Content available at: https://www.ipinnovative.com/open-access-journals

IP International Journal of Medical Paediatrics and Oncology

Journal homepage: https://www.ijmpo.com/

Original Research Article

Antibody titre in infants of covid-19 infected mothers

Pushkar Lal Meena[1], **Jaya Ninama**[1], **Shivani Sharma**[1], **Rameshwar Lal Suman**[1,*]

[1] *Dept. of Paediatrics and Oncology Pushkar Lal Meena, RNT Medical College, Udaipur, Rajasthan, India*

ARTICLE INFO

Article history:
Received 02-05-2023
Accepted 22-06-2023
Available online 12-07-2023

Keywords:
Antibody titer
Covid-19
Infants
Infected mothers
Sars-cov-2
Vaccination

ABSTRACT

Introduction: COVID-19 is caused by SARS-CoV-2 and spreads from person-to-person. Pregnant women continued to be vulnerable to COVID-19. Infant protection from covid-19 infection is primarily dependent on neonatal innate immune responses and maternally derived, transplacentally acquired antibodies. Our aim was to study trans placental passage of anti-SARS-CoV-2 antibody and the magnitude of natural passive immunity in infants born to mothers with covid 19.

Materials and Methods: Prospective observational study was conducted at Balchikitsalay of MBGH, RNT medical college, Udaipur, Rajasthan from June 2021 to December 2022. Mothers with history of covid-19 positive in past at time of delivery in our hospital[MBGH] and all infants [0 days to 12 months] delivered from covid positive mothers who fulfill inclusion and exclusion criteria were enrolled in study. Measurement of SARS Cov2 antibody titre (serum IgG) in mothers and infants at our central lab where this sample was analysed by electrochemiluminescence.

Result: Total 100 covid-19 positive mothers and their infants who fulfill inclusion and exclusion criteria were enrolled in study. Out of 100 infants, 59% were males and 41% were females. Out of 100 infants, 12 (12%) were found in age group of <=3 months, followed by 32 (32%) in 4-6 months age group, 32 (32%) in 7-9 months and 24 (24%) in 10 -12 months age group. In our study 100 infants had different antibody titre level at different age. In Age group <= 3 months had maximum mean value of Antibody titre 135 AU/ml, followed by 26.5 AU/ml in Age group 4-6months, then 2.5 AU/ml in age group 7-9 months, and 0.5 AU/ml in age group 10-12 months. Antibody titre value sharply fall after birth and antibody titre remain almost one tenth of birth, after age of 3 month. After 6 month of age, it fall below protective level (10 Au/ml).

Conclusion: In our study protective value of antibody titre remain till 6th month of age, after that antibody titre decline below protective value. So we recommend that vaccination against covid-19 should be started after 6th month of life like other influenza virus

1. Introduction

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)/COVID-19 virus and spread from person-to-person.[1,2] Pregnant women continue to be vulnerable to COVID-19.[3,4] It is well known that when a woman was infected with a particular virus during pregnancy, the fetus can obtain specific maternal IgG through placental transport, which plays a passive immune role to protect the baby from virus infection after birth.[5] The detection of immunoglobulin (IgM/IgG) against SARS-CoV-2 among infants born from COVID-19 confirmed mothers but themselves tested COVID-19 negative have been reported.[6] Currently, the only route through which neonates and infants can access any level of COVID-19 immunity is by the passive transfer of antibodies from a vaccinated or previously infected mother. The presence of vaccine-induced antibodies in

* *Corresponding author*.
E-mail address: pushkarlalmeena7.pm@gmail.com (R. L. Suman).

https://doi.org/10.18231/j.ijmpo.2023.013

children of mothers who were vaccinated during pregnancy has been demonstrated.[7] The IgG antibodies cross the placenta and have been detected in cord blood.[8]

Infants protection from infection is primarily dependent on neonatal innate immune responses and maternally derived, transplacentally acquired antibodies. The extent to which maternal antibodies produced in response to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection during pregnancy cross the placenta is important for understanding potential neonatal protection from coronavirus disease 2019 (COVID19). Maternally derived antibodies are a key element of neonatal immunity. Understanding the dynamics of maternal antibody responses to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection during pregnancy and subsequent transplacental antibody transfer can form neonatal management as well as vaccination strategies.[9] It is generally believed that maternal antibodies disappear gradually in 12-18 months after birth. However, the maternal protective effect of against SARS-CoV-2 in infants was rapidly eliminated naturally after birth. These results can help us understand the risk of infantile vulnerability and improve vaccination strategies in the future.[10,11] However now, in the early vaccination era of the COVID-19 pandemic, another essential role of SARS-CoV-2 serology is the determination of specific antibodies after active immunization.[12]

2. Materials and Methods

Prospective observational study was conducted at Balchikitsalay of MBGH, RNT medical college, Udaipur, Rajasthan from June 2021 to December 2022. Mothers with history of covid-19 positive in past at time of delivery in our hospital [MBGH] were enrolled in study. All newborns and infants [0 days to 12 months] delivered from covid positive mothers who fulfill inclusion and exclusion criteria were enrolled in the study. All infants' age were divided into 4 groups 0-3 month, 4-6 month, 7-9 month, and 10-12 month. Measurement of SARS Cov2 antibody titre (serum IgG) in mothers and infants at our central lab where this sample was analysed by electrochemiluminescence method.

