

# Evaluation of the effect of COVID-19 infection in pregnancy and puerperium in a suburban medical college in West Bengal, India

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## ABSTRACT

**Background:** The pandemic of SARS-CoV-2 was a novel situation, there was no conclusive knowledge, particularly concerning its effect on pregnant women and infants. Eminent obstetric organizations have introduced an array of guidelines to assist clinicians in countering this prior unknown outbreak. The primary objective of this study was to summarize the clinical characteristics, complications, and maternal and neonatal outcomes of COVID-19 during pregnancy and puerperium. **Methods:** This was a cross-sectional observational study conducted in the Outpatient/Emergency/Inpatient or COVID ward in the Department of Obstetrics and Gynaecology, of a tertiary hospital in Nadia district, West Bengal, India, from 1.7.2020 to 30.6.2021 including 104 pregnant or puerperal mothers with laboratory-confirmed, i.e., RT-PCR or Rapid Antigen Test positive reports after informed consent. The obstetric outcome, modes of delivery, and neonatal status including any complications or SNCU admission within six weeks postpartum were recorded. **Results:** The majority were in the  $\geq 20$ -24 years age group, primigravida, residents of Nadia with no significant travel or contact history. 73.08% were affected in the third trimester and the comorbidities detected were chiefly anemia (15.38%), hypertensive or chronic liver diseases, and hypothyroidism. 45.19% of the mothers were asymptomatic while the other complaints were fever (18.27%), cough (11.55%), anosmia and/or ageusia (10.58%), sore throat (9.61%), respiratory distress, loose stools, and chest pain. The medical complications were predominantly low SpO<sub>2</sub>, convulsions, pneumonitis, and two maternal deaths. The obstetric complications were preterm birth (26.9%), pre-eclampsia/eclampsia (17.3%), antepartum (3.9%) and postpartum hemorrhage (4.4%), and sepsis (5.8%). Fourteen mothers had first-trimester termination, 63 had vaginal deliveries, and the rest had cesarean section. Out of 90 neonates, most were in the range of  $\geq 2$ -2.5 kg birth weight and normal 1-min APGAR score. None tested positive for COVID-19 RTPCR and no detectable congenital anomaly or neonatal death was recorded.

**Keywords:** COVID-19, maternal features, neonatal outcome, pregnancy, puerperium

## Introduction

A unique coronavirus, named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), had spread through human-to-human transmission emerging in China<sup>[1]</sup> and the

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World Health Organization initially declared the outbreak of the Coronavirus 2019 (COVID-19) as a Public Health Emergency of International Concern (PHEIC), and on March 11, 2020, they upgraded it to the level of a pandemic.<sup>[2]</sup> Since it was a novel situation, there was no conclusive knowledge about COVID-19, particularly concerning its effect on pregnant women and infants, apart from limited specific evidence-based information regarding the evaluation or management of COVID-19 in obstetrics.<sup>[3]</sup> As stated by the available data and

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recommendations, that pregnant women seem to be subjected to similar risks as nonpregnant adults.<sup>[4]</sup> Eminent obstetric organizations have introduced an array of guidelines to assist clinicians to counter this prior unknown pandemic, incorporating those from the International Federation of Gynaecology and Obstetrics (FIGO),<sup>[5]</sup> the Royal College of Obstetricians and Gynaecologists, UK (RCOG),<sup>[6]</sup> and the American College of Obstetricians and Gynaecologists (ACOG).<sup>[3,7]</sup> Major facts available to date are from case studies, case series, and observational studies, but detailed information, knowledge, and perception are the prerequisites for healthcare providers of all strata, to implement cardinal prevention and management strategies. The primary objective of this study was to summarize the clinical characteristics, complications, and maternal and neonatal outcomes of COVID-19 during pregnancy and puerperium, thereby elucidating its overall effects in obstetrics.

## Materials and Methods

This was a cross-sectional observational study conducted in the Outpatient/Emergency/Inpatient or COVID ward in the Department of Obstetrics and Gynaecology, of a tertiary hospital in Nadia district, West Bengal, India, for one year from 1.7.2020 to 30.6.2021 including 104 patients satisfying the following criteria after informed consent:

- **Inclusion Criteria:** All pregnant or puerperal mothers with laboratory-confirmed, i.e., RT-PCR or Rapid Antigen Test positive reports for COVID-19 infection.
- **Exclusion Criteria:** 1. All COVID-19 positive mothers beyond puerperium. 2. All mothers with suspicion but RT-PCR negative for COVID-19.

