



# Impact of the Coronavirus Infection in Pregnancy: A Preliminary Study of 141 Patients

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## Abstract

**Background** The novel coronavirus disease (COVID-19) is the most challenging health crisis that we are facing today. Against the backdrop of this pandemic, it becomes imperative to study the effects of this infection on pregnancy and its outcome. Hence, the present study was undertaken to evaluate the effects of COVID-19 infection on the maternal morbidity and mortality, the course of labour as well as the neonatal outcome.

**Materials and Methods** A total of 977 pregnant women were included in the study, from 1st April to 15th May 2020 at a tertiary care hospital. There were 141 women who tested COVID positive and remaining 836 patients were included in the COVID negative group. Findings were compared in both the groups.

**Results** The incidence of COVID positive pregnant women was found to be 14.43%. More patients delivered by LSCS in the COVID positive and the COVID negative group (50%) as compared to COVID negative group (47%), ( $p > 0.05$ ). Low APGAR score (0-3) was observed in 2(1.52%) neonates of COVID positive mothers and in 15 (1.91%) neonates of COVID negative mothers. Overall most of the babies were healthy. Out of all babies tested, 3 were detected positive initially which were retested on day 5 and were found to be negative.

**Conclusion** There is no significant effect of COVID infection on maternal and foetal outcome in pregnancy and there is no evidence of vertical transmission of the COVID-19 infection but long-term follow-up of these babies is recommended.

**Keywords** COVID-19 · Pandemic · Pregnancy · Mortality · Morbidity · APGAR · Neonate

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## Introduction

The novel coronavirus infection (COVID-19) is a global public health emergency. The first case of coronavirus infection was identified in Wuhan, Hubei province of China and was notified to the WHO on 31st December 2019. By 30th of January 2020, the coronavirus disease was declared as a Public Health Emergency of International Concern (PHEIC) [1]. It did not take long for the COVID-19 to establish its roots in India as the first case was confirmed on 30th January [2]. As of 16th May 2020, the total number of cases in India was 85,940 with 2753 deaths reported by the Ministry of Health and Family Welfare [3].

The mode of transmission is by droplets which can occur when the patient sneezes or coughs. The incubation period varies from 2 days to 2 weeks following exposure to the virus [4]. An analysis of 181 confirmed COVID-19 cases outside Wuhan, China, found the mean incubation period to be 5.1 days and that 97.5% of the individuals who developed

symptoms did so within 11.5 days of infection [5]. The period from the onset of COVID-19 symptoms to death ranged from 6 to 41 days with a median of 14 days with a case fatality rate of 2.3% [6, 7]. The patient can present with an array of symptoms, most commonly presenting with complaints of cold, cough, fever, malaise, headache, itching or watering in the eyes [8]. However, patients may also present with gradual worsening of respiratory discomfort or multiorgan failure. The diagnosis of current infection relies on tests to detect the presence of virus in various body fluids. The standard test being done presently is detection of the viral RNA by RT-PCR (Reverse Transcriptase Polymerase Chain Reaction) from the nasopharyngeal mucosa as recommended by the ICMR (Indian Council of Medical Research). Antibody tests on blood are used to confirm past infection and presumed immunity to repeat infection, although effectiveness of such tests is not yet known [9].

Coronavirus disease has thrown the entire medical fraternity into a world of uncertainty and clinical dilemma in the absence of preexisting guidelines or protocols. In the backdrop of this pandemic, it thus becomes imperative to study the effects of the infection on pregnancy. This is probably the first study in India to assess the effects of COVID-19 infection on the maternal morbidity and mortality as well as the effects on newborn in the 141 pregnant women diagnosed with COVID infection in the early phase of the pandemic.

## Materials and Methods

This is a retrospective observational analytical study done in the Department of Obstetrics and Gynaecology at Tertiary Care Hospital attached to a Medical College, located in Central Mumbai, draining patients from the entire Mumbai Metropolitan region and referrals from far away places like Raigad, Ratnagiri districts too. The hospital is located near a red zone of COVID infection and conducts deliveries of approximately 10,000 patients every year. The Institutional Ethics Committee (IEC) approval was taken for the study.

