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CASE REPORT

Cord blood antibody following maternal SARS-CoV-2 inactive vaccine (CoronaVac) administration during the pregnancy

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ABSTRACT

Maternal vaccination with SARS-CoV-2 vaccines has not been well studied yet in terms of safety and efficacy for protecting the newborn by the placental passage of antibodies. We reported 34 years of old health care worker (HCW) without any known SARS-CoV-2 infection. She had the first dose of SARS-CoV-2 inactivated virus vaccine (CoronaVac, Sinovac Life Science Co, Ltd, Beijing, China) at a gestational age of 28 weeks. The second dose of vaccine was given four weeks later at a gestational age of 32 weeks. HCW did not report any vaccine-related adverse events after either the first or second dose of the vaccine. Three weeks after the second dose of the vaccine, her anti-receptor-binding domain (RBD) of SARS-CoV-2 spike protein antibody was 779 arbitrary units (AU) per ml. She gave a birth of 38 weeks three days gestation age of healthy, full-term girl with a birth weight of 2770 gr. The mother's anti-RBD antibody was 734 AU/ml, the infant's cord blood anti-RBD antibody level was 764 AU/ml, respectively, cord sera/maternal sera transfer ratio was 1,04. This infant is the first identified case of SARS-CoV-2 IgG antibodies detectable in cord blood after maternal vaccination with CoronaVac.

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Introduction

The COVID pandemic that emerged at the end of 2019 is still ongoing.[1] Due to mechanical, physiological, and immunologic alterations that occur during the pregnancy, the risk of certain infections increase.[2] However, pregnancy does not increase the risk for acquiring SARS-CoV-2 infection but appears to worsen the clinical course of SARS-CoV-2 infection compared with nonpregnant females of the same age.[3] Although the severe infection risk is low, many international health organizations, including the Center for Disease Control and Prevention (CDC) of the US, Society for Maternal-Fetal Medicine, and the American College of Obstetricians and Gynecologists, define pregnancy as a risk factor for severe COVID-19.[4–6] In Turkey, inactive SARS-CoV-2 vaccine (CoronaVac, Sinovac Life Science Co, Ltd, Beijing, China) and mRNA vaccine (Pfizer-BioNTech) was granted Emergency Use Authorization (EUA), as like many parts of the World.

On the other hand, preauthorization clinical trials for pregnant persons were not designed, and only limited data on safety during pregnancy usage were available yet. There is no defined contraindication of SARS-CoV-2 EUA vaccines in pregnant women. The CDC, American College of Obstetricians and Gynecologists, and the American Academy of Pediatrics have recommended that COVID-19 vaccines should not be withheld from pregnant women.[4–6]

Here, we report the first known case of an infant with SARS-CoV-2 IgG antibody detected in cord blood after maternal vaccination of SARS-CoV-2 inactivated virus vaccine (CoronaVac, Sinovac Life Science Co, Ltd, Beijing, China).

Case presentation

34-years-old health care worker (HCW) without any known SARS-CoV-2 infection, administered the first dose of SARS-CoV-2 inactivated virus vaccine (CoronaVac, Sinovac Life Science Co, Ltd, Beijing, China) at a gestational age of 28 weeks. The second dose of vaccine was given 4 weeks later, at a gestational age of 32 weeks. HCW did not report any vaccine-related adverse events after either the first or second dose of the vaccine. Three weeks after the second dose of the vaccine, the anti-receptor-binding domain (RBD) of SARS-CoV-2 spike protein antibody was measured using the blood by SARS-CoV-2 IgG II Quant Reagent Kit (Abbott Ireland Diagnostics Division, Finisklin Business Park, Sligo, Ireland). The test result was 779 arbitrary units (AU) per ml (cutoff value≥50AU/ml).[7] Before delivery, the mother was also tested nasopharyngeal swab SARS-CoV-2 polymerase chain reaction, which was negative. She gave birth at 38 weeks and 3 days gestation age to a healthy, full-term girl with a birth weight of 2770 g. A cord blood sample was taken immediately after birth and sent for detection of anti-RBD antibodies. Meanwhile, blood was also drawn from the mother and also sent for detection of anti-RBD antibody. Informed consent for the blood draw and sampling of cord blood was obtained from the mother. The mother's anti-RBD antibody was 734 AU/ml, and the infant's cord blood anti-RBD antibody level was 764 AU/ml). The cord sera/maternal sera transfer ratio was 1.04. Newborn complete blood count, newborn congenital metabolic diseases screening, TSH, free T4 level, and cystic fibrosis screening tests were all in the normal range.

