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Vertical Transmission of Anti-SARS-CoV-2 IgG Antibodies from Mothers exposed to Covid-19 Infection during Pregnancy – A Retrospective Study

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ABSTRACT

Objective: Covid-19 pandemic is still a threat and its implication in pregnancy is being sought. The immune response in pregnant women and the vertical transmission of anti-SARS-CoV-2 antibodies from mother to infants is being explored. Objective of this study was to evaluate the SARS-CoV-2 infection in women at full term of pregnancy presented for admission in the hospital and the transplacental passage of anti–SARS-CoV-2 antibodies in the neonates born to women acquiring SARS-Cov-2 infection sometime during pregnancy.

Material & Method: This cohort study was conducted on pregnant women presenting for delivery at Convenient Hospitals Limited, Indore, India. Presences of anti-SARS-CoV-2 antibodies in mothers with past history of Covid-19 infection as well as their presence in cord blood and blood of neonates at the time of delivery were evaluated.

Results: Neonates born to the Covid-19 infected mothers were negative for Covid-19 by RT- PCR suggesting that there was no vertical transmission of the infection, but they were sero-positive for anti-SARS-CoV-2 antibodies in peripheral and cord blood.

Conclusions: Management of pregnant women with SARS-Cov-2 infection during the third trimester, and the immune response in the mother and neonate on delivery suggests that SARS-CoV-2 infection in pregnancy offers passive immunity to newborns and gives protection to them. This can be used as an aid in defining protocols for the management of the sero- positive neonates. Moreover, multidisciplinary approach is required to achieve a good outcome in women with SARS-CoV-2 infection and the other group without any SARS-CoV-2 infection, during pregnancy.

Keywords: Anti-SARS-CoV-2 antibodies, Covid-19, Pregnancy, Real-time reverse transcription-polymerase chain reaction, Severe Acute Respiratory Syndrome

INTRODUCTION

Pregnancy is a condition of immune suppression and the physiological adaptations in pregnancy make women more vulnerable to severe viral infections. Viral infections associated with pregnancy and the potential mechanisms for the associated adverse pregnancy outcomes have been explained [1]. The ongoing Corona virus pandemic is a threat in pregnancy and vaccination against Covid-19 in such women is not yet formulated. Covid-19 infection in pregnancy raises concerns as infections with other corona viruses such as SARS and MERS have been associated with severe maternal and neonatal

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morbidity and mortality and adverse pregnancy outcomes including preterm birth and stillbirth [2].

The dynamic changes of Severe Acute Respiratory Syndrome Corona virus 2 (SARS-CoV-2) specific antibodies in infants born to mothers with Covid-19 have been reported [3]. Vertical transmission of severe acute respiratory syndrome corona virus 2 is possible and seems to occur in a minority of cases of maternal corona virus disease 2019 infection in the third trimester [4]. A low possibility of vertical transmission of Covid-19 and antibodies against SARS-CoV-2 has been reported among infants vertically exposed but negative for Covid-19 infection [5].

The present study was to evaluate the vertical transmission of anti-SARS-CoV-2 antibodies as well as Covid-19 virus in infants and the mothers with the history of infection during pregnancy.

MATERIAL & METHODS

Nasal and naso-pharyngeal swabs were collected from all females admitted in the Department of Obstetrics and Gynecology at Convenient Hospitals Ltd., Indore, India in the third trimester at full term for delivery during the period from 01 September, 2020 to 30 April, 2021. This was to rule out recent Covid-19 infection by Real Time Reverse Transcriptase Polymerase Chain Reactions (RT-PCR) by using dedicated reagents from Mol Bio Diagnostics Private Limited., Goa, India. At the time of delivery, blood samples of mother and infant as well as cord blood were collected in vacutainers with clot activator and were sent for evaluation of anti-SARS-CoV- 2 antibodies in the Department of Laboratory Medicine at Convenient Hospitals Ltd., Indore, India. Serum was tested for the presence of anti-SARS-CoV-2 antibodies by Electro chemiluminescence (ECLIA) on Roche Cobas e 411 analvzer. Anti-SARS-CoV-2 immunoassav bv ECLIA is an immunoassay for the in vitro qualitative detection of antibodies (including IgG) to Severe Acute Respiratory Syndrome Corona virus 2 and is an aid in the determination of the immune reaction to SARS-CoV-2.

The cut off Index (COI) of < 1.0 obtained with Roche anti-SARS-CoV-2 assay is Non Reactive and COI above 1.0 is Reactive for anti-SARS-CoV-2 antibodies.

