

## Study of Impact of Covid-19 on Pregnancy Outcome

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### Abstract

**Background:** This is a prospective, observational study done amongst the covid positive pregnant patients who are admitted and undergone intervention during the duration of SARS-CoV-2 between April 2020 and April 2021, and who delivered within the next 14 days at the government medical hospital Bhavnagar were included and an observational prospective study conducted for their severity, maternal outcome and neonatal outcome.

**Result:** This study included a total of 74 patients diagnosed with covid positive status by RT-PCR method, 55 (73.33%) patients had mild-moderate covid symptoms while 19 (26.7%) patients has severe covid symptoms which required either oxygen support or ICU admission. Out of these 55 patients, 34 (61.82%) patients had a normal vaginal delivery and out of this, 7 (20.6%) had condition deterioration and required subsequent oxygen support, and 21 (38.2%) patients had to undergo caesarean section for some obstetric indication and out of this 8 (38.1%) patients had condition deterioration with subsequent oxygen support requirement. In the mild-moderate symptoms group, 8.83% of patients had neonatal ICU admission after normal delivery while it was 19% after caesarean section. In the severe covid group all those with spontaneous delivery still required ICU care with increased oxygen support. Of those who underwent CS due to obstetric cause, 33.34% of patients had increased oxygen requirements while 16.67% had to be admitted in ICU care.

**Conclusion:** Covid 19 infection posed a significant risk to a small proportion of pregnant women including an increased risk for critical diseases requiring ventilation support. COVID-19 is not an indication for caesarean section or induction of labour, the however second stage should be assisted in those with severe disease and caesarean section may be indicated to allow for proper ventilation supports or resuscitation.

**Keywords:** pregnancy, covid positive severity, caesarean section, vaginal delivery.

### Introduction

The 2019 novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) first reported in Wuhan, China, in December 2019 and declared a pandemic by the WHO on 23rd March 2020[1]. Since then it has affected 22,83,97,253 people world wide and 3,34,77,819 people in india as of 20<sup>th</sup> September 2021 with 46,89,629

and 4,45,165 deaths world wide and in India respectively.

The disease caused by SARS-CoV-2 is known as COVID-19. SARS-CoV-2 is a positive-sense single-stranded RNA virus of the species “severe acute respiratory syndrome-related coronavirus”

and is believed to have emerged from a bat-borne virus due to its close genetic similarity to bat coronaviruses.[2]

Pregnant women are at risk of this virus just as other members of the population, but they are a unique group. A change in the maternal immune system to prevent rejection of the semiallogenic fetus results in a state of relative immunosuppression. Several factors are responsible for this including, a shift from a cell-mediated type-1 helper to hormone-mediated type-2 helper cell response, which is more anti-inflammatory in nature. These physiological and anatomical changes predispose the mother to more severe infections that would otherwise have a mild course and furthermore have the potential to infect and cause complications in the fetus.[3]

#### Pathogenesis of COVID-19

The severe acute respiratory syndrome coronavirus-2 (SARSCoV-2) is a novel enveloped ribonucleic acid (RNA) beta coronavirus belonging to the subfamily Coronavirinae in the Coronaviridae family.

This family of viruses have a large RNA genome and therefore a propensity for genetic variation[4,5,6]

These viruses have four structural proteins namely spike (S) [that gives them the crown appearance from which corona is derived], membrane (M), envelop (E) and nucleocapsid (NC).

The S protein is responsible for binding the virus to the host cell[7]

Following exposure to SARS-CoV-2, the virus infects the hosts cells by binding to the angiotensin-converting enzyme 2 (ACE2) receptor . These receptors are expressed predominantly in type 2 alveolar cells of the lungs and also in several extrapulmonary sites such as the mucosa of the oral cavity, the nasal and respiratory tract, cardiovascular and

digestive systems making these susceptible to the virus[8,9]