3. Result

Total 100 covid-19 positive mothers and their infants who fulfilled inclusion and exclusion criteria were enrolled in study. Out of 100 infants, 59% were males and 41% were females. Out of 100 infants, 12 (12%) were found in age group of <=3 months, followed by 32 (32%) in 4-6 months age group, 32 (32%) in 7-9 months and 24 (24%) in 10 -12 months age group.

As per distribution of infants Antibody titre with reference to Age, infants in Age group <= 3 months had maximum mean value of Antibody titre 135 AU/ml, followed by 26.5 AU/ml in Age group 4-6months, 2.5 AU/ml in age group 7-9 months, 0.5 AU/ml in age group 10-12 months.

Table 1: Distribution of infants antibody titre (serum IgG level) according to age

Age	Mean (AU/ml)	SD	P Value
<=3 Month	135.5	83.4	
4-6 Month	26.4	12.8	<0.001
7-9 month	2.5	2.4	
10-12 Month	0.5	0.4	

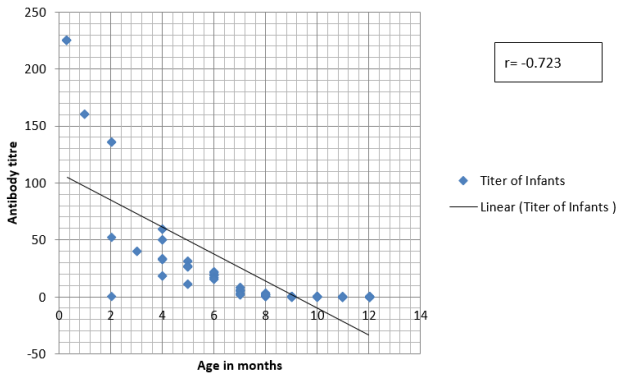

Fig. 1: Correlation Between age in month of infants and antibody titre of infants

Figure 1 showing that when age increases, antibody titre value decreases. So this is negative correlation. This diagram showing that Antibody titre value sharply fall after birth and antibody titre remain almost one tenth of birth, after age of 3 month. Antibody titre value begin to fall below protective value (10 AU/ml) after 6 month of age. At 9 month of age antibody titre become nearby zero.

Table 2: Distribution of infant antibodytitre according to trimester in which mother got infected

Trimester (Time of Infection in mother)	Mean (AU/ml)	sd	P Value
First	7.8	14.0	
Second	6.7	10.5	<0.001
Third	51.5	70.4	

As per Distribution of Infant Antibody Titre according to Trimester in which mother got infected, it was found that third trimester infected mother's infants had maximum mean value 51.5 AU/ml.

4. Discussion

In our study all 100 mothers was found serum IgG positive. Their infants had different antibody titre level (serum IgG level) at different age. In Age group <= 3 months had maximum mean value of Antibody titre 135 AU/ml and after

that antibody titre value sharply fall. Antibody titre remain almost one tenth of birth, after age of 3 month. After 6 month of age, it fall below protective level (10 Au/ml).

Similarly Wang X, et al. conducted a study[13] "Dynamic changes of acquired maternal SARS‑CoV‑2 IgG in infant" in Department of Pediatrics, Children's Digital Health and Data Center, Zhongnan Hospital of Wuhan University China. In this study 26 pregnant women and their 27 babies were tested for IgM and IgG antibodies against SARS-CoV-2. The SARS-CoV-2 IgG positive rate of parturient was 80.8%, and half of their infants obtained maternal IgG. IgG transfer rates were 81.8% in those infants whose mother infected more than 2 weeks before delivery. Study's data shows that there is no positive results of IgM were found in infants born to mothers with SARS-CoV-2. In the first two months of life, the IgG level of infants dropped sharply to one tenth of that at birth.

In our study it was found that third trimester infected mother's infants had maximum mean value of antibody titre 51.5 AU/ml. First trimester infected mother's infants had mean value of 7.8 AU/ml and second trimester infected mother's infants had mean value of 6.7 AU/ml.

Similary, In Zeng H et. al study[14] 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.

