections were higher during the second wave.

Keywords: COVID-19, First wave, Obstetric outcome, Second wave.

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Introduction

After a rapid increase in cases of severe acute respiratory distress syndrome coronavirus 2 (SARS-CoV-2) worldwide, the World Health Organization (WHO) declared COVID-19 infection as a pandemic.[1,2] Various studies done so far implied that people of all age groups are at risk of the infection, and the severity is linked with age and comorbidities.[3] Individuals with coexisting other medical disorders or with side effects from treatments, including chemotherapy, immunosuppressive agents, surgeries, etc., have a suppressed immune status and are more vulnerable to COVID-19 infection. Pregnancy is an immunosuppressed state due to suppressed T-cell activity.[4] In addition to the immunosuppressed state, the physiological changes occurring during pregnancy in the respiratory system and cardiovascular systems may result in worsening of clinical features and outcomes due to COVID-19 infection.[5]

During the H1N1 influenza pandemic of 2009, severe pneumonia and acute respiratory distress syndrome leading to need for mechanical ventilation and death were observed more in pregnant women compared with age-matched controls.[6] Severe respiratory distress and mortality were also reported to be higher in the SARS and Middle East respiratory distress syndrome (MERS) epidemics.[7] SARS-CoV-2 infection is associated with increased maternal and neonatal adverse effects.[8] It has been reported that the severity of the disease and the rate of miscarriage were more in the second COVID wave when compared with the first COVID wave.[9] This study aimed to compare the maternal and neonatal adverse effects between the first and second COVID waves.

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Methodology

A prospective cohort study was carried out at a tertiary care COVID-19-dedicated hospital. Institutional Ethics Committee approval was obtained from Employees' State Insurance Corporation (ESIC) Medical College and Hospital Faridabad prior to the commencement of the study (134/A/11/16/Academics/

Table 1: Demographic profile of the study population

Sl. no.	*Parameters*	*First wave (n = 104)*	*Second wave (n = 96)*	*p-value*
1.	Age (years)	24.6 ± 3.5	24.2 ± 2.9	0.383
2.	Parity	2.1 ± 0.9	1.9 ± 0.7	0.083
3.	Gestational age (weeks)	38.2 ± 2.7	37.9 ± 3.5	0.496
4.	Education			0.138
	Upto 5th standard	38 (36.5%)	30 (31.3%)	
	6th–12th standard	55 (52.9%)	52 (54.2%)	
	Graduate and above	11 (10.6%)	14 (14.5%)	
5.	Socio-economic status			0.078
	Lower	8 (7.7%)	11 (11.5%)	
	Upper–lower	27 (25.9%)	36 (37.5%)	
	Lower-middle	48 (46.2%)	34 (35.4%)	
	Upper-middle	19 (18.3%)	15 (15.6%)	
	Upper	2 (1.9%)	0 (0.0%)	

Table 2: Obstetric outcome of the study population

Sl. no.	*Parameters*	*First wave (n = 104)*	*Second wave (n = 96)*	*p-value*
1.	Comorbidity			0.172
	Absent	77 (74.1%)	63 (65.6%)	
	Present (hypertension, diabetes, anemia, hypothyroidism)	27 (25.9%)	33 (34.4%)	
2.	Moderate-to-severe COVID-19 disease	2	7	<0.0001
3.	Number of women requiring ICU stay	2	7	<0.0001
4.	Average duration of ICU stay (days)	7.2 ± 1.9	14.6 ± 4.5	<0.0001
5.	Number of women requiring mechanical ventilation	1	7	<0.0001
6.	Mortality	1	4	<0.0001

