

VERTICAL TRANSMISSION OF CORONA VIRUS DISEASE-19 (COVID-19) FROM INFECTED PREGNANT MOTHERS TO NEONATES

Abeera Choudry, Jehan Ara Rafiq Baig, Zainab Abbas Mirza, Munawar Jannat, Zeeshan Ahmed, Mobeen Shafique

Pak Emirates Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To assess the vertical transmission of Corona Virus disease (COVID-19) from infected pregnant mothers to neonates.

Study Design: Cross sectional study.

Place and Duration of Study: Department of Obstetrics and Gynaecology, Pak Emirates Military Hospital Rawalpindi, from May 2020 to Jun 2020.

Methodology: A total of 90 pregnant patients reported in Pak Emirates Military Hospital during the pandemic of COVID-19 with COVID-19 test positive from 01 May 2020 to 30 June 2020. Diagnosis was confirmed with reverse transcriptase polymerase chain reaction (RT-PCR) of nasal and throat swabs. Clinical, analytical, laboratory and radiographic findings were then recorded. The (RT-PCR) for COVID-19 of all the babies who were delivered to these mothers was also done on throat and nasal swabs. The neonatal blood was also sent for serology (IgM/IgG).

Results: Out of 90 patients studied, 46 were delivered either through a Caesarean section or by vaginal delivery. The patients were categorized as asymptomatic 51 (55.66%) and symptomatic 39 (43.33%). Out of those symptomatic, patients with mild to moderate disease were 33 (84.61%), patients with severe disease 05 (12.82%) and critically ill patient was 01 (2.56%). All the patients who delivered were COVID-19 test positive at the time of delivery and later when the babies of all these mothers were tested, they were all found to be COVID-19 negative on RT-PCR and no immunoglobulins were found in the serum of these neonates. The possibility for transplacental transmission could only be checked by these two methods (RT-PCR and Serology) since RT-PCR of amniotic fluid, high vaginal swab and breast milk was not available.

Conclusion: In our study we did not find any evidence of vertical transmission of corona virus disease -19 (COVID-19) from infected pregnant mothers to neonates.

Keywords: Corona Virus Disease-19 (COVID-19) vertical transmission, Immunoglobulins, Pregnancy, Reverse transcriptase polymerase chain reaction (RT-PCR).

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INTRODUCTION

COVID-19 is regarded as a health emergency affecting the human race globally and can cause worst outcomes during pregnancy¹. This disease is caused by severe acute respiratory syndrome corona virus 2 (SARS-COV-2). Wuhan, China was the first place where the pandemic started, in December 2019^{2,3}. The causal agent is an RNA virus which is found to be non-segmented, enveloped virus belonging to a large yet diverse family of viruses that are zoonotic (i.e; the virus can live in animals as well as humans). Until now there are seven corona viruses that are

known to infect humans. Previously SARS-CoV-1 and Middle East Respiratory Syndrome Corona Virus (MERS-CoV), had caused deadly pandemics and they are of the same viral group as 2019- n-CoV⁴.

The World Health Organization (WHO) declared the outbreak a Public Health Emergency of International Concern, on 30 January 2020, and a pandemic on 11 March^{1,2}. Till 30 June 2020, cases of COVID-19 were more than 10 million, reported worldwide, in more than 190 countries causing 504,000 deaths; whereas more than 5.2 million people have recovered.

The spread of this deadly pathogen is generally through close contact. When an infected person coughs, sneezes or talks, small droplets

Correspondence: Dr Zainab Abbas Mirza, Consultant Gynecologist, Pak Emirates Military Hospital, Rawalpindi Pakistan
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are produced. These small droplets then settle on to the surfaces but do not travel long distances through air.

The research shows that these droplets may remain in air for several minutes. The other possible way by which the people can get infected is when they touch contaminated surfaces and then touch their face⁵. Once the patient becomes infected and becomes symptomatic, he is most contagious during the first three days.