The antenatal and puerperal mothers who had symptoms of COVID-19 infection like fever, acute respiratory illness, diarrhea, headache, malaise, chest pain, etc., were subjected to immediate Rapid Antigen Tests with nasopharyngeal and oropharyngeal swabs. If positive, the patient was considered to be a confirmed case. If negative, then swabs for RT-PCR for COVID-19 were sent. The mothers with a positive history of contact with a confirmed COVID patient in the previous 14 days or residence in a location reporting community spread, also underwent the same protocol. All RAT or RT-PCR positive mothers thus diagnosed or any obstetric patient attending OPD or emergency with a recent RAT or RT-PCR positive swab report were included in the study after informed consent. The infected mothers were triaged after a thorough history, clinical examination, and the basic investigations. The patients fulfilling the eligibility criteria for home isolation and not requiring admission for obstetric causes were provided with the option for home isolation after an undertaking for monitoring by the physician and obstetrician. The rest were admitted to the allotted Gynecology and Obstetric COVID-19 ward in our institution. All the patients were treated according to the Government of India and ICMR guidelines. In the case of positive puerperal mothers, neonatal nasopharyngeal or oral swabs were sent on day 1 and day 5. If the mother tested positive later in the puerperium, neonatal swabs were within

the shortest possible time. The mothers and neonates were followed up throughout admission and home isolation periods as per guidelines and after that till puerperium and any medical complications, the progression of disease was noted and managed accordingly. In cases of pregnant women, the obstetric outcome, modes of delivery, and neonatal status, i.e. birth weight, 1 min APGAR score, any complications, or SNCU admission within six weeks postpartum were recorded. The information was also collected for mothers who delivered later after discharge or were infected with puerperium. The entire data were entered in MS Excel 2013 and results were presented in the form of tables, pie charts, bar diagrams, etc. Institutional ethical clearance obtained: dated June 22, 2020.

## Results

The majority of the patients were in the  $\geq 20$ –24 years age group (40, i.e., 38.46%) followed by  $\geq 25$ –30 years (38, i.e., 36.54%) and the least in  $> 35$  years [Figure 1]. Sixty-two (59.61%) mothers were primigravida, four (3.85%) postnatal, and the rest multigravida [Figure 2]. Most were residents of the districts of Nadia (54 or 51.92%) and North 24 Parganas (46 or 44.24%) [Figure 3]. Table 1 shows that the number of patients with positive travel and contact histories was 2 (1.92%) each and 76 (73.08%) were affected in the third trimester, 14 (13.46%) in the second, and 10 (9.61%) in the first trimester, respectively. The associated comorbidities were chiefly anemia (16 or 15.38%), hypertensive disorders (14 or 13.46%), chronic liver diseases (4 or 3.85%), and hypothyroidism (4 or 3.85%) [Table 1].

Most of the mothers were asymptomatic on detection (47 or 45.19%), while the chief complaints noted were fever (19 or 18.27%), cough (12 or 11.55%), anosmia and/or ageusia (11 or 10.58%), sore throat (10 or 9.61%), respiratory distress (2 or 1.92%), loose stools (2 or 1.92%) and chest pain (1 or 0.96%) [Figure 4]. The medical complications were a few like predominantly low SpO<sub>2</sub> (10 or 9.61%), convulsions (2 or 1.92%), and pneumonitis (2 or 1.92%) including two unfortunate