To rule out the presence of IgM antibodies against SARS-CoV-2 in serum and Cord blood, rapid Corona Antibody (IgM/IgG) kit based on immunechromatography test kit from Oscar Medicare Pvt. Ltd., (Delhi) India was used.

RESULTS

Total 225 females in the third trimester at full term were admitted at Convenient Hospitals Ltd., Indore, India in the period from 01 September, 2020 to 30 April, 2021 for either normal delivery or lower (uterine) segment Caesarean section (LSCS).Out of 225 pregnant women, 203 were found to be negative for SARS-CoV-2 infection by RT-PCR at the time of delivery.

However, 22 women were positive for SARS-CoV-2 by RT-PCR suggesting an active Covid-19 infection in them. Nasal and nasopharyngeal swabs collected from the neonates born to these 22 women were negative for Covid-19 infection by RT-PCR. Anti-SARS-CoV-2 antibodies were not found in these 22 pregnant women with active infection and even their newborns were negative for anti-SARS-CoV-2 antibodies.

Seven out of 225 pregnant women gave the history of Covid-19 infection during their pregnancy. To rule out any recent Covid-19 infection and also to confirm the prior infection as reported by them, SARS-CoV-2 RT-PCR and anti-SARS-CoV-2 antibody tests were carried out in these seven pregnant women at the time of admission in the hospital. SARS-CoV-2 RT-PCR was found to be negative in these women but they all were reactive for anti-SARS-CoV-2 antibodies with COI median 13.52 (Range 6.9 to 40.05). Nasal and nasopharyngeal swabs and blood samples (peripheral and cord) were collected from the neonates of these seven confirmed sero- positive cases of Covid-19 infection to evaluate their Covid-19 status. SARS-CoV-2 RT-PCR was negative in these neonates but they were sero-positive for anti-SARS-CoV-2 antibodies with COI median 20.44 (Range 6.18 to 61.51) and COI median 14.37 (Range 7.97 to 48.04) respectively in peripheral as well as cord blood. Absence of IgM antibodies against SARS-CoV-2 was confirmed in neonates the by rapid immunochromatography test. The course of the disease was favorable with no maternal deaths and none were found to be critical. The neonates born to the Covid-19 infected mothers were healthy and were

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negative for Covid-19 by RT-PCR suggesting that there was no vertical transmission of the infection.

DISCUSSION

Trans-placental or intra-uterine transmission of active Covid-19 infection from mother to the fetus was not found in our study. Negative results for Covid-19 among newborn from infected mothers suggests that the SARS-CoV-2 infection to fetus through placenta does not occur.

Symptomatic Covid-19 during the third trimester of pregnancy is not associated with vertical transmission of active infection to the neonate [6]. There is no definitive evidence of intra - uterine vertical transmission of Covid-19 in pregnant women diagnosed in the third trimester [7, 8]. However, due to altered permeability/damages of the placenta, probably secondary to an inflammatory status, SARS-CoV-2 is able to bypass the placental barrier and reach fetal blood [9]. There was no vertical transmission of Covid-19 infection in our study, possibly due to the intact placenta in all the cases included in our study.

Presence of anti-SARS-CoV-2 antibodies in peripheral blood in newborns and cord blood suggests a vertical transmission of IgG antibodies from the mother to the fetus.

Due to its large molecular mass, IgM generally does not cross the placental barrier in large quantities and our study also ruled out the presence of SARS-CoV-2 IgM antibodies in the neonates by rapid immunochromatography test. IgG is passively transferred across the placenta from mother to fetus, beginning at the end of the second trimester and reaches high levels at the time of birth [10].

The neonates born to SARS-CoV-2 RT-PCR positive mothers with active infection were evaluated for the presence of Covid-19 infection and anti-SARS-CoV-2 antibodies in their blood. However, these neonates did not reveal any Covid-19 infection (RT-PCR negative) and there were no anti-SARS-CoV-2 antibodies in them.

CONCLUSION

There is no risk for vertical transmission of active Covid-19 infection from mother to their neonates, if there is no damage to the placenta. Trans-placental transmission of IgG antibodies against the virus and the extent of natural immunity in infants born to mothers infected with Covid-19 needs to be investigated further for the evaluation of the extent of passive immunity in them against SARS-CoV-2 infections and the duration for which the infants are protected.

ABBREVIATIONS

SARS - Severe Acute Respiratory Syndrome

SARS-CoV-2 – Severe Acute Respiratory Syndrome Corona virus 2

COVID-19 - Corona virus Disease 19

RNA – Ribonucleic Acid

RT-PCR – Reverse Transcriptase - Polymerase Chain Reaction

COI – Cutoff Index

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