Common symptoms are cough, fever, fatigue, breathlessness and anosmia. Respiratory complications like pneumonia and acute respiratory distress syndrome, then follow. The incubation period is around fourteen days. There is no role of antiviral therapy, so far. Trials on vaccines are still awaited. Mainly the treatment is both supportive and symptomatic⁶.

Globally an estimated 116 babies will be born under COVID-19 pandemic. Out of these one quarter (29 million) will be in South Asia, according to UNICEF¹. Harsh realities like global containment measures such as lock downs and curfews, over whelmed health centres and socio-economic break down are the real challenges. Since it's a newly emerging disease, so there is very little evidence of poor pregnancy outcomes in pregnant patients with COVID-19. At present, the babies born to these infected pregnant mothers have not shown any known adverse neonatal outcomes. Vertical transmission in the neonates of infected mothers is also not seen, worldwide. This pandemic has already exhausted the medical health care system, and if neonates also show signs of vertical transmission then one can easily understand the amount of physical, mental as well as financial crisis in the society.

METHODOLOGY

A cross sectional study was conducted at the Obstetric Gynaecology, department of Pak Emirates Hospital, Rawalpindi, a tertiary care hospital. Duration of study was two months, from May 2020 to June 2020. Ethics clearance was obtained from the ethics committee of Pak Emirates Military Hospital Rawalpindi.

The study was conducted to assess the vertical transmission of COVID-19 from infected pregnant mothers to their neonates. A total of 90 pregnant patients diagnosed according to WHO criteria for COVID-19 infection, and hence were enrolled in our study. The patients were selected through non probability consecutive sampling. After taking the informed verbal consent, all the pregnant patients who were COVID-19 test positive were included in the study whereas all those pregnant mothers who were COVID-19 test negative were excluded. These positive patients were then admitted, as per policy in vogue, and kept in isolation, in specially designated wards. The demographic variables like age, parity, obstetric history, as well as complaints like fever, sore throat, cough, myalgias, dyspnoea, fatigue, etc were recorded on specifically designed forms. Detailed history of contact with COVID-19 patients was also taken. A minimum sample size of 30 was calculated by WHO sample size calculator and non-probability sampling technique was used.

COVID-19 disease was confirmed through reverse transcriptase polymerase chain reaction (RT-PCR) of nasal/throat swabs. Clinical, analytical, laboratory and radiographic findings were then recorded.

The parameters used to assess the vertical transmission were RT-PCR of nasal/throat swabs of mothers, chest X-Ray findings and HRCT scan (High Resolution computerized tomography) of chest, where required. Similarly the RT-PCR for SARS COVID-19 of the nasal/throat swabs of all the neonates was also taken at 24 hours of age and tested at AFIP (Armed Forces Institute of Pathology). If initial testing is negative then test is repeated at 48 hours of age. Serology for immunoglobulins (both IgM and IgG) was also done on the blood of neonates born to infected mothers. All babies born to Covid positive mothers were kept in nursery in isolation, till two reports of PCR were available. The babies were discharged after the second negative report.

The RT-PCR for SARS-CoV-2 of amniotic fluid high vaginal swab and breast milk could not be done because of non-availability of the kit.

RT-PCR was performed on nasal/throat swabs according to manufacturers instructions. Results of serology were analyzed by using HITACHI (ROSCHE) serum analyzer. All statistical analysis were performed using SPSS program version 20. Descriptive statistics were used to analyze the data. Calculations for percentages were made using the qualitative variables like parity and history of previous cesarean delivery.

The positive result for COVID-19 was defined as positive test of RT-PCR of nasal/throat swabs^{7,8}. The definition of recent physical contact was regarded as a close contact with anyone in the family or any person who is having COVID-19⁹. If the patient is having a temperature higher than 98.6°F then fever was labelled. If on radiological testing there was evidence of consolidation, ground glass appearance, atelectasis and or pleural effusion then diagnosis of pneumonia was made¹⁰.

Pregnant patients were divided into asymptomatic (with no symptoms), mild to moderate disease (symptomatic but vitally stable). Severe disease (with respiratory rate more than 30/min, resting Oxygen saturation <93%). Critical disease (with shock and organ failure, respiratory failure which needs mechanical ventilation or unresolved hypoxemia requiring extra corporeal membrane oxygenation).