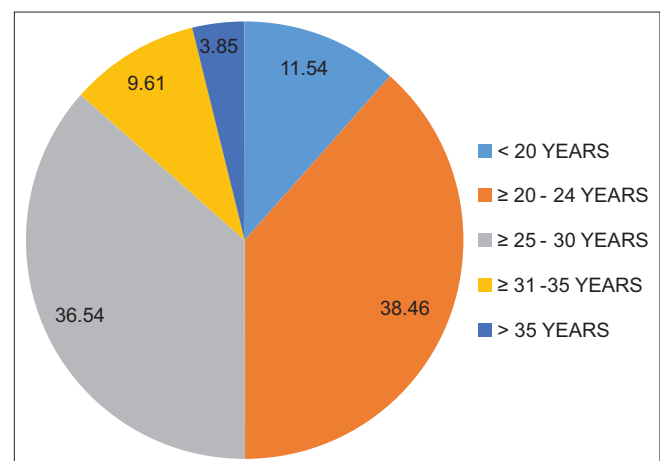


Figure 1: Distribution of patients according to Age

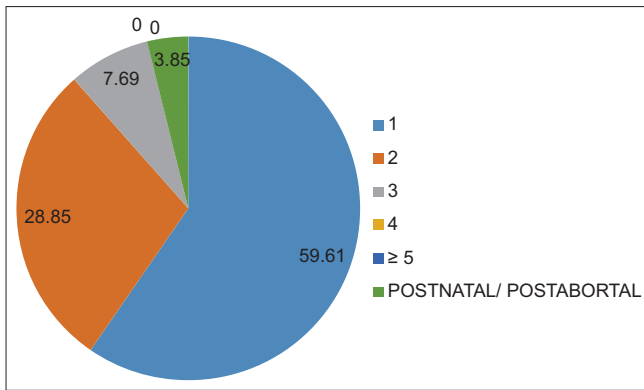


Figure 2: Distribution of patients according to Gravid status

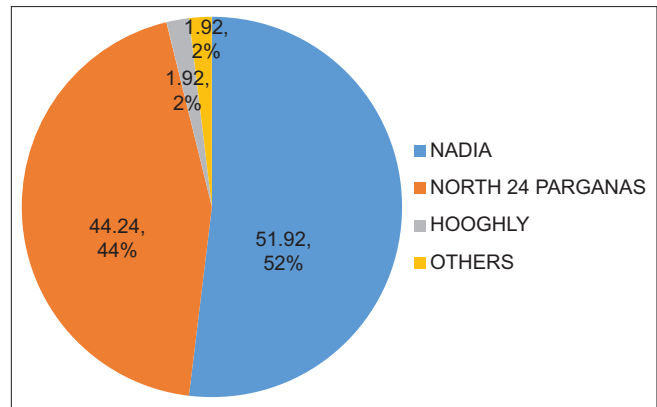


Figure 3: Distribution of patients according to District of residence

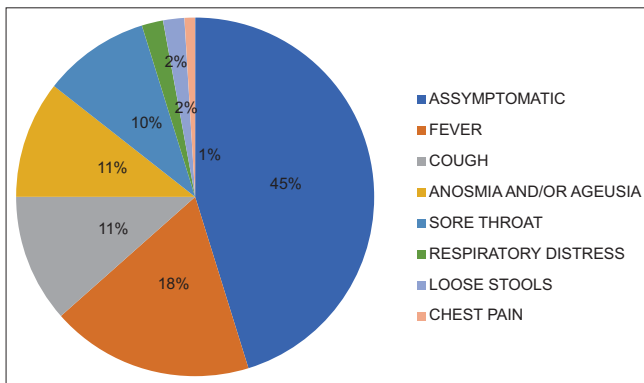


Figure 4: Distribution of patients according to Chief symptom

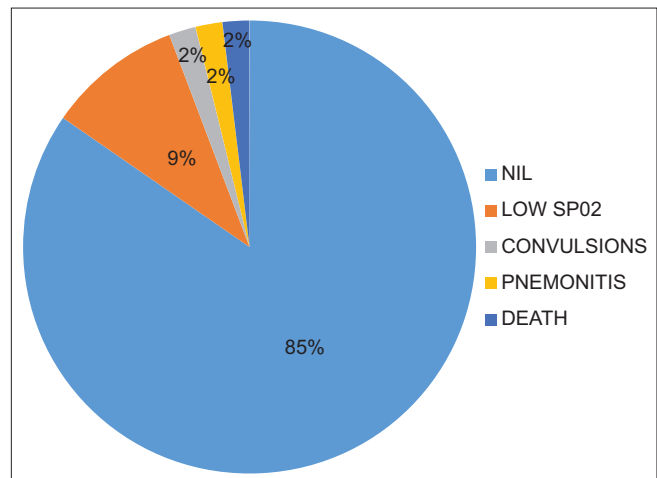


Figure 5: Distribution of patients according to Maternal Medical complications

Table 1: Distribution according to pregnancy period at COVID affection, travel and contact history, and comorbidities

	Number of patients
Period of affection	
Antenatal	
First trimester	10 (9.61%)
Second trimester	14 (13.46%)
Third trimester	76 (73.08%)
Postabortal/puerperium	4 (3.85%)
Travel history	
Present	2 (1.92%)
Absent	102 (98.18%)
Contact history	
Present	2 (1.92%)
Absent	102 (98.18%)
Comorbidities	
Nil	66 (63.46%)
Anemia	16 (15.38%)
Hypertensive disorders	14 (13.46%)
Chronic liver disorders	4 (3.85%)
Hypothyroidism	4 (3.85%)

maternal deaths in COVID- ICU [Figure 5]. There were associated comorbidities in both maternal deaths, pre-existing nonalcoholic fatty liver disease in one and essential hypertension in the other. The investigations [Figure 6] revealed deranged complete blood count in 26 (25%), liver profile in 12 (11.54%),

renal profile in 8 (7.69%), coagulopathy in 10 (9.61%), and elevated CRP in (13.46%). CT scan thorax was performed with informed consent and abdominal shield for each of the 10 patients with low SpO2 out of which 4 exhibited ground glass opacities and 2 consolidation with pleural effusion.

