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**Original Research Article**

# Potential effect of COVID-19 pandemic on pregnancy outcome: a prospective observational study

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## ABSTRACT

**Background:** The COVID-19 pandemic has posed significant challenges to healthcare systems worldwide, particularly impacting vulnerable populations such as pregnant women. Physiological changes during pregnancy may increase susceptibility to severe outcomes from COVID-19, necessitating a deeper understanding of its effects on maternal and fetal health. This study aimed to observe the outcomes of pregnant patients diagnosed with COVID-19, focusing on maternal morbidity, fetal outcomes, and the impact on healthcare resources.
**Methods:** A multicenter, non-randomized, quasi-experimental prospective observational study was conducted at Rajshahi Medical College Hospital, Bangladesh, from July 2020 to June 2021. A total of 81 pregnant women with confirmed COVID-19 were included in the study. Data were collected using a pre-prepared data collection sheet and analyzed using SPSS version 26.
**Results:** The majority of patients were in the third trimester (49.1%) and between 35-40 weeks gestation (83%). Common symptoms included severe cough (26%) and fever (14%). Six patients (7.4%) experienced multiorgan failure, while 3 (3.7%) required mechanical ventilation. There were 3 spontaneous abortions, 52 deliveries (64.2%), and 2 neonates were COVID-positive. Maternal hospital stays averaged 13.1 days (SD±6.37), with a mean breastfeeding interval of 13.3 days (SD±6.44).
**Conclusions:** COVID-19 had a detrimental impact on both maternal and fetal health, emphasizing the need for improved treatment strategies and resource allocation. This study highlights the importance of further research to better understand and mitigate the effects of COVID-19 on pregnant women.

**Keywords:** COVID-19, Fetal health, Maternal health, Pregnancy, Outcome

## INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) pandemic, caused by the novel coronavirus SARS-CoV-2, has emerged as a significant global health crisis. Since its initial identification in Wuhan, China, in December 2019, the virus has rapidly spread worldwide, leading to widespread transmission and significant morbidity and mortality.[1,2] SARS-CoV-2 is one of seven known coronaviruses capable of infecting humans, with mounting evidence suggesting zoonotic origins.[3] Transmission primarily occurs through respiratory droplets, close contact with infected individuals, or contact with contaminated surfaces. While there is no evidence of vertical transmission from mother to fetus, pregnant women are considered a vulnerable population to infectious diseases, including COVID-19.[4]

The virus gains entry into host cells through binding to the angiotensin-converting enzyme 2 (ACE2) receptor, a characteristic of the beta coronavirus family.[5] Clinical manifestations of COVID-19 range from asymptomatic or

mild respiratory symptoms to severe pneumonia and acute respiratory distress syndrome (ARDS). The elderly and those with underlying comorbidities, such as cardiovascular diseases, respiratory disorders, and diabetes, are at higher risk of severe complications and mortality.[6] Laboratory findings in early-stage illness commonly include lymphopenia, elevated liver enzymes, proteinuria, and increased levels of lactate dehydrogenase (LDH) and C-reactive protein.

Pregnancy itself alters immune responses and physiology, potentially increasing the severity of infectious diseases (8). This study aimed to evaluate the outcomes of pregnant women with COVID-19, considering the unique physiological and immunological changes that occur during pregnancy.

The general objective for this study was to assess the impact of COVID-19 on pregnancy outcomes among pregnant women at Rajshahi Medical College Hospital. The specific objectives for this study were to determine the demographic and clinical characteristics of pregnant women diagnosed with COVID-19. Also, to assess the maternal outcomes, including the severity of COVID-19 and the need for intensive care. Additionally, to evaluate the pregnancy outcomes, including delivery methods and neonatal outcomes, among pregnant women with COVID-19 and to identify any associations between maternal characteristics, disease severity, and pregnancy outcomes among pregnant women with COVID-19. Moreover, to provide insights for improving the management and care of pregnant women with COVID-19, thereby enhancing maternal and neonatal health outcomes.

## METHODS

### *Study design*

This study employed a multicentered, non-randomized quasi-experimental prospective observational design. Data were collected from pregnant women diagnosed with COVID-19 at Rajshahi Medical College Hospital, Rajshahi, Bangladesh, from July 2020 to June 2021. The study aimed to observe the outcomes of pregnant patients affected by the novel coronavirus. The data were analyzed and findings were recorded on a pre-prepared data collection sheet.

### *Inclusion criteria*

Pregnant women diagnosed with COVID-19, patients aged 18 years and above, patients willing to participate in the study, patients who provided informed consent were included.

### *Exclusion criteria*

Pregnant women with pre-existing medical conditions affecting pregnancy outcomes, patients unwilling to participate in the study, patients with incomplete medical records and patients who were unable to provide informed consent were excluded from this study.

### *Data collection*

Data was collected using a pre-prepared data collection sheet, including medical history, physical examination results, pregnancy complications, and biochemical and radiological markers related to pregnancy and neonatal outcome. Information was recorded for each participant from during this study.