A total of 977 patients were included in the study, who were in labour or who had an abortion or an ectopic pregnancy, from 1st April to 15th May 2020. Out of which 141 women tested COVID positive and 836 women were COVID negative. Aims and Objectives of the Study were to assess the maternal morbidity and mortality due to covid-19 infection in the pregnant patients and to assess the effects of covid-19 infection on the newborn along with assessment of association of comorbidities with worsening of outcome in pregnant woman.

Details about the patients like age, parity, gestational age, address, history of contact, any comorbid conditions, mode of delivery/outcome, baby details, APGAR score and treatment given were noted. The testing of all the pregnant

women who came to the labour room was done as per the Municipal Corporation of Greater Mumbai (MCGM) guidelines AMC/WS/5970/OD/VIP issued in April 2020, in which testing was advised to all pregnant patients and ICMR guidelines which stated that pregnant women residing in containment zones or from hotspot district presenting in labour or likely to deliver in next 5 days should be tested even if asymptomatic. Most of our patients were from containment zones or hotspot areas of the city. The swabs were collected after wearing complete PPE (Personal protective equipment) and were transferred in a VTM (viral transport medium) and sent to the microbiology department for testing. All the patients were advised to wear a mask and all the health care workers were using complete PPE during their shifts in the labour ward. To reduce the risk of transmission, we carried out several measures including creating awareness about hand hygiene and usage of masks in all patients, maintaining a distance between beds and a strict and correct use of personal protective equipment (PPE) among the health care workers. Separate rooms for donning and doffing were assigned in the labour ward complex. Cleaning and disinfection of the labour room and labour OT was done on regular and frequent intervals.

For COVID positive patients, chest X-ray was done and they were started on oral or parenteral antibiotics along with tablet Hydroxychloroquine (HCQ) treatment in the dose of 400 mg BID on first day and later 200 mg BID for 4 days. Symptomatic patients requiring oxygen or ventilatory support were managed in a separate ward in consultation with the physician. Asymptomatic positive patients were discharged or transferred to COVID care centre (CCC) on day 5. Neonatal swabs were sent within 24 h and rooming-in was recommended. Direct breastfeeding was encouraged in these patients. Mothers were instructed to wear a medical mask, when they were near their baby and perform hand hygiene before close contact with the baby.

All the maternal and neonatal parameters were analysed using descriptive statistics i.e. percentages and proportions were calculated. The Chi-square test was used to compare categorical variables in COVID positive and negative groups. *p* value of less than 0.05 was considered significant.

## Results

A total of 977 pregnant women were included in the study period of 45 days, from 1st April to 15th May 2020. Of these, there were 141 women who tested COVID positive and the remaining 836 patients were COVID negative. Thus giving the incidence of COVID infection in pregnancy as 14.43%. Among COVID positive cases, only 8 patients gave a history of contact with patients diagnosed with COVID-19 infection and 133 were community acquired cases.

**Table 1** Demographic Profile of the patients ( $n=977$ )

Parameters	COVID positive	COVID negative	<i>p</i> value
Age group (years)			
< 20	8 (5.67%)	104 (12.44%)	> 0.05
21–25	64 (45.39%)	361 (43.18%)	
26–30	57 (40.42%)	300 (35.88%)	
> 30	12 (8.51%)	71 (8.49%)	
Parity			
Primigravida	55 (39%)	291 (34.80%)	> 0.05
Multigravida	84 (59.57%)	534 (63.87%)	
Grand multipara	2 (1.41%)	11 (1.31%)	
Gestational age (in weeks)			
≥ 37	103 (73.04%)	597 (71.41%)	> 0.05
34.1–36.6	23 (16.31%)	143 (17.10%)	
< 34	15 (10.63%)	96 (11.48%)	
Total	141	836	

**Table 2** Associated Comorbidities

Parameters	COVID positive	COVID negative	<i>p</i> value
DM/GDM	4 (2.83%)	24 (2.87%)	> 0.05
HTN/PIH/Eclampsia	7 (4.96%)	45 (5.38%)	
TB/Asthma/LRTI	2 (1.41%)	11 (1.31%)	
Hypothyroidism	5 (3.54%)	17 (2.03%)	
Anaemia	5 (3.54%)	30 (3.58%)	
Thalassemia	1 (0.70%)	1 (0.11%)	
HIV/HBSAG/HCV	1 (0.70%)	13 (1.55%)	
Others	2 (1.41%)	20 (2.39%)	
Total	27 (19.14%)	161 (19.25%)	