Fourteen (13.46%) patients had a termination of pregnancy in the first trimester of which 10 (9.61%) underwent dilatation and evacuation for incomplete abortion and 4 (3.85%) laparotomy for ectopic pregnancy [Table 2]. The obstetric complications observed were preterm birth (28 or 26.9%), pre-eclampsia/eclampsia (18 or 17.3%), antepartum (4 or 3.9%), and postpartum hemorrhage (15 or 14.4%) and sepsis (6 or 5.8%) [Figure 7]. For the mode of delivery, 25 (24.04%) were preterm vaginal, 34 (32.69%) term vaginal, and 4 (3.85%) term assisted delivery, respectively [Table 2]. Among those who underwent cesarean section, 3 (2.88%) were preterm, 22 (21.16%) were term, and 2 (1.92%) postmortem sections were performed.

Ninety neonates delivered, with birth weight < 2 kg for 10 (11.11%), ≥ 2–2.5 kg for 30 (33.33%), >2.5–3 kg for 28 (31.11%), >3–3.5 kg for 18 (20%), and > 3.5 kg for 4 (4.45%), respectively. Seventy-five (83.33%) newborns had 1-min APGAR

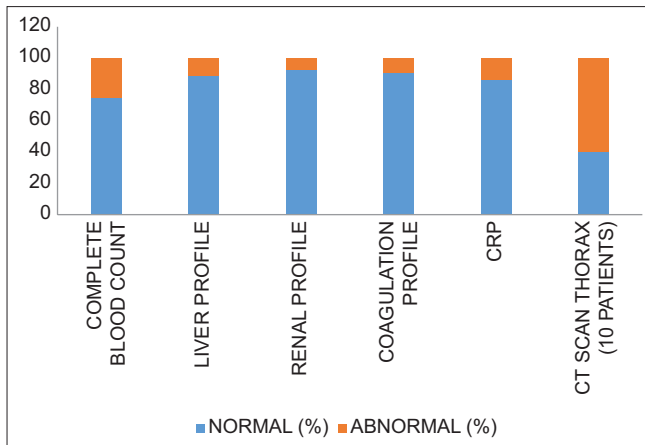


Figure 6: Distribution of patients according to Maternal investigations

scores ranging from 7 to 10, 13 (14.45%) in the 4–6 range, and there were two stillborns delivered from postmortem cesarean section. There were no RTPCR-positive babies, congenital anomalies in neonates, or neonatal deaths. Only six (6.67%) neonates had SNCU admission, out of which four (4.44%) had respiratory distress and two (2.22%) had pathological jaundice [Table 3].

### Discussion

It is conventionally accepted that pregnant mothers are susceptible to higher morbidity and mortality from diverse respiratory infections like H1N1 and varicella pneumonia.<sup>[7]</sup> Concerning COVID-19, the limited data available to date do not suggest that pregnancy increases the risk of infection or severe illness when compared with the general population.

In the combined report from the eight consecutive case series, considering 211 (71.5%) cases of RTPCR-confirmed and 84 (28.5%) clinically detected COVID-19, the maternal age varied from 20 to 44 years, and the gestational age on admission from 5 to 41 weeks.<sup>[8]</sup> One observation exhibited the mean age of diagnosis as 30 years (26–32) with 26 deliveries below 16 years, and the median attack rate in the first trimester was 0% (0–2.9%), 1.2% (0–6.3%) in the second, and 2.5% (0.3–7.8%) in the third trimester, respectively.<sup>[9]</sup> As per Prabhu M *et al.*,<sup>[10]</sup> the mean age in years was 30.5 (26.1–36.8) for symptomatic and 31.4 (26.6–37.2) for asymptomatic mothers and the mean gravidity was 2.0 (2.0–5.0). The mean (SD) age and gestational week of affection were 30.3 (1.5) years and 35.9 (2.9) weeks, respectively, in another research.<sup>[11]</sup> About risk factors and comorbidities, age and obesity (defined as body mass index (BMI) >30) have been suggested as risk factors for developing severe forms of the disease.<sup>[12]</sup> Several researchers have mentioned increased maternal age, elevated BMI, chronic hypertension, and pre-existing diabetes to be associated with severe COVID-19 in pregnant women.<sup>[13]</sup> Additionally, a prospective survey of 23 pregnant infected women revealed that 48% of infected women had pre-existing comorbidities, among which morbid obesity and diabetes