#### Three phases have been described following SARS-CoV-2 virus infection [7,10] :-

1. In the first phase, the virus binds to ACE2 receptors in the nasal epithelium where it undergoes local replication and propagation as well as infecting the epithelial cells in the conducting airways . This phase, known as the asymptomatic stage lasts for 1–2 days . Host innate immune response at this stage is limited and there are usually no symptoms. The virus can be detected at this stage by nasal rather than pharyngeal swabs and although the viral burden at this stage on the individual is low, they are infectious.
2. The next phase known as the invasion and infection of the upper respiratory tract stage involves migration of the virus from the nasal epithelium to the upper respiratory tract via the conducting airways generating a greater immune response. At this stage, the patient experiences fever, malaise and a dry cough which in over 80% of cases is self-limiting (i.e. do not progress beyond this stage). Diagnosis at this stage can be from nasal or pharyngeal swabs and sputum. This stage lasts for a few days only.
3. The third stage is one with involvement of the lower respiratory tract and progression to acute respiratory distress syndrome (ARDS) and has been also been referred to as hypoxia, ground glass infiltrates and progression to ARDS stage. It is estimated that about 20% (one fifth) of patients progress to this stage .

#### Disease transmission [11,12,13,14] :-

Available information suggests that the infection was originally zoonotic. Still, the current transmission is person to person by respiratory droplets after contact with an infected person .

Transmission could also occur through infected faeces, but the propagation throughout this route is much less relevant.

The possibility of vertical transmission is highly unlikely and has not been demonstrated. Based on limited data, there is no evidence of the presence of the virus in genital fluids, urine, amniotic fluid, or breast milk. The low maternal viremia found in this infection also suggests a negligible placental seeding

### **Disease Description [15,16,17,18]**

Most patients have mild symptoms, but approximately 20% develop severe disease.

The most frequent symptoms include: fever (80–100%), cough (59–82%), myalgia/fatigue (44–70%), and shortness of breath (31–54%).

Less frequent symptoms are expectoration (28–33%), headache (6–17%), and diarrhoea (2–10%).

Presence of pneumonia with bilateral infiltrates or consolidation areas is a common finding in about 50% of symptomatic patients

The main findings in laboratory tests during early stages of the disease include lymphopenia, transaminase elevation, proteinuria, as well as increased lactate dehydrogenase and C-reactive protein level.

Complications include severe pneumonia, acute respiratory distress syndrome, cardiac abnormalities, respiratory tract superinfections, sepsis, and septic shock.

Clinical course and outcomes of COVID-19 in pregnancy[18,19] :-

Although the clinical presentation of pregnant women with COVID-19 is similar to that of non-pregnant aged matched controls and indeed several studies show a similar hospitalisation rate, pregnant women are at a significantly higher risk for severe outcomes compared to non-pregnant women.

In their live systematic review, Allotey et al. reported that approximately 90% of pregnant women diagnosed with COVID-19 recovered without needing to deliver . Another meta-analysis of 637 pregnant women with COVID-19 found that 76.5% of patients had mild disease, 15% had severe disease, and 7.7% had critical disease at the time of admission . Of those with mild disease, approximately 3% went on to develop severe or critical infection

### **Methods and Materials:**

Pregnant women were tested if they presented with symptoms compatible with COVID-19 or a history of potential exposure; additionally, universal screening was started in our hospitals in April.

Pregnant women with a positive reverse transcriptase–polymerase chain reaction

(RT-PCR) test result for severe acute respiratory syndrome coronavirus 2 (SARSCoV-2) between April 2020 and April 2021, and who delivered within the next 14 days at government medical hospital bhavnagar were included.

Patients demographics like age, parity, comorbidity like DM, asthma, pre eclampsia, BMI noted.

Patients vitals like pulse rate, BP , respiratory rate, Spo2 noted.

Special investigation are done.

The study was approved by the national ethics committee. Oral informed consent was obtained

Mothers were stratified by symptom severity at admission as asymptomatic, mild, or severe (need for advanced oxygen support: high-flow nasal cannula, noninvasive ventilation, or mechanical ventilation).

Maternal outcomes were defined as severe if mothers required advanced oxygen support or admission to the intensive care unit (ICU) or had signs of sepsis with hypoperfusion/organ dysfunction.