COVID-19, coronavirus-19; ICU, intensive care unit

MC/2016/152). All COVID-19 infection-confirmed pregnant women by reverse transcription-polymerase chain reaction (RT-PCR) being admitted in the labor wards and obstetric emergencies from May 2020 to August 2021 were recruited. About 104 women with positive RT-PCR reports were admitted between May 2020 and February 2021 (first wave), and 96 women with positive RT-PCR were admitted between March 2021 and August 2021 (second wave). The pregnant women admitted during the first and second waves were categorized into groups A and B, respectively. Data collected from the in-patient records included their age, parity, socioeconomic status, and gestational age at the time of presentation. Data regarding the maternal co-morbidities, severity of the disease, requirement of intensive care units (ICU) and mechanical ventilation, duration of ICU stay, and the number of maternal mortality were collected. Data regarding the newborn birth weight, requirement of neonatal intensive care unit (NICU) admissions and mechanical ventilation, duration of NICU stay, newborn with respiratory distress syndrome, and RT-PCR positivity at birth and on the seventh day of life and beyond were collected. COVID-19 test was conducted by RT-PCR just after birth and at the seventh day of life for all neonates born to confirmed COVID-19-infected mothers at the time of delivery. Babies were subjected to repeat RT-PCR tests at the fourteenth day if the report of the seventh day was positive for SARS-CoV-2 virus. Microsoft Excel datasheet was used for all data entries. Continuous variables were analyzed for normality. Baseline comparison between groups was done using parametric and nonparametric tests based on the distribution of variables. Biennial outcomes were compared and analyzed.

Results

The mean ages of the pregnant women in groups A and B were 24.6 ± 3.5 and 24.2 ± 2.9 years, respectively (Table 1). The gestational ages at the time of presentation in groups A and B were 38.2 ± 2.7 and 37.9 ± 3.5 weeks, respectively (Table 1). Almost 52.9% and 54.2% of groups A and B were educated between the sixth and twelfth classes (Table 1). Only 10.6% and 14.5% of women in groups A and B were graduates and above (Table 1). Around 46.2% of mothers in group A belonged to lower–middle and 37.5% of group B belonged to upper–lower socioeconomic status (Table 1). Around 74.1% and 65.6% of groups A and B had no other comorbidities and 2.08% and 6.72% of groups A and B had moderate-to-severe disease and required ICU admission (Table 2). Significant statistical differences in the severity of disease (p-value < 0.0001) and ICU requirement (p-value < 0.0001) were found between the two groups (Table 2). Disease severity and ICU requirement were more in group B than group A (Table 2). Average duration of ICU stay was 7.2 ± 1.9 and 14.6 ± 4.5 days in groups A and B, respectively (Table 2), and this difference was statistically significant (p-value < 0.0001) (Table 2). More number of pregnant women required ventilatory support during the second COVID-19 wave (p-value < 0.0001) (Table 2). As a result,

Table 3: Neonatal outcome of the study population

Sl. no.	*Parameters*	*First wave (n = 104)*	*Second wave (n = 96)*	*p-value*
1.	Birth weight (kilogram)	2.2 ± 1.5	2.0 ± 1.6	0.362
2.	Number of newborns requiring NICU stay	14 (13.4%)	19 (19.8%)	0.096
3.	Average duration of NICU stay (days)	4.9 ± 2.6	5.4 ± 2.5	0.167
4.	Newborns with respiratory distress syndrome	14 (13.4%)	15 (15.6%)	0.674
5.	Newborns requiring mechanical ventilation	14 (13.4%)	19 (19.8%)	0.096
6.	RT-PCR positive at birth	9 (8.6%)	7 (7.3%)	0.685
7.	RT-PCR positive at day 7 of life and beyond	0 (0.0%)	2 (2.1%)	0.438