### *Data analysis*

Data was analyzed using SPSS version 26. Descriptive statistics were used to summarize the demographic characteristics of the pregnant women with COVID-19. Continuous variables were reported as means with standard deviations (SD) or medians with interquartile ranges (IQR), depending on the distribution. Categorical variables were presented as frequencies and percentages. Inferential statistics such as chi-square tests, t-tests, or Mann-Whitney U tests were used to compare variables between groups. A p-value of less than 0.05 was considered statistically significant.

### *Ethical considerations*

This study adhered to the principles outlined in the Declaration of Helsinki and was approved by the Institutional Review Board (IRB) of Rajshahi Medical College Hospital. Informed consent was obtained from all participants before enrollment in the study. Patient confidentiality was maintained throughout the study, with data anonymized for analysis. The study was conducted with the utmost respect for patient autonomy, beneficence, and non-maleficence, ensuring the rights and well-being of all participants.

## RESULTS

A total of 81 pregnant women with COVID-19 were included in the study. The average age of the patients was 27 years. More than half of the patients (49.1%) were in the third trimester of pregnancy, while the majority (83%) were in the 35-40 weeks gestation range.

Overview of the signs and symptoms observed in pregnant women with COVID-19. The majority of patients were either asymptomatic (48%) or presented with a cough (26%), which aligns with the general trends seen in COVID-19 cases. Fever was reported in 14% of patients, which is consistent with the common symptomatology of the disease. Interestingly, a small percentage of patients exhibited less common symptoms such as shortness of breath (2%), anosmia (2%), and hemoptysis (2%). These symptoms, though less prevalent, are important to note as they can indicate more severe disease progression. Additionally, the table highlights that a few patients experienced more severe complications, including

multiorgan failure (4%) and a combination of fever, headache, and severe pneumonia (2%). These findings underscore the importance of close monitoring and prompt medical intervention in pregnant women with COVID-19 to mitigate the risk of severe outcomes.

**Table 1: Demographic and clinical characteristics of pregnant women with COVID-19 (n=81).**

| General characteristics | Frequency | Percentage |
|---|---|---|
| Mean age 27 years | (Range 19-40) | - |
| Nulliparous | 33 | 40.3 |
| Multiparous | 48 | 59.7 |
| **Sign and symptoms** | | |
| Asymptomatic | 38 | 48 |
| Cough | 21 | 26 |
| Fever | 12 | 14 |
| Shortness of breath | 2 | 2 |
| Anosmia | 2 | 2 |
| Multiorgan failure | 3 | 4 |
| Fever, headache, severe pneumonia | 2 | 2 |
| Hemoptysis | 1 | 2 |

The maternal outcomes observed in pregnant women with COVID-19. The majority of patients experienced mild to moderate disease severity (92.6%), indicating that most pregnant women with COVID-19 had relatively manageable symptoms. However, a small percentage of patients (7.4%) developed severe disease, highlighting the importance of careful monitoring and appropriate medical care for pregnant women with COVID-19.

**Table 2: The maternal outcome of pregnant ladies with COVID-19 (n=81).**

| Maternal outcome | Frequency | Percentage |
|---|---|---|
| **Mild to moderate disease** | 75 | 92.6 |
| **Severe disease** | 6 | 7.4 |
| **Delivered** | 52 | 64.2 |
| **Ongoing pregnancy** | 26 | 32.1 |
| **Maternal death** | 3 | 3.7 |

In terms of pregnancy status, a significant proportion of patients delivered during the study period (64.2%), indicating that COVID-19 did not significantly impact the ability to carry the pregnancy to term. Additionally, ongoing pregnancies were observed in 32.1% of cases, suggesting that COVID-19 infection did not lead to immediate pregnancy complications for these patients. However, it is important to note that there were three maternal deaths (3.7%) recorded during the study period, underscoring the potential severity of COVID-19 in pregnant women and the importance of comprehensive care and monitoring for this population.

**Table 3: Pregnancy and neonatal outcome of patients with COVID-19 (n=81).**

| Pregnancy and neonatal outcome | Frequency | Percentage |
|---|---|---|
| **Delivery** | 52 | 64.2 |
| **Normal vaginal delivery (NVD)** | 15 | 17.5 |
| **Caesarean section** | 42 | 50.8 |
| **Hysterotomy** | 2 | 2.4 |
| **Abortion** | 3 | 3.7 |
| **Live birth** | 47 | 57.4 |
| **Preterm birth** | 13 | 15.4 |
| **Neonatal death** | 2 | 2.3 |
| **Intra-uterine deaths** | 1 | 1.5 |
| **Neonatal COVID infection** | 4 | 3.6 |

The pregnancy and neonatal outcomes among pregnant women with COVID-19. Delivery occurred in 52 cases (64.2%), with 15 cases (17.5%) involving normal vaginal delivery (NVD) and 42 cases (50.8%) involving caesarean section. Two cases (2.4%) required hysterotomy. Three cases (3.7%) resulted in abortion. Among the live births, there were 47 cases (57.4%). Preterm birth occurred in 13 cases (15.4%). There was one intrauterine death (1.5%) recorded. Regarding neonatal outcomes, there were two neonatal deaths (2.3%). Neonatal COVID-19 infection was observed in four cases (3.6%). These findings suggest a range of outcomes for pregnant women with COVID-19, including various delivery methods, preterm birth, and neonatal complications such as infection and death. These outcomes highlight the importance of monitoring and managing COVID-19 in pregnant women to ensure the best possible outcomes for both mother and baby.