Clinical deterioration was defined by an increased need for oxygen

supplementation after delivery. Neonatal outcomes considered were neonatal ICU (NICU) admission

**Initial Management [20]:** Initial evaluation includes:

- Medical history and physical examination including blood pressure, temperature, oxygen saturation (SO<sub>2</sub>), and heart and respiratory rate.
- Fetal heart rate auscultation, cardiotocography (CTG), or fetal ultrasound should be used depending on gestational age and

maternal symptoms to confirm fetal viability or well-being.

- If there is a clinical indication (respiratory rate >20 bpm, SO<sub>2</sub><96%, presence of dyspnoea, or body temperature ≥38 °C): – Chest X-ray: Measures of fetal protection (abdominal apron) are needed

Laboratory workup: blood count, kidney function including creatinine, urea, electrolyte panel (Na, K<sup>+</sup>, Ca, Mg), liver profile, lactate dehydrogenase and Creactive protein, and coagulation tests (prothrombin time and activated partial thromboplastin time).

**Table 1.** Admission criteria for pregnant women with COVID-19

- Persistent fever >38°C despite using paracetamol
- Chest X-ray demonstrating pneumonia
- Pregnant women with other co-morbidities like chronic hypertension, obstructive pulmonary disease, pregestational diabetes, immunosuppression, organ transplant recipients, HIV infection with <350 CD4<sup>+</sup> cells, or patients who receive corticosteroids equivalent to >20 mg of prednisone for >2 weeks, use of immunosuppressive drugs, neutropenia, etc.) must be carefully evaluated by an infectious disease specialist
- CURB severity scale with a total score >0 (each item gives a score of one point):  
C: Acute confusion  
U: Urea >19 mg/dL  
R: ≥30 bpm  
B: SBP ≤90 mm Hg or DBP ≤60 mm Hg
- Intensive care unit admission criteria (Table 2)

COVID-19, coronavirus disease 2019; DBP, diastolic blood pressure; SBP, systolic blood pressure.

**Table 2.** Admission criteria to the intensive care unit

*Major criteria*

- Need for invasive mechanical ventilation
- Shock with the need for vasopressors

*Minor criteria*

- Respiratory rate ≥30 bpm
- PaO<sub>2</sub>/FiO<sub>2</sub> ratio <250
- Multilobar infiltrates
- Confusion/disorientation
- Uraemia (blood urea nitrogen >20 mg/dL)
- Leukopenia: <4,000 cells/mm<sup>3</sup>
- Thrombocytopenia: <100,000 platelets/mm<sup>3</sup>
- Hypothermia/central temperature <36°C
- Hypotension in need of aggressive fluid resuscitation

Admission criteria: 1 major criterion or 3 minor criteria. FiO<sub>2</sub>, fraction of inspired oxygen; PaO<sub>2</sub>, partial pressure of oxygen.