5. Conclusion

In our study protective value of antibody titre remain till 6^{th} month of age, after that antibody titre decline below protective value. So we recommend that vaccination against covid-19 should be started after 6^{th} month of life like other influenza virus. Third trimester infected mother's infants had maximum mean of antibody titre value.

6. Limitation

1. We have not follow same child upto 6^{th} month of age.
2. No equalization of infants every month or in different group.
3. We have not included vaccination status of mothers.

7. Conflict of Interest

None.

8. Source of Funding

None.

References

1. Shereen MA, Khan S, Kazmi A, Bashir N, Siddique R. COVID-19 infection: Origin, transmission, and characteristics of human coronaviruses. *Journal of advanced research*. 2020;24:91–8. doi:10.1016/j.jare.2020.03.005.
2. Stephen S, Issac A, Radhakrishnan RV, Jacob J, Vijay VR, Jose S, et al. Scrutiny of COVID-19 response strategies among severely affected European nations. *Osong Public Health Res Perspect*. 2021;12(4):203–14. doi:10.24171/j.phrp.2021.0068.
3. Dong L, Tian J, He S, Zhu C, Wang J, Liu C, et al. Possible vertical transmission of SARS-CoV-2 from an infected mother to her newborn. *JAMA*. 2020;323(18):1846–8.
4. Jelly P, Chadha L, Kaur N, Sharma S, Sharma R, Stephen S, et al. Impact of COVID-19 pandemic on the psychological status of pregnant women. *Cureus*. 2021;13(1):e12875. doi:10.7759/cureus.12875.
5. Xu Y, Li X, Zhu B. Characteristics of pediatric SARS-CoV-2 infection and potential evidence for persistent fecal viral shedding. *Nature Med*. 2020;26(4):502–5.
6. Alzamora MC, Paredes T, Caceres D, Webb CM, Valdez LM, Rosa ML, et al. Severe COVID-19 during pregnancy and possible vertical transmission. *Am J Perinatol*. 2020;37(8):861–65. doi:10.1055/s-0040-1710050.
7. Halasa NB, Olson SM, Staat MA, Newhams MM, Price AM, Boom JA, et al. Effectiveness of maternal vaccination with mRNA COVID-19 vaccine during pregnancy against COVID-19-associated hospitalization in infants aged< 6 months-17 states. *Morbidity Mortal Weekly Rep*. 2021;71(7):264–70.
8. Gray KJ, Bordt EA, Atyeo C, Deriso E, Akinwunmi B, Young N, et al. COVID-19 vaccine response in pregnant and lactating women: a cohort study. *medRxiv*. 2021;p. 10.1101/2021.03.07.21253094.
9. Flannery DD, Gouma S, Dhudasia MB, Mukhopadhyay S, Pfeifer MR, Woodford EC, et al. Assessment of maternal and neonatal cord blood SARS-CoV-2 antibodies and placental transfer ratios. *JAMA Pediatr*. 2021;175(6):594–600. doi:10.1001/jamapediatrics.2021.0038.
10. Gostin LO, Salmon DA. The dual epidemics of COVID-19 and influenza: vaccine acceptance, coverage, and mandates. *JAMA*. 2020;324(4):335–6.
11. Sharma R, Jelly P, Chadha L, Saxena V, Mohan L. A comparative study of attitudes towards COVID-19 vaccination in the rural and urban population of Uttarakhand, India. *J Global Health Econ Policy*. 2021;1. doi:10.52872/001c.29948.
12. Jabal KA, Ben-Amram H, Beiruti K, Batheesh Y, Sussan C, Zarka S, et al. Impact of age, ethnicity, sex and prior infection status on immunogenicity following a single dose of the BNT162b2 mRNA COVID-19 vaccine: real-world evidence from healthcare workers. *Euro Surveill*. 2020;26(6):2100096. doi:10.2807/1560-7917.ES.2021.26.6.2100096.
13. Wang X, Yang P, Zheng J, Liu P, Wei C, Guo J, et al. Dynamic changes of acquired maternal SARS-CoV-2 IgG in infants. *Sci Rep*. 2021;11(1):8021. doi:10.1038/s41598-021-87535-x.
14. Zeng H, Xu C, Fan J, Tang Y, Deng Q, Zhang W, et al. Antibodies in infants born to mothers with COVID-19 pneumonia. *JAMA*. 2020;323(18):1848–9.

Author biography

Pushkar Lal Meena, Resident https://orcid.org/0009-0000-5282-4325

Jaya Ninama, Resident

Shivani Sharma, Resident

Rameshwar Lal Suman, Senior Professor

Cite this article: Meena PL, Ninama J, Sharma S, Suman RL. Antibody titre in infants of covid-19 infected mothers. *IP Int J Med Paediatr Oncol* 2023;9(2):68-70.