RESULTS

A total of 90 pregnant patients were part of the study. All of these became COVID-19 positive and hence admitted. Out of these 90 cases, 51 (56.66%) were asymptomatic whereas 39 (43.33%) were symptomatic. Out of the symptomatic patients 33 (84.61%) were having mild to moderate disease whereas 5 patients (12.82%) suffered with severe COVID-19 disease and needed intensive care. There was 1 (2.56%) critically ill patient who needed ventilatory support.

Forty six patients (51.11%) delivered during their hospital stay. Caesarean section was done in 21 patients (45.65%). While 25 patients (54.35%) delivered vaginally. The details of Caesareans as well as parity is shown in tables. The ages were ranging between 21-40 years. The demographic profile of the study group as table-I & II.

Table-I: Demographic variables.

Age of Subject (Years)	n= 90 (%)
21-30	37 (41.11)
31-40	53 (58.88)

Parity

Primigravida	32 (35.55)
Multigravida	58 (64.44)

Table-II: Details of delivery.

Mode of Delivery	n=46 (%)
Vaginal Delivery	25 (54.34)
Caesarean Section	21 (45.65)

Type of Caesarean Section

Primary	06 (28.57)
Secondary (Previous 2 or 3)	15 (71.42)

Outcome

Baby Boys	28 (60.86)
Baby Girls	18 (39.13)

All the babies born to these mothers were RT-PCR COVID-19 negative. No Immunoglobulins were detected in their blood samples. The RT-PCR testing was done at 24 hours and then repeated at 48 hours, but still there was no evidence of disease in neonates. Assessment of vertical transmission was done because it was suggested that severity of disease might be more in neonates compared to older children. In our study there was no evidence of vertical transmission seen.

Patients with COVID-19 infection, 31-40 yrs old patients made the major chunk of the study whereas 21-30 yrs old group was next in the row. The parity distribution showed that patients with COVID-19 (64.44%) were multi-gravida while primigravida were 32 patients (35.55%).

One primigravida, 27 years old, was critically ill. She had, multiple co-morbidities like mitral valve disease, cardiomyopathy, bronchial asthma. Because of severe respiratory disease,

caesarean section under general anesthesia was done. Later she developed respiratory failure, acute renal shut down and multi organ failure and died on 8th post of day.

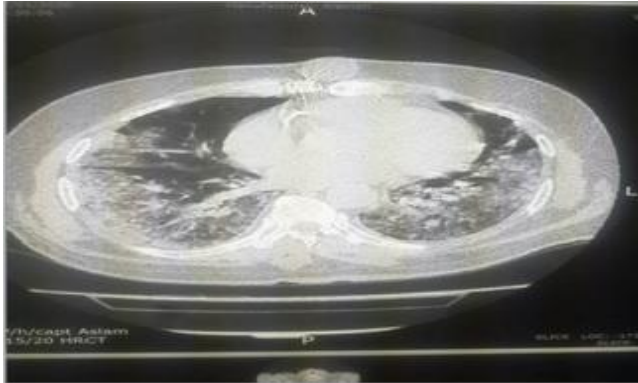


Figure-1: HRCT Chest of Covid Positive patient showing typical bilateral peripheral lower lobe basal ground glass haze and consolidation.

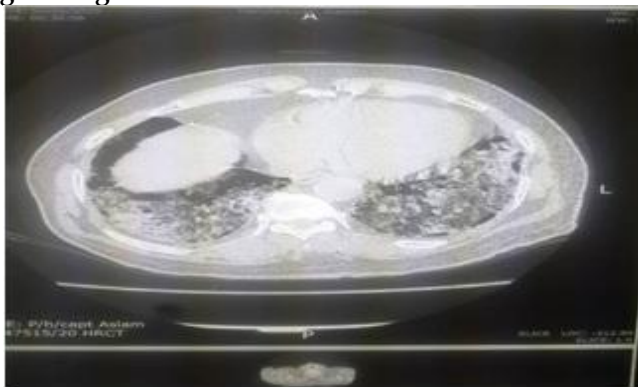


Figure-2: Progression of disease on HRCT.