### Severity Classification and Admission Criteria in Pregnant Women with COVID-19 :-

:-

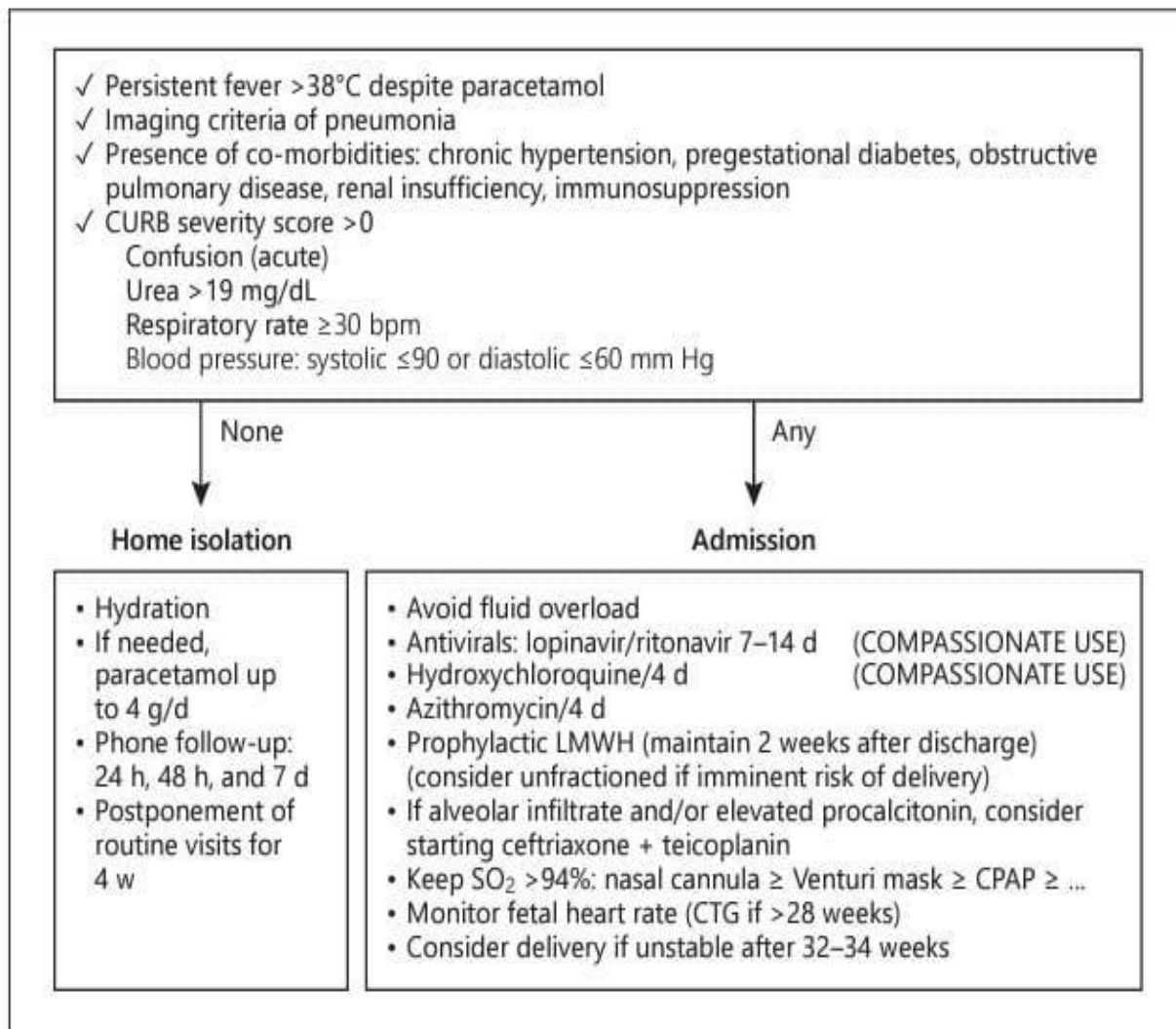
**Mild Infection:** Presence of local symptoms in the upper respiratory tract (cough, throat sore, rhinorrhoea, or anosmia) with or without non-specific symptoms such as fever or myalgia and a CURB score of 0.