*DM* diabetes mellitus, *GDM* gestational diabetes mellitus, *HTN* hypertension, *PIH* pregnancy induced hypertension, *TB* tuberculosis, *LRTI* lower respiratory tract infections, *HIV* human immunodeficiency virus, *HBSAG* hepatitis B, *HCV* hepatitis C

## Demographic Profile

Table 1 shows Demographic profile of the patients in COVID positive and negative group. Majority of the patients were found in the age group of 21–25 years. More number of women in our study were multigravida and had gestational age of  $\geq 37$  weeks.

## Associated Comorbidities

Table 2 shows associated comorbidities in both groups. As many as 27 (19.14%) COVID positive patients and 161 (19.25%) women in COVID negative group had comorbidities. Anaemia, pregnancy-induced hypertension and eclampsia were the most common comorbidities in both the groups.

**Table 3** Mode of delivery

Outcome	COVID positive	COVID negative	<i>p</i> value
Vaginal delivery	66 (49.25%)	415 (51.87%)	> 0.05
Instrumental	1 (0.74%)	9 (1.12%)	> 0.05
LSCS	67 (50%)	376 (47%)	> 0.05
Total	134	800	

**Table 4** Maternal complications

Complications	COVID positive	COVID negative	<i>p</i> value
Abortions	6 (4.25%)	33 (3.94%)	> 0.05
Ectopic pregnancy	1 (0.70%)	3 (0.35%)	> 0.05
APH and PPH	3 (2.12%)	17 (2.03%)	> 0.05
Maternal deaths	3 (2.12%)	8 (0.95%)	> 0.05
Total	13 (9.21%)	61 (7.29%)	

## Mode of Delivery

Table 3 shows that the number of patients who were delivered by LSCS in COVID positive group (50%) was higher as compared to COVID negative group (47%) but the difference between the two groups was not statistically significant, ( $p > 0.05$ ). Chen et al. [10] reported a study with LSCS done for all patients. In our study LSCS was done for Obstetric indications only. Out of the total 141 patients in the COVID positive group, 134 patients delivered either by LSCS/vaginal delivery/Instrumental delivery, 6 had abortions and 1 had an ectopic pregnancy. Similarly in the COVID negative group, we had 800 post-delivery patients with 16 pairs of twin deliveries, 33 abortions and 3 ectopic pregnancies.

## Maternal Complications

Table 4 shows incidence of maternal complications in both the groups. Most of our patients (97%) of them were asymptomatic or had mild symptoms like fever or cough not requiring any oxygen therapy. The rate of maternal death in COVID positive patients 3(2.12%) was slightly higher as compared to COVID negative pregnant women 8 (0.95%), ( $p > 0.05$ ). We had 3 maternal deaths in COVID positive patients. First case was a Primigravida with 35 weeks of gestation with sepsis and hepatitis, other 2 patients were referred to us in moribund condition on day 2 of normal delivery with severe anaemia with pneumonia with cardiogenic shock with HELLP syndrome and other was a post LSCS patient with sepsis and acute kidney injury (AKI). There were 8 maternal deaths in the COVID negative group.

**Table 5** Neonatal outcome

Outcome	COVID positive	COVID negative	<i>p</i> value
APGAR score (at 0 min)			
7–10	128 (97.7%)	746 (95.03%)	> 0.05
4–6	1 (0.76%)	24 (3.05%)	< 0.05
0–3	2 (1.52%)	15 (1.91%)	> 0.05
Weight at birth in kg			
> 3	38 (29.0%)	206 (26.24%)	> 0.05
2.5–2.9	54 (41.22%)	283 (36.05%)	< 0.05
2–2.4	25 (19.08%)	168 (21.4%)	> 0.05
1.5–1.9	12 (9.11%)	79 (10.06%)	> 0.05
< 1.5	2 (1.52%)	49 (6.25%)	< 0.05
Total	131	785	

