Determining the ideal COVID-19 vaccine type and timing during pregnancy

June 29 2022

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Although pregnant individuals and newborns may face elevated risks of developing more severe cases of COVID-19 following SARS-CoV-2 infection, data indicate that COVID-19 vaccination during pregnancy can help to protect both the mother and child. New research collaboratively led by investigators at Massachusetts General Hospital (MGH) and Brigham and Women's Hospital (BWH) and published in

Nature Communications examined how different COVID-19 vaccines and the timing of vaccination during pregnancy impact the extent of this protection.

"Our goal was to compare maternal antibody responses and transplacental transfer of antibody to the neonate with vaccination across all three trimesters of pregnancy, and across different vaccine platforms (Moderna, Pfizer, and Johnson & Johnson). We hope to use this information to better counsel patients wondering about vaccination in the first versus the second or third trimester," says co–senior author Andrea Edlow, MD, MSc, a maternal-fetal medicine specialist at MGH and an assistant professor of Obstetrics, Gynecology, and Reproductive Biology at Harvard Medical School.

For the study, Edlow and her colleagues characterized antibody responses after Janssen's adenovirus-based Ad26.COV2.S, Moderna's mRNA-based mRNA-1273, and Pfizer-BioNTech's mRNA-based BNT162b2 vaccines in 158 pregnant individuals. The team also evaluated the transfer of protective SARS-CoV-2 antibodies via the placenta from mother to fetus by analyzing maternal and umbilical cord blood in 175 maternal-neonatal pairs.

The research revealed induction of lower-functioning SARS-CoV-2-specific antibodies after Ad26.COV2.S compared with mRNA vaccination, as well as subtle advantages in antibody levels and function with mRNA-1273 versus BN162b2. mRNA vaccine-induced antibodies had higher levels and functions against SARS-CoV-2 variants of concern, such as Alpha, Beta, Delta, and Gamma. Vaccine-induced antibodies also demonstrated neutralizing activity against Omicron. First and third trimester vaccination led to enhanced maternal immune responses relative to second trimester vaccination. The transfer of SARS-CoV-2-specific antibodies to the fetus through the placenta was most efficient following first and second trimester vaccination.

"These data support the initial vaccine series early in pregnancy if it has not yet been administered, with possible boosting later in pregnancy if eligible, to optimize protective antibody titers for both mother and neonate," says co-senior author Galit Alter, Ph.D., a core member at the Ragon Institute of MGH, MIT and Harvard and a professor of Medicine at Harvard Medical School.

The investigators stressed the need for more research on this topic. "Additional studies are needed to understand how to optimize maternal and neonatal immunity induced by vaccines in general during pregnancy," says co–senior author Kathryn J. Gray, MD, Ph.D., an associate obstetrician at Brigham and Women's Hospital and an assistant professor of Obstetrics, Gynecology, and Reproductive Biology at Harvard Medical School.

More information: Caroline G. Atyeo et al, Maternal immune response and placental antibody transfer after COVID-19 vaccination across trimester and platforms, *Nature Communications* (2022). DOI: 10.1038/s41467-022-31169-8

Provided by Massachusetts General Hospital