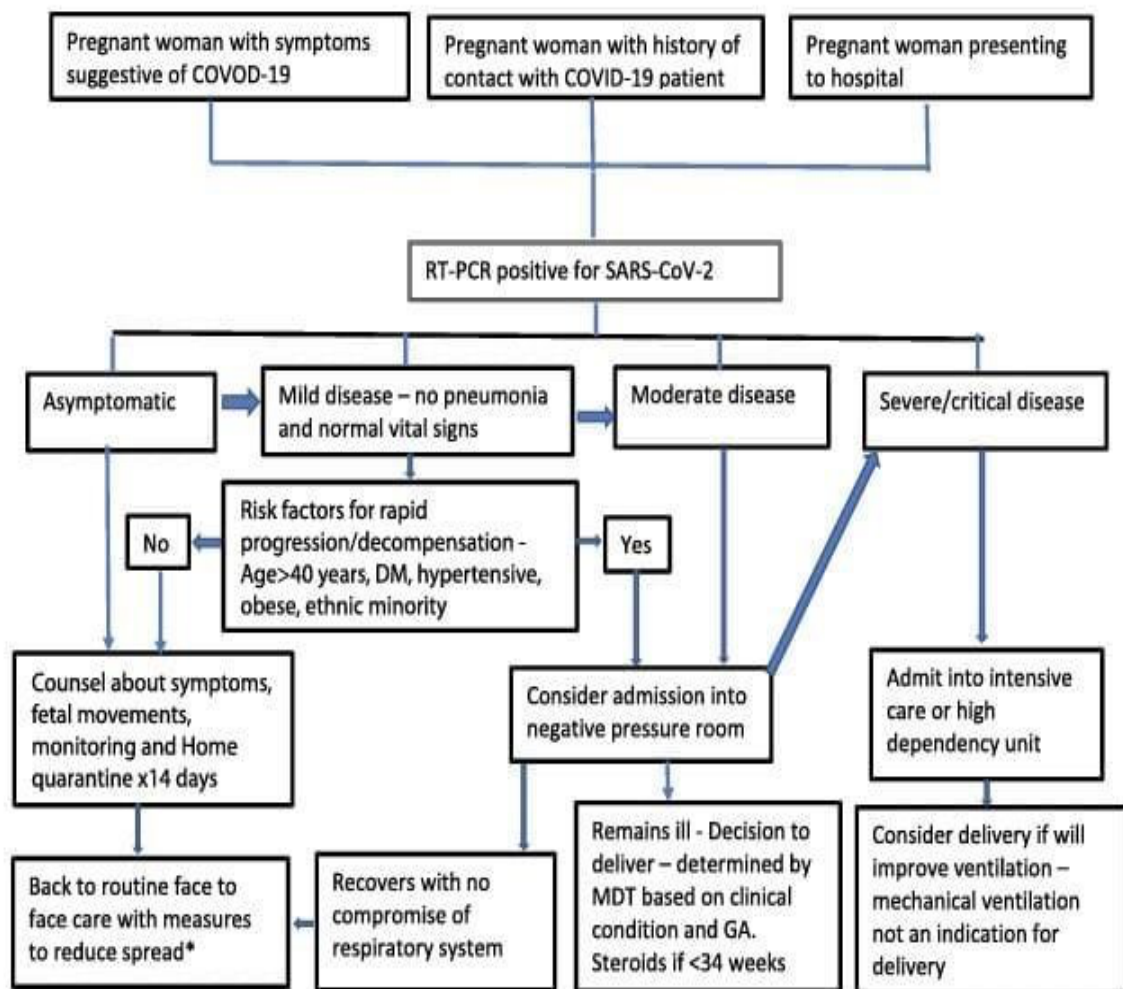
**Moderate Infection:** Mild pneumonia, considered as pneumonia confirmed by chest X-

ray, without presenting severity signs (basal  $SO_2 > 90\%$ , no need for vasopressors or ventilatory assistance, and CURB score  $\leq 1$ )

**Septic Shock:** Arterial hypotension that persists after resuscitation volume and that requires vasopressors to maintain a mean arterial pressure  $\geq 65$  mm Hg and lactate  $\geq 2$  mmol/L (18 mg/dL) in the absence of hypovolemia.

**Clinical Management of Pregnant Women [20]:**





**Fig [21] :- Suggested algorithm for antenatal care of women with COVID-19.**

### Delivery Care and Other Obstetric Procedures [22,23,24,25]:-

1. Indication for delivery: in clinically stable pregnant women with confirmed or suspected COVID-19 infection, there is no indication to induce labour or perform a caesarean section. Preferably, it should occur when the microbiological test (PCR) has become negative.
2. In pregnant women with COVID-19 infection without severity criteria with spontaneous-onset delivery or with an indication of induction due to obstetric indications, the mode of delivery will depend on obstetric conditions and fetal status.

3. In case of required labour induction for obstetric indications, priority will be given to methods which minimize examination and/or transfers of the patient (such as extended-release prostaglandins, )

#### 4. Caesarean Delivery

##### Vaginal Delivery :-

Continuous CTG monitoring is advised due to possible increased risk of fetal distress, as reported in some early reports. Monitor temperature, respiratory rate, and SO<sub>2</sub> hourly.

• Under normal labor progression, vaginal examinations should be minimized (i.e., every 2–4 hr)

Consider shortening the second stage of labour (forceps or vacuum) according to obstetric criteria.