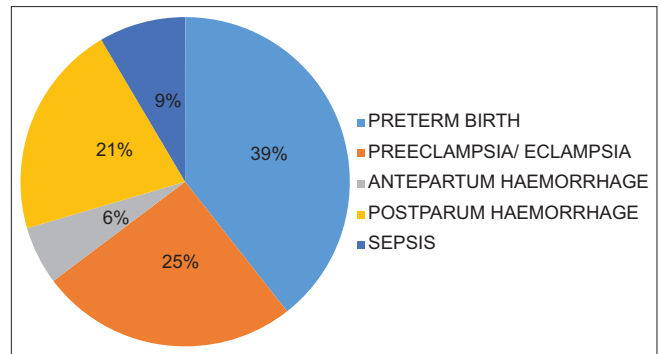


Figure 7: Distribution of patients according to Maternal Obstetric complications

Table 2: Distribution according to gestational age and mode of termination

Gestational age	Number of patients
First trimester	14 (13.46%)
Second trimester	4 (3.85%)
Third trimester	
Preterm	24 (23.08%)
Term	62 (59.61%)
Mode of termination	
Dilatation and evacuation	10 (9.61%)
Laparotomy for ectopic pregnancy	4 (3.85%)
Preterm vaginal delivery	25 (24.04%)
Preterm cesarean section	3 (2.88%)
Term vaginal delivery	
Normal	34 (32.69%)
Assisted	4 (3.85%)
Term cesarean section	22 (21.16%)
Postmortem cesarean section	2 (1.92%)

were significant.<sup>[14]</sup> Another review exhibits that comorbidities like diabetes enhance the threat of severe COVID-19.<sup>[15]</sup> According to our findings, the maximum patients were in the ≥ 20–24 years age group, primigravida, and affected in the third trimester. The comorbidities were few, mostly anemia, hypertensive and liver disorders, hypothyroidism but no obesity or pre-existing Diabetes Mellitus were detected.

Most reports stated women appearing in the third trimester with fever (68%) and cough (34%) with lymphocytopenia (59%) and elevated C-reactive protein (70%).<sup>[11,16]</sup> Pregnant women with COVID-19 are mostly asymptomatic and the symptoms, if developed, are usually mild, commonly cough (41%), fever (40%), dyspnea (21%), and myalgia (19%).<sup>[13]</sup> These findings were similar to the chief presenting features of our study. We found deranged blood parameters in lesser numbers, whereas WHO presents the common laboratory findings of lymphopenia (33%), raised white cell count (28%), and raised C reactive protein levels (51%).<sup>[17]</sup> Chest radiography and CTPA changes in pregnancy with COVID-19 corresponded to those in the nonpregnant population, usually showing bilateral consolidation, and occasionally associated with pneumothoraxes in one article.<sup>[18]</sup> At the same time, we detected mainly ground-glass opacities

**Table 3: Distribution according to birth weight, 1-min APGAR score, and neonatal complications**

	Number of neonates
Birth weight	
<2 KG	10 (11.11%)
≥2–2.5 KG	30 (33.33%)
>2.5–3 KG	28 (31.11%)
>3–3.5 KG	18 (20%)
>3.5 KG	4 (4.45%)
1 min apgar score	
7–10	75 (83.33%)
4–6	13 (14.45%)
0–3	2 (2.22%) [stillborn from postmortem CS]
Neonatal complications	
COVID-19 rtPCR positive	0 (0%)
Congenital anomalies	0 (0%)
Stillbirth	2 (2.22%)
Respiratory distress	4 (4.44%)
Pathological jaundice	2 (2.22%)
SNCU admission	6 (6.67%)
Neonatal death	0

and consolidation. Though the medical complications in our survey were infrequent, reports validate that COVID-19 in pregnancy moderately increases the chances of severe infection, intensive care unit (ICU) admission, and the need for mechanical ventilation.<sup>[19-21]</sup>