**Table 6** Neonatal complications

Complications	COVID positive	COVID negative	<i>p</i> value
IUFD	3 (2.23%)	31 (3.79%)	< 0.05
Baby in NICU	24 (17.91%)	202 (24.75%)	< 0.05
Total	27 (20.14%)	233 (28.55%)	

## Neonatal Outcome

Table 5 shows APGAR score was normal (7–10) in most of the neonates in both the groups, (> 0.05). Low APGAR i.e. 0–3 was observed in 2 (1.52%) neonates of COVID positive mothers and in 15 (1.91%) neonates of COVID negative mothers. In both the groups, majority of neonates had birth weight between 2.5 and 2.9 kg, (< 0.05).

## Neonatal Complications

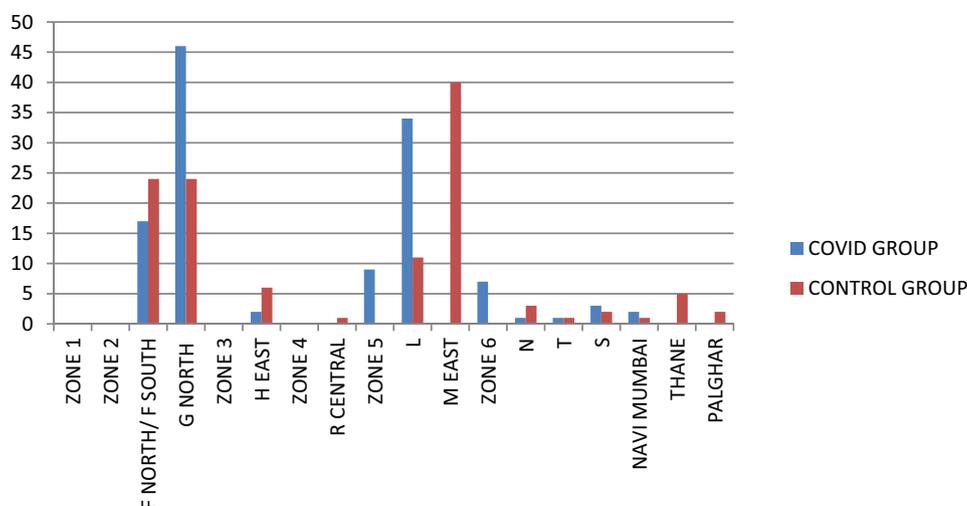
Table 6 shows that out of the 134 patients in the COVID positive group, 3(2.23%) had an IUFD while 31(3.79%) women had an IUFD in COVID negative group. Out of 24 babies of COVID positive mothers in NICU, 16 babies went to NICU due to low birth weight (LBW), 2 for low APGAR score, 6 babies due to various reasons like neonatal seizures, meconium aspiration syndrome and ABO incompatibility. Out of total 131 babies tested, only 3 babies were tested positive on first swab and all of them tested negative on day 5 (Fig. 1).

## Discussion

Viral pneumonia is believed to be the most common non-obstetric infectious disease during pregnancy associated with maternal and neonatal morbidity and mortality [11]. Atypical coronavirus disease (COVID-19), caused by the SARS-CoV-2 virus, is highly infectious and is currently spreading rapidly across the world [12]. It has caused thousands of morbidities and mortalities worldwide since its emergence of SARS-CoV-2 in Wuhan, Hubei Province, China in December 2019 [13]. Many studies have focused on infected patients from the general population; however, details of COVID-19 related pregnancy outcomes are scarce. Chen et al. [10] reported the maternal–neonatal outcomes and vertical transmission potential of COVID-19 pneumonia in pregnant women. Their study focused on pregnant women who only delivered babies by LSCS, and no case has been reported for normal vaginal delivery.