#### Caesarean Delivery:

- Caesarean section should follow usual obstetric indications. The potential risk of vertical transmission is not an indication for caesarean section.
- Maternal indication: in women with respiratory compromise, labour may stress the pulmonary situation, and maternal hypoxia also has fetal risks.

#### Postpartum Care :-

- Immediate postpartum and postanaesthetic recovery after caesarean section will be performed in the same isolation conditions and, ideally, in the same delivery/ labour room.
- Paracetamol is the analgesic of choice due to some reports of rapid disease progression in young adults under NSAIDS.
- Postpartum prophylactic low-molecular-weight heparin (if maternal weight 80 kg: 60 mg every 24 h) is indicated during hospitalization and 6 weeks thereafter.

#### Outcome.

MILD AND MODERATE CASES (NON – SEVERE) (N = 55)				
MATERNAL PARAMETERES		VAGINAL DELIVERY (N = 34)	CS (OBGY CAUSE) (N = 21)	CS ( DUE TO COVID)
DEMOGRAPHY	AGE (YEARS)	25.4 YRS	28.6 YRS	-
	GESTATIONAL AGE (WEEKS)	37.9 WKS	39.6 WKS	-
	PARITY (>2)	7 (20.6%)	6 (28.6%)	-
S/S	FEVER	25	15	-
	COUGH	15	11	-
	MALAISE	21	14	-
	DIARRHOEA	5	2	-
	DYSPNIA	-	-	-
	D + O2 SUPPORT	-	-	-
	ICU CARE	-	-	-
LAB INVESTIGATIONS	HIGH TLC	12 (35.3%)	8 (38.1%)	-
	LYMPHOPENIA	6 (17.65%)	3 (14.3%)	-
	ESR	15	13	-
	ALT (> 45U/L)	6	3	-
	CRP(> 10MG/L)	9	11	-
	XRAY CHEST	24	16	-

SEVERE CASES (O2 REQUIREMENT AND ICU ADMISSION) (N = 19)				
MATERNAL PARAMETERES		VAGINAL DELIVERY (N = 3 )	CS ( OBGY CAUSE) N = 6	CS ( DUE TO COVID) N = 10
DEMOGRAPHY	AGE (MEAN)	27.3 YRS	29.1 YRS	30.4 YRS
	GESTATIONAL AGE	37.6 WKS	39.2 WKS	38.9 WKS
	PARITY (>3)	1 (33.33%)	3 (50%)	4 (40%)
S/S	FEVER	3	6	10
	COUGH	2	5	7
	MALAISE	3	6	10
	DIARRHOEA	-	1	1
	DYSPNIA	3 (100%)	6(100%)	10(100%)
	D + O2 SUPPORT		5 (83.33%)	6 (60%)
	ICU CARE	3	1 (16.67%)	4 (40%)
LAB INVESTIGATIONS	HIGH TLC	2	4	7
	LYMPHOPENIA	1	2	3
	ESR	3	5	9
	ALT (> 45U/L)	1	5	7
	CRP(> 10MG/L)	3	6	10
	XRAY CHEST	3	6	10

MILD AND MODERATE CASES				
		VAGINAL DELIVERY (N = 34)	CS ( OBGY CAUSE) (N=21)	CS ( DUE TO COVID)
MATERNAL OUTCOME				-
1. O2 SUPPORT	NEW CASES	7 (20.6%)	8(38.1%)	-
	INCREASED	-	-	-
2. ICU CARE	NEW CASES	-	3 (14.29%)	-
3. MORTALITY		-	1 (4.76%)	-
4. TERM				-
	> 37WKS	26 (76.5 %)	17 (87)	-
	34-37 WKS	6 (17.65%)	2	-
	< 34 WKS	2 (5.88 %)	2	-
NEONATAL ICU CARE		3 (8.83%)	4 (19%)	-
NEONATE MORTALITY		0	2 (9.5%)	-