Rest all of the patients recovered gradually and discharged thereafter. The patients who were in their early third trimester and were asymptomatic, they were discharged after repeating COVID-19 test (2 tests 7 days apart). Mostly became COVID-19 negative and later delivered in Combined Military Hospital Rawalpindi.

All the neonates were born with good APGAR scores. No severe neonatal asphyxia was noted. The babies remained in isolation, in nursery till two samples of RT-PCR for CoV-2 were negative.

DISCUSSION

SARS-CoV-2 is the scientific name for the virus, which triggers the disease identified as COVID-19¹¹. It is an extremely contagious patho-

gen and the transmission of this virus from mothers to infants before, during or after birth, especially through germ cell and placental blood, is not confirmed so far. There is hardly any difference in overall clinical picture of that of the pregnant and non pregnant women suffering with this disease, according to various small studies done in China^{12,17,18}. Results from samples taken from the newborns revealed no signs of vertical transmission of this disease. These findings are the same as of SARS in which there was no evidence of vertical transmission in neonates^{13,14}. Different small studies with limited number of patients, are done on vertical transmission. Because of the fear that if neonates are infected with COVID-19 then they will have severe illness with increased morbidity and mortality rates¹⁵.

Pregnant ladies have high susceptibility to respiratory pathogens. Their altered physiological as well as immunological status makes them prone to acquire the disease. But the evidence suggests that infected pregnant mothers have no difference of disease pattern as compared to non pregnant infected patients. In another study it was reported that 50% of women with pregnancy who developed SARS needed intensive care and 33% were placed on mechanical ventilation¹⁶, in contrast to SARS-CoV-2 where the severity of disease in pregnant mothers is not found to be that exaggerated. The same findings were recorded in our study, where most of the patients recovered and had live births. So far, the infected pregnant patients, worldwide, are showing good prognosis and, morbidity as well as mortality is far less than feared.

Chen *et al* reported nine pregnant ladies with confirmed COVID-19. None of the patients developed severe disease or died. There were nine live births and all neonates were found to be COVID-19 negative¹⁷. Similarly, Zhang *et al* also showed the same results. They evaluated 16 infected pregnant mothers and did not find vertical transmission in new borns¹⁸. Since its a new disease and in Pakistan the peak of this disease was evident in the beginning of May

2020, which explains the limited number of our patients. To date, there is little international as well as national studies on pregnant mothers who are infected with corona virus. Vertical transmission was not seen even in (SARS) or (MERS). These viruses are not isolated from breast milk^{17,18}. Despite the severity of these viral diseases in the past, there was no known case of vertical transmission seen. Similarly, in the present pandemic, there is no substantial proof of transmission of virus from mother to babies.

The main steps of management of Corona Virus disease 2019 in pregnancy includes, early diagnosis through high suspicion of index as well as proper isolation rooms, extensive measures for the control of infection, fluid maintenance yet avoiding overload, early start of antibiotics, detailed testing for the virus and other infections, fetal surveillance, monitoring of uterine contractions, maternal oxygen saturation, early consideration of ventilatory support in case of respiratory failure¹⁹. Such patients should be managed in a hospital which is equipped with advance health facilities and have well trained doctors to manage properly the critical obstetric patients^{20,21}.

At the time of article submission there were 209,330 cases of COVID-19 in Pakistan. There were 2846 new cases /24 hours. 98,503 patients had recovered, according to Ministry of health.

CONCLUSION

Majority of the infected pregnant patients exhibited fewer symptoms than the rest of the non pregnant infected COVID-19 population. But we conclude that with the available data, there was no evidence of intrauterine vertical transmission of the COVID-19 from infected pregnant mothers to their neonates. But an infected mother can infect her baby via respiratory droplets, especially while breast feeding so they should strictly follow the precautions and use face masks.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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