There is a very limited data currently available on maternal outcomes in COVID-19 infection in pregnancy. However, as per the data from other viral illnesses such as influenza, SARS and MERS, pregnant women are more likely to develop viral pneumonitis, with higher morbidity and

**Fig. 1** Most of the patients are referred to us for delivery due to various reasons. The demographic data of the residence of these patients was analysed and we noted that Zone 2 and Zone 5 which are high risk containment zones of Mumbai i.e. Dharavi, Chembur and Govandi areas contributed to the maximum number of Covid positive cases i.e. 50.35% and 34.04% respectively



mortality [14]. The present study involved 977 deliveries, among these, 141 patients tested COVID positive with an incidence of 14.43%. Although the pregnant women with COVID-19 infection tended to present with mild respiratory symptoms, the risk of severe pneumonia during this period is high [10, 14, 15]. WHO report found that in these patients, the adverse pregnancy outcomes was high, especially among those with other associated diseases such as preeclampsia or other complications because respiratory syndromes may aggravate pulmonary oedema and decrease oxygen saturation [16]. In our study, patients had presented with a number of comorbidities or complications in their pregnancy such as anaemia, gestational DM (GDM), hypertension and other medical disorders in both the groups.

Liu et al. [16] and Fan et al. [17] reported that most pregnant women acquired the infection in the third trimester of pregnancy. Similar findings were noted in our study. The emergence of a disease with respiratory implications in the third trimester of pregnancy is usually associated with a higher risk of LSCS, preterm births, low Apgar indexes, and low birth weight. In our study, out of 141 COVID positive cases, 134 women were post-delivery (vaginal delivery/LSCS) cases, 1 patient had ectopic pregnancy and six patients had abortions. Several studies have reported that most women underwent LSCS [10, 14, 15, 17, 18]. Recent literature tends to lean towards LSCS; however, much depends on woman's comorbidities. In our study, more number of patients were delivered by LSCS in COVID positive group (50%) as compared to COVID negative group (47%) but difference was not statistically significant, ( $p > 0.05$ ). LSCS was done for obstetric indications like non-progress of labour, foetal distress, etc. and not just because the pregnant woman had COVID 19 infection. Regarding the characteristics of the newborns, majority of neonates were born with a normal Apgar index (7–10) with average birth weight of (2.5–2.9 kg) in both the groups.

Certain generalized viral infections, such as HIV are predisposed to intrapartum neonatal transmission [10, 19]. For COVID-19, data is limited. In one case series three neonates were born vaginally (one singleton, one set of twins) and throat swabs for PCR at day one of birth were negative for COVID-19 in all three cases [20]. Another COVID-19 positive patient had negative vaginal swab testing during delivery [18]. Many studies [10, 20] have suggested no increased risk of perinatal vertical transmission. Histopathological review of three placentas of confirmed COVID-19 positive patients following delivery by caesarean section showed no signs of villitis and chorioamnionitis, and all three placental samples were negative for COVID-19 RNA. These reports showed no evidence for intrauterine vertical transmission for COVID-19 in second or third trimester has been confirmed. These findings are in accordance with the findings of our study. The Neonatal mortality (IUFD) was found

to be 3(2.23%) in COVID positive group and 31(3.79%) in COVID negative group. We had 3 maternal deaths in COVID positive patients. First case was a Primigravida with 35 weeks of gestation with sepsis and hepatitis, other 2 patients were referred to us in moribund condition on day 2 of normal delivery with severe anaemia with pneumonia with cardiogenic shock with HELLP syndrome and other was a post LSCS patient with sepsis and acute kidney injury (AKI). There were 8 maternal deaths in COVID negative group, out of these 2 were due to direct causes like Postpartum haemorrhage and Antepartum haemorrhage. Other six maternal deaths were due to indirect causes.

## Conclusion

Research on the effects of COVID-19 infection during pregnancy is still in its initial stages. In the present study, we compared the outcomes of COVID-19 positive and negative pregnant women and their neonates. The results of the study suggested that there is no effect of COVID 19 infection on maternal and perinatal outcome. The majority of the women were discharged without any major complications and there was no evidence of vertical transmission of the COVID-19 infection. However, long-term follow-up of these babies to see any delayed effects is necessary. Our study was a small preliminary analysis of COVID positive pregnant women in the initial stage of the epidemic. As several pregnant women are getting infected all over the world, a clear picture will emerge in the coming days about the effect of COVID 19 infection on pregnancy, labour and the neonates.

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## Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical approval** Approved by IEC.

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