In one study, only four spontaneous miscarriages or terminations were reported out of 295 cases. The gestational age at delivery ranged from 28 to 41 weeks and 78% of mothers underwent cesarean section.<sup>[8]</sup> According to Zahrani *et al.*, 46.3% of the infected women had a spontaneous normal vaginal delivery and 50.2% cesarean birth. The observed adverse pregnancy outcomes were premature delivery (36.5%), fetal distress (20.7%), preeclampsia (2.4%), eclampsia (1.2%), and three maternal deaths.<sup>[22]</sup> In another analysis of 50 deliveries of COVID-infected mothers, there were a 94% cesarean rate and 35% preterm birth.<sup>[23]</sup> Our assessment revealed 9.61% miscarriage, 26.9% preterm delivery, 17.3% pre-eclampsia/eclampsia, 21.16% cesarean rate, and two maternal deaths. A review of contemporary literature reveals that pregnancies with SARS-CoV-2 infection are at risk of pre-eclampsia, premature birth, and NICU admissions and the severity of obstetric morbidity and mortality usually corresponds with that of COVID-19.<sup>[15]</sup>

Regarding neonatal outcome, Wilkinson<sup>[9]</sup> found no significant increase in stillbirth (OR 0.78, 95% CI 0.51–1.20,  $P = 0.26$ ) or neonatal death (OR 0.89, 95% CI 0.54–1.47,  $P = 0.64$ ) in the COVID era. The mean birth weight was 3,284 g  $\pm$  577 g, which was equivalent to the mean birth weight z-score of  $-0.46 \pm 1.10$  as compared to the WHO fetal growth charts.<sup>[24]</sup> In one review, the mean birth weight was 3212 gms and the mean 1- and 5-min APGAR scores were 8 and 8.8, respectively. Twenty out of 23 neonates were tested for SARS-CoV-2 and all were reported to be negative.<sup>[25]</sup> As per Capobianco and colleagues, the percentage of

COVID-19-positive neonates was 6.0% (95% CI 2.0–12.0%) and the commonly observed neonatal complications were pneumonia and respiratory distress syndrome.<sup>[11]</sup> One study noted higher rates of cesarean sections and small for gestational age among COVID-19 pregnancies (71.1% vs. 43.4%,  $P < 0.001$  and 24.6% vs. 11.8%,  $P = 0.003$ ; respectively) and significantly lower mean birth weight ( $3.0 \pm 0.6$  vs.  $3.3 \pm 0.6$  kg,  $P = 0.022$ ), compared to the noninfected.<sup>[26]</sup> The majority of the babies in our study were in the range of  $\geq 2$ –2.5 kg birth weight and normal 1-min APGAR score. None tested positive for COVID-19 RTPCR nor any detectable congenital anomaly or neonatal death were recorded. Only a few neonates suffered from respiratory distress and pathological jaundice requiring SNCU admission.

## Limitations

1. The number of patients and study period were limited. A larger and extended study was preferable for better evaluation.
2. This was a preliminary observational study; a prospective cohort study was required to deduce inferences.
3. The study was limited to only those obstetric patients who were confirmed but not those who were suspected of COVID-19, i.e., with COVID-like disease with RT-PCR negative result.
4. Neonatal outcome was also dependent on the available quality of neonatal care, especially due to the nonavailability of NICU in this institution. So actual correlation might differ when studied in a different setting.
5. The patients were followed up only up to six weeks postpartum.

## Conclusion

The virus and disease both are novel and their effects on obstetric patients and neonates are still under evaluation. This study was an attempt to assess these parameters in a limited-resource suburban setting. A detailed evaluation of the outcome of the infection in obstetrics is a prerequisite to avert its adverse consequences and dreaded complications.

## Abbreviations

RT-PCR = Real-Time Reverse transcription–Polymerase Chain Reaction.

RAT = Rapid Antigen Test.

SARS-CoV-2 = Severe Acute Respiratory Syndrome Coronavirus 2.

FIGO = International Federation of Gynaecology and Obstetrics.

RCOG = Royal College of Obstetricians and Gynaecologists.

ACOG = American College of Obstetricians and Gynaecologists.

CDC = Centers for Disease Control and Prevention.

ICMR = Indian Council of Medical Research.

BMI = Body Mass Index.

CRP = C-Reactive Protein.

CT = Computerized Tomography.

ICU = Intensive Care Unit.

SNCU = Special Newborn Care Unit.

OR = Odds Ratio.

CI = Confidence Interval.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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