NICU, neonatal intensive care unit; RT-PCR, reverse transcriptase polymerase chain reaction

maternal mortality was also higher during the second wave (*p*-value < 0.0001) (Table 2). The mean birth weights of newborns in groups A and B were 2.2 ± 1.5 and 2.0 ± 1.6 kg, respectively (*p*-value 0.362) (Table 3). About 13.4% and 19.8% of babies born to mothers in groups A and B, respectively, required admission in the NICU (*p*-value 0.096) (Table 2). The average duration of NICU stay was 4.9 ± 2.6 and 5.4 ± 2.5 days in groups A and B, respectively (*p*-value 0.167) (Table 2). Around 13.4% and 15.6% newborns of groups A and B had respiratory distress syndrome (*p*-value 0.674), while 13.4% and 19.8% required mechanical ventilation in groups A and B, respectively (*p*-value 0.096) (Table 2). While 8.6% and 7.3% of newborns in groups A and B had RT-PCR positive at birth (*p*-value 0.685), 2.1% of newborns in group B had RT-PCR positivity on day 7 of life and beyond. No neonate in group A had positive RT-PCR report on day 7 and beyond (*p*-value 0.438) (Table 2).

Discussion

SARS-CoV-2 had affected a huge population irrespective of age. In India, there were lesser number of COVID-positive patients/million people in the first wave, whereas in the second wave, the number of cases increased enormously to almost 400,000 cases/day.[10] It was reported that in the first wave, almost 65.15% of the confirmed cases were symptom-free, 34.09% had the milder form of the disease and only 1.32% had severe disease requiring intensive care management.[11] Dave et al. reported that 84.04% of pregnant women were asymptomatic in the first wave and only 27.18% of pregnant women were asymptomatic in the second wave.[12] There were different mutant variants with more effective transmission identified across different places of India.[13] Majority of the population in both groups A and B did not have any comorbidities. The common comorbidities noticed in the study population were hypertension, anemia, hypothyroidism, and diabetes. No significant difference was noted between groups A and B. Similar findings regarding the comorbidities were noticed by Mahajan et al.[14] There were more women with moderate-to-severe COVID-19 infection in group B than in group A. The requirement of mechanical ventilation was also higher in group B compared with group A. This is similar to the study by Chaudhary et al. in which the requirement of mechanical ventilation was more in the second wave than the first wave. The mortality rate was also higher in the second wave than the first wave.[15] In our study, four among 96 pregnant COVID-positive women succumbed in the second wave and one among the 104 pregnant COVID-positive women died during the first wave. Data from the western country also reported that the severity of the illness was more in the second wave than in the first wave.[16]

The average birth weight was 2.2 ± 1.5 and 2.0 ± 1.6 kg in groups A and B, respectively. The available literature does not report any relation between COVID infection and low birth weight.[17] Newborns admitted to the NICU and required mechanical ventilation were slightly higher in group B (19.8%) than in group A (13.4%) though there was no statistical difference. Studies reported the vertical transmission to the fetus in minority of the cases in the third trimester.[18] Hosier et al. reported the placental invasion of SARS-CoV-2.[19] Chaudhary et al. reported two newborns and three newborns tested positive in the first and second wave, respectively.[14] Parpillewar et al. reported that four newborns were tested positive, who were not separated from their mother after delivery, and none were tested positive who were separated after delivery from their mother.[20] In our study, 9 and 7 newborns were tested positive in the first and second wave, respectively. We tested for positivity on day 7 of life, two babies in group B were tested positive, and none were tested positive in group A.

The major limitations of the study being it to be a single-center study and that the study population only comprised the women in the third trimester of pregnancy. It was not a randomized trial and no comparison was one with normal control population admitted for delivery during the time period. Since first-trimester data are not available, so possible teratogenecity related to SARS-CoV-2 infection and the related drugs could not be assessed.

Conclusion

This study indicates that the severity of the disease was more in the second COVID-19 wave compared with the first. Dreadful maternal outcomes like requirement of ICU and mechanical ventilator were higher during the second wave. In terms of neonatal outcomes, neonatal infection and the need for NICU were higher in the second wave. Though our cohort was small, still it could add useful information to the existing knowledge about the obstetric outcomes in COVID-19-infected pregnancies.

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