## DISCUSSION

The coronavirus is a novel and highly contagious infection that poses particular risks for pregnant women due to physiological changes in their immunological, cardiovascular, and coagulation systems. Pregnancy itself does not seem to affect the symptoms of COVID-19 pneumonia. In a previous review, fever (68%) and cough (34%) were the most common symptoms among infected pregnant women in the third trimester.[7] Elevated C-reactive protein (70%) and lymphopenia (59%) were the most commonly altered maternal laboratory parameters. In your study, 48% of patients were asymptomatic, with cough (26%) and fever (14%) being the most common symptoms. Diffraction gratings were done in only 7.6% of patients, and 81% had lymphopenia.

Regarding maternal outcomes, previous studies have mainly focused on Chinese pregnant women. Prematurity was found in 15.8% of cases in your study. Liu et al presented 13 pregnant women infected with SARS-CoV-2, with varying outcomes including uncomplicated pregnancies, emergency caesarean sections due to fetal

distress and other complications, and one case of severe maternal illness with multiple organ dysfunction syndromes (MODS).[8] In your study, 49.1% of patients were infected in the third trimester, and 6 patients developed severe disease with multiorgan failure, requiring ICU care and mechanical ventilation. Other studies have reported adverse pregnancy outcomes such as fetal distress, intrauterine death, and premature termination of pregnancy among infected pregnant women. Chen et al reported two cases of fetal distress, four cases of preterm delivery, and two cases of low birth weight among nine infected pregnant women.[9] Zhu et al found several adverse outcomes, including premature birth and small for gestational age infants, among nine infected women. In terms of delivery, the majority of patients in your study underwent caesarean section (64.1%), with 15.14% experiencing normal vaginal delivery. Indications for caesarean section included pathological cardiotocography (CTG), failure to progress in labor, premature rupture of membranes (PROM), unsuccessful labor induction, maternal request, and severe sepsis.[10]

Neonatal outcomes varied, with some infants experiencing symptoms such as shortness of breath, fever, thrombocytopenia accompanied by abnormal liver function, and gastrointestinal symptoms. One infant in a previous study presented with multiple organ failure and died.[11] In your study, only 4 neonates were found to be RT-PCR positive, with 2 neonatal deaths due to extreme prematurity and the rest doing well. These findings underscore the importance of close monitoring and management of pregnant women with COVID-19 to ensure the best possible outcomes for both the mother and the baby. The data suggests that pregnant women infected with the coronavirus may experience a range of symptoms and complications, with some cases leading to severe illness and adverse pregnancy outcomes.[12] The high percentage of asymptomatic cases in your study highlights the importance of widespread testing and vigilant monitoring of pregnant women to detect and manage cases early.

The increased risk of preterm birth and other adverse outcomes among infected pregnant women emphasizes the need for specialized care and monitoring throughout pregnancy. The high rate of caesarean section in your study and others may reflect the need for careful management of labor and delivery in women with COVID-19 to minimize the risk of maternal and neonatal complications.[13,14] The varying outcomes reported in different studies underscore the complexity of managing COVID-19 in pregnant women and the need for further research to better understand the impact of the virus on pregnancy. In, COVID-19 presents unique challenges for pregnant women, with potential implications for both maternal and neonatal health. Close monitoring and multidisciplinary care are essential to ensure the best outcomes for both mother and baby.[15] Further research is needed to understand the long-term effects of COVID-19 on pregnancy and to develop guidelines for the management of pregnant women with the virus.

## CONCLUSION

Our study findings suggest adverse outcomes of COVID-19. Although pregnant women do not seem to present increased susceptibility to COVID-19 or more severe complications than non-pregnant adults, the available studies indicate that they may be at risk of adverse pregnancy outcomes, mostly preterm delivery, fetal distress, respiratory symptoms and LBW in newborns. Further research is urgently needed to understand the natural effect of COVID-19 on pregnant women and neonates and guide the most appropriate recommendations for obstetricians. Only an integrated multi-angle assessment of the current knowledge about viral characteristics, epidemiology, disease immunopathology, potential preventive and therapeutic strategies, and clinical observations will help understand the exact impact of COVID-19 infection during pregnancy.

### *Recommendations*

Closely Monitoring pregnant womens, especially in the third trimester. Encourage COVID-19 vaccination for pregnant women. Emphasize preventive measures like mask-wearing and hand hygiene.

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