SEVERE CASES				
		VAGINAL DELIVERY (N = 3)	CS ( OBGY CAUSE) (N = 6 )	CS ( DUE TO COVID) (N = 10)
MATERNAL OUTCOME				
1. O2 SUPPORT	NEW CASES	-		
	INCREASED		2 (33.34%)	4 (40%)
2. ICU CARE	NEW CASES	3(100%)	1 (16.67%)	2 (20%)
3. MORTALITY		3 (100%)	0	6 (60%)
4. TERM				
	> 37WKS	2 (66.67%)	5 (83.33%)	5 (50%)
	34-37 WKS	1 (33.34%)	1 (16.67%)	3 (30%)
	< 34 WKS	0	0	2 (20%)
NEONATAL ICU CARE				
NEONATE MORTALITY				
		3 (100%)	2 (33.34%)	6 (60%)
		3 (100%)	1 (16.67%)	2 (20%)

## Results

This study included a total of 74 patients diagnosed with covid positive status by RT-PCR method.

Out of this 74 patients , 55 (73.33%) patients had mild-moderate covid symptoms while 19 (26.7%) patients has severe covid symptoms which required either oxygen support or ICU admission.

Out of this 55 patients ,34 (61.82%) patients had normal vaginal delivery , 21(38.2%) patients had to under go caesarean section for some obstetric indication. None had to under go caserean section because of deterioration respiratory condition of mother.

Out of the 19 patients of the severe covid group, 10 (52.63%) patients had to undergo caserean section due to worsening cardio-respiratory condition of mother, 6 (31.57%) patients had to undergo caserean section due to some obstetric cause while 3(15.8%) patients underwent spontaneous delivery.

In terms of maternal outcome, 34 patients with mild symptoms that have undergone normal delivery , 7 (20.6%) had condition deterioration and required subsequent oxygen support. While

out of 21 patients that under went CS with mild to moderate covid symptoms, 8 (38.1%) patients had condition deterioration with subsequent oxygen support requirement.

Like wise in mild-moderate symptoms group, 8.83% of patients had neonatal icu admission after normal delivery while it was 19% after caesarean section.

Like wise there was 9.5% mortality after CS while there were none after normal delivery in mild-moderate covid group. In the severe covid group :-

1. All those with spontaneous delivery still required icu care with increased oxygen support. Those underwent CS due to obstetric cause , 33.34% patients had increased oxygen requirement while 16.67% had to be admitted

in icu care while thode who underwent CS for covid cause, 40 % patient had increased oxygen requirement while 20% had to be admitted in ICU.

2. In term of mortality , all 3 patients with spontaneous delivery expired during the study while there were 60 percent mortality

within those who underwent CS due to covid cause.

3. Similarly, all 3 neonate delivered spontaneously expired within study, while there was 17% mortality and 20% mortality in those who underwent CS for Obstetric and covid causes respectively.

### Discussion

1. Covid 19 infection posed significant risk to a small proportion of pregnant women including an increased risk for critical disease requiring ventilation support.
2. Most of the pregnant women present with mild signs and symptoms which require home isolation and regular follow up with excellent prognosis, 20% of the patients develop serious disease requiring admission and oxygen supports.
3. Among the patients with mild symptoms, all those had normal vaginal delivery had excellent outcomes while those with in this group that had to under go caserean section due to obstetric causes had clinical deterioration.
4. Hence we can say that caesarean section is a independent risk factor for maternal and neonatal morbidity and mortality as it increases physiological stress of both mother and child.
5. COVID-19 is not an indication for caesarean section or induction of labour, however second stage should be assisted in those with severe disease and caesarean section may be indicated to allow for proper ventilation supports or resuscitation.

### Limitations

There's only a small number of cases in this study, and it is difficult to draw any definitive conclusions about the clinical manifestations and outcomes of the SARS-CoV-2 infection in the pregnant women and their neonates.

Lack of sufficient information on newborns to determine vertical transmission.

The lack of association between cesarean delivery and risk of NICU admission may have been related to the lack of statistical power

The main limitation of our review is related to the fact that the primary studies currently available in the literature were not of sufficiently high quality regarding their methodology

### Conclusion

Covid 19 infection posed a significant risk to a small proportion of pregnant women including an increased risk for critical diseases requiring ventilation support..COVID-19 is not an indication for caesarean section or induction of labour, the however second stage should be assisted in those with severe disease and caesarean section may be indicated to allow for proper ventilation supports or resuscitation.

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