

Short Communication

EVALUATION OF MATERNAL AND NEONATAL IGG AND IGM SARS-COV-2 ANTIBODIES, TRANSFER RATIOS OF ANTIBODIES VIA PLACENTA, IMMUNE RESPONSE IN NEONATES BY IGG AND IGA SARS-COV-2 ANTIBODIES DETECTION

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ABSTRACT

Objective: To study SARS-CoV-2 viral load in maternal and neonatal bodily fluids, Passage of anti-SARS-CoV-2 antibody through placenta and breastmilk, and incidence of fetoplacental infection.

Methods: The data were gathered from five databases and included a review of research articles published between 2020 and 2021.

- PubMed
- Google Scholar

The following terms were used in the search: 1. Clinical symptoms of the mother, 2. The ratio of negative to positive RT-PCR test results in infants, 3. Ratios of normal to aberrant IgG and IgM, 4. Antibody Placental Transfer, 5. Time period for maternal immunization to produce effective antibodies, 6. Neonatal Immune Response, 7. Antibodies are transferred through breast milk after moms have been immunised.

Results: Several prospective and retrospective studies conducted in Wuhan, Philadelphia, Florida and Massachusetts consisted of seropositive as well as seronegative pregnant women. SARS-CoV-2 antibodies were detected in the sera of the mother and correlated with the antibodies detected in the neonatal blood. Significant transfer of IgG SARS-CoV-2 antibodies through placenta and breast milk was observed; that is, positive correlation was found between SARS-CoV-2 IgG concentrations in cord and maternal sera ($r = 0.886$; $P < .001$). Not only passively, but mothers infected during the peripartum period protect the newborn by actively stimulating and training the neonate system via breastmilk immune complexes.

Conclusion: We here highlight novel insights arising from recent research endeavours on the transmission of SARS-CoV-2 antibodies from a mother to an infant.

Keywords: SARS-CoV-2, Antibodies transmission, Maternal, Neonatal, COVID-19, Transplacental, Breastmilk, IgG, IgM, IgA

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INTRODUCTION

SARS-CoV-19 was declared a pandemic by the World Health Organization. It affected people of all ages, castes, and nations, and the pandemic is still spreading. The virus primarily attacked organs such as the lungs, which caused respiratory difficulty in the victims. COVID-19's severe dangers to women and babies during pregnancy have spurred a worldwide discussion about the benefits and drawbacks of antenatal SARS-CoV-2 vaccination. In the case of pregnant women, considerable antibody transfer from the placenta and breast milk to the neonates was observed during the period of birth or the second and third trimesters. The results revealed a significant rate of placental antibody transmission. Antibodies must be passed down through the placenta or breastfeeding in order for neonates to be immune to the virus. According to the current circumstance, the transplacental transit of IgG and IgA provided the neonates with increased viral resistance. The data analysed below shows the use of ELISA to examine blood samples, cord samples, and human milk. The presented statistical data shows the levels of IgG,

IgM, and IgA increment or decrement. Certain studies included pregnant women who were seropositive or seronegative at random, whereas others only included seropositive women and had a set duration. We describe the maternal viral load, substantial antibody transmission across the placenta, and breast milk in this brief communication.

RESULTS

From February 16 to March 6, 2020, retrospective assessments of the clinical records of six COVID-positive pregnant women hospitalized to Wuhan University's Zhongnan Hospital were conducted. At delivery, blood samples were taken from the mothers, and neonatal blood and throat swab samples were taken at birth. RT-PCR tests on neonatal throat swabs and blood samples all came out negative. Antibodies were found in the serum of all six infants (table 1). As of March 8, 2020, none of the infants have shown any signs or symptoms [1]. Significant increase in IgG is observed compared to IgM.

