VACCINE INTEGRITY PROJECT

Executive Summary

Safety And Effectiveness Of Tetanus-Diphtheria-Acellular Pertussis (Tdap) Vaccination During Pregnancy: A Systematic Review And Meta-analysis

Background

Pertussis (whooping cough) remains a serious and sometimes fatal disease in young infants, particularly before they are old enough to begin routine childhood vaccination. In the United States, infants under 3 months of age bear the highest risk of severe complications, hospitalization, and death. In 2025, according to CDC data, there were more than 28,000 pertussis cases in the US and more than 35,000 the previous year. (Pertussis is a cyclical disease, where declines are expected after a case peak is reported.) Last year, 16 deaths were reported – most among infants under 1 year of age.

CDC's Advisory Committee on Immunization Practices (ACIP) updated its immunization recommendation in 2012 to include vaccination with a combined tetanus-diphtheria-acellular pertussis (Tdap) dose during every pregnancy. Maternal vaccination boosts antibody levels to be transported across the placenta, providing the infant with passive immunity. (Vaccination against pertussis does not begin until two months of age.) Tdap vaccination during pregnancy is recommended between 27 and 36 weeks' gestation.

The most recent ACIP publication reviewing Tdap vaccine evidence was the Morbidity and Mortality Weekly Report "Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis Vaccines," published in January 2020, which summarizes available evidence (including safety outcomes) and policy for Tdap use. The report reflected evidence considered through late 2019.

The Vaccine Integrity Project, an initiative of the University of Minnesota's Center for Infectious Disease Research and Policy, working with the nonprofit Evidence Foundation, conducted this review to evaluate the most up-to-date evidence on the safety, effectiveness, and immunogenicity of Tdap vaccination during pregnancy.

Methods

This systematic review and meta-analysis builds on two prior high-quality reviews and incorporates newly published evidence through March 2026:

- Researchers screened 14,174 papers and included 91 studies in the final analysis, including 62 new studies
- Study designs included randomized controlled trials and observational studies of large datasets including nationwide administrative claims data and electronic health records
- Outcomes assessed included:
    - Infant protection against pertussis

- Maternal and infant safety outcomes
- Immune response in mothers and infants

Results

Safety

Across a large and diverse body of evidence, no safety signal was identified for Tdap vaccination during pregnancy. There was no meaningful increased risk of:

- Stillbirth
- Preterm birth
- Hypertensive disorders of pregnancy
- Gestational diabetes
- Congenital anomalies
- Neonatal complications (including NICU admission, sepsis, or mortality)
- Serious adverse events in either pregnant women or infants

The evidence informing safety outcomes has some limitations, primarily due to the rarity of these outcomes or risk of bias related to the study designs, but the overall pattern across studies is consistent and reassuring.

Importantly, the scale of the evidence, including millions of pregnancies studied across clinical trials, observational datasets, and national surveillance systems (Vaccine Adverse Event Reporting System, Vaccine Safety Datalink, Department of Defense, etc.) designed to detect rare events, supports the conclusion that the vaccine remains safe.

Vaccine Effectiveness

The data suggest that Tdap vaccination during pregnancy provides protection for infants during the highest-risk period before they can be vaccinated. When there is an even higher baseline risk of pertussis – during an outbreak in a specific region or community, for example – the absolute reduction in the number of infant cases would be expected to increase further. The included studies have limitations related to risk of bias in observational data, but importantly, effectiveness outcomes do track with the immune responses in pregnant women and infants.

- Maternal vaccination was associated with:
  - Probable reduction in pertussis infection in infants
  - Probable reduction in severe disease, including hospitalization
- Evidence also suggests protection against pertussis-related infant death, though data are limited due to the rarity of this outcome

Immunogenicity

Evidence consistently shows strong immune responses in both pregnant women and infants:

- Maternal vaccination leads to higher antibody levels at delivery

- Infants born to vaccinated pregnant women have substantially higher antibody levels at birth, providing early-life protection
- Passive immunity persists until infants begin their primary DTaP vaccine series

These findings confirm the biological mechanism underlying the observed clinical protection.

Conclusions

The totality of evidence supports the conclusions that:

- Tdap vaccination during pregnancy has a strong safety record
- Tdap vaccination during pregnancy is effective in protecting infants from pertussis and its complications
- Tdap vaccination produces strong and reliable immune responses in both pregnant women and infants

Some limitations remain across the evidence base, particularly in measuring rare outcomes and concerns with risk of bias in observational datasets. However, evidence from randomized trials, large observational studies, and ongoing safety surveillance systems shows that there is likely no meaningful increase in risk.

At the same time, the benefits are well established: maternal vaccination significantly reduces the risk of serious and potentially life-threatening pertussis infection in early infancy.

Continued monitoring and research will further strengthen the evidence base, but current data strongly support existing recommendations for Tdap vaccination during pregnancy.