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Discussion

This report has shown that SARS-CoV-2 Ig antibodies are detectable in a newborns' cord blood sample after two doses of the SARS-CoV-2 inactivated virus vaccine given during pregnancy (CoronaVac, Sinovac Life Science Co, Ltd, Beijing, China). Like our case, Paul et al. reported a full-term female who was born to a COVID-19 naïve mother who received a single dose of messenger RNA (mRNA) vaccine (Moderna) 3 weeks before delivery.[8] Mittal et al. investigated anti-SARS-CoV-2 antibodies in maternal plasma and cord blood from 27 women that received the SARS-CoV-2 vaccine (mRNA vaccines) during pregnancy. They delivered 28 infants, and gestational age at first vaccine dose was 33 ± 2 weeks. The vaccine types were 18 Pfizer mRNA, six Moderna mRNA, and four unknowns. These authors found that only three infants did not have positive IgG (one set of twins), of whom two mothers had received their first vaccine less than 3 weeks before delivery. They also revealed that the average maternal-to-infant IgG transfer ratio was 1.0 ± 0.6. An increased latency from vaccination until delivery and having the second dose vaccine before delivery were associated with an increased proportion of transfer.[9] The protection of newborns from infection mainly depends on neonatal immune responses and maternally derived transplacentally acquired antibodies. Maternal immunization protects both the mother and fetus from the morbidity of certain infections. It can also provide passive infant protection against vaccine-preventable infections acquired independently after birth. In the context of the ongoing COVID-19 pandemic, it is essential to know which maternally produced antibodies in response to either SARS-CoV-2 infection or SARS-CoV-2 vaccination cross the placenta during the pregnancy. The knowledge will help establish maternal vaccination strategies. Recently, Flannery et al. demonstrated that among the 83 SARS-CoV-2 seropositive pregnant women, anti-SARS-CoV-2 IgG antibodies were detected in 72 (87%) born babies' cord blood.[10] They show that cord blood IgG concentrations were positively correlated with maternal IgG concentrations and that placental transfer rations were more than 1 among mothers with asymptomatic SARS-CoV-2 infection or symptomatic infection. They also revealed that antibody transfer ratios increased with increasing time between the onset of maternal infection and delivery.[10]

Anti-SARS-CoV-2 antibodies might also be detected in the breast milk of a previously infected[11] or vaccinated mother. Perl et al. conducted a prospective cohort study of a convenience sample of breastfeeding women (either exclusive or partial) in Israel.[12] All participants received two doses of the SARS-CoV-2 mRNA (Pfizer-BioNTech) vaccine 21 days apart. They collected breast milk samples before administering the vaccine and then once weekly for 6 weeks, starting at week two after the first dose. They show that the mean levels of anti-SARS-CoV-2-specific IgA antibodies in the breast milk increased rapidly. Antibodies were significantly elevated at 2 weeks after the first vaccine, when 61.8% of samples tested positive, rising to 86.1% at week 4 (1 week after the second vaccine), and mean levels of antibodies remained elevated for the duration of follow-up. At week six, 65.7% of samples tested still positive.[12] The safety of COVID-19 vaccines in pregnant women has not yet been studied. Recently, Shimabukura et al. investigated the safety of mRNA vaccines by extracting the data from the US the "v-safe after vaccination health checker" surveillance system, the v-safe pregnancy registry, and the Vaccine Adverse Event Reporting System (VAERS) [13]. These authors report that nearly 31,000 persons had undergone vaccination with mRNA vaccines, Pfizer-BioNTech, or Moderna during pregnancy.[13] They revealed that solicited local and systemic reactions reported to the v-safe surveillance system were similar among persons identified as pregnant and nonpregnant women. Although not directly comparable, the proportions of adverse pregnancy and neonatal outcomes (e.g., fetal loss, preterm birth, small size for gestational age, congenital anomalies, and neonatal death) among participants with completed pregnancies from the v-safe pregnancy registry appear to be similar to the published incidences in pregnant populations studied before the COVID-19 pandemic.[13]

Vaccination during pregnancy is recommended in the following situations; if the risk of infection exposure is high, the infection poses risks to the mother and fetus, and the vaccine is unlikely to cause harm. The Infectious Diseases Society of America (IDSA) recommends tetanus, diphtheria, acellular pertussis (Tdap), and influenza vaccines for pregnant women. Non-live vaccines are recommended if medical or exposure indications put them at risk for vaccine-preventable infections but live attenuated virus vaccines should not be given to these women.[14] Early data do not indicate any obvious safety signals concerning pregnancy or neonatal outcomes associated with COVID-19 vaccination in the third trimester of pregnancy.[13] In this case report, we show that immunization during the pregnancy period with CoronaVac lead to the passage of anti-SARS-CoV-2 antibody to newborns and did not cause any adverse reactions to mother and fetus. But to achieve clear conclusions, continued monitoring is needed to assess further maternal, pregnancy, neonatal, and childhood outcomes associated with maternal COVID-19 vaccination, including in earlier stages of pregnancy and during the preconception period.

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No potential conflicts of interest were disclosed.

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