Table 1: Antibody and IL-6 levels in infant sera samples

Clinical value	Reference range	Infants					
		1	2	3	4	5	6
IgM, AU/ml	<10	39.6	16.25	3.79	1.9	0.96	0.16
IgG, AU/ml	<10	125.5	113.91	75.49	73.19	51.38	7.25
IL-6. pg/ml	0.1-2.9	15.07	33.65	19.16	18.15	32.75	19.62

The study carried out at Pennsylvania Hospital in Philadelphia, Pennsylvania consisted of 1714 parturient women. SARS-CoV-2 IgG and/or IgM antibodies were found in 83 of 1471 mother/newborn dyads for which matched samples were available. IgG was found in the cord blood of 72 of the 83 neonates. Antibodies were not found in any infant born to a seronegative mother, and IgM was not found in any cord blood sample. Eleven infants born to seropositive mothers were seronegative: 5 of 11 (45%) were delivered to moms who only had IgM antibodies, and 6 of 11 (55%) were born to mothers who had much lower IgG levels than mothers of seropositive infants. IgG concentrations in the cord blood were favourably linked with maternal IgG concentrations ($r = 0.886$; $P.001$). Women with asymptomatic SARS-CoV-2 infections, as well as those with mild, moderate, and severe coronavirus illness, had placental transfer ratios greater than 1.0 in 2019. The transfer ratios rose as the period between the beginning of maternal infection and delivery grew longer [2].

Another cohort study was conducted among pregnant women presenting for care at 3 tertiary care centers in Boston, Massachusetts. This study revealed non-overlapping placental expression of SARS-CoV-2 receptors angiotensin-converting enzyme 2 and transmembrane serine protease 2, which may serve as protective mechanisms against vertical transmission [3]. As expected, IgM placental transfer was rare and IgG was identified in 23 (62%) of the umbilical cords among the 37 mothers with RT-PCR confirmed SARS-CoV-2 infection.

The prospective cohort study included 28 pregnant women who tested positive for SARS-CoV-2 infection and gave birth at Policlinico Umberto I in Rome, Italy, between November 2020 and May 2021, as well as their newborns and measured virus spike protein-specific salivary IgA antibodies in the infants ($P = .01$). IgA spike immune complexes were found in breast milk and may have served as specific triggers for the infant's mucosal immune response [4].

Significant secretion of SARS-CoV-2-specific IgA and IgG in human milk and plasma after SARS-CoV-2 vaccination was observed in a prospective cohort study conducted at Shands Hospital, University of Florida, from December 2020 to March 2021 [5].

DISCUSSION

The neonates born to seropositive women, regardless of whether they were symptomatic or not, had SARS-CoV-2 antibodies transmitted to them from their mothers. The evaluation of cord samples revealed transplacental IgG transfer. Beginning around the end of the second trimester, IgG is passively transferred from mother to foetus across the placenta, reaching high levels at the time of delivery, resulting in viral resistance in neonates. [1]. In lactating women, the IgA antibodies moved extensively through the breast milk, providing immunity to the babies. During the investigation, no IgM antibodies were detected in the cord or serum samples. There was no detection of IgM antibodies in any cord blood serum samples, even in cases of critical maternal illness or preterm delivery, supporting that maternal-fetal SARS-CoV-2 transmission is rare [2]. After immunization, there was an increase in IgG and IgA antibodies in

human breast milk [5]. The transfer ratios rose as the period between the beginning of maternal infection and delivery grew longer [1].

CONCLUSION

This article demonstrates that the delivery of breastmilk immune complexes by the mother's immune system stimulates and trains the immune system of the neonates for active protection, extending previous research showing that mothers provide a passive defence to their newborns via transplacental passage of maternal IgG antibodies and IgA antibodies via breast milk [4]. These findings can be put to use for improving clinical treatment and vaccine research and deployment methods for pregnant women and their babies [3]. Also, after the COVID-19 immunization, there is a statistically significant rise in SARS-CoV-2-specific IgA and IgG in human milk and plasma. These new findings point to the prospect of protective antibodies being transferred to nursing infants following maternal COVID-19 immunization, which could have a positive impact on vaccination strategies for breastfeeding moms [5].

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declared none

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