

Maternal Immunization and Vaccine Hesitancy in Pregnancy: Determinants, Barriers, and Strategies to Improve Uptake- A Literature Review

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Abstract

Review Article

Maternal immunization is a cornerstone of preventive antenatal care, protecting both pregnant women and their infants during increased vulnerability to infectious diseases. Recommended vaccines in pregnancy include influenza, tetanus–diphtheria–acellular pertussis (Tdap), COVID-19, and, more recently introduced, respiratory syncytial virus (RSV). Evidence consistently demonstrates favourable safety profiles and significant reductions in maternal and neonatal morbidity; however, uptake remains suboptimal worldwide. This review synthesizes current evidence on determinants of maternal vaccine hesitancy, key barriers to uptake, and evaluates evidence-based strategies to improve maternal immunization uptake. Maternal vaccine hesitancy, defined by the World Health Organization (WHO) as a delay in acceptance or refusal despite availability, is examined through the “3Cs” framework: confidence, complacency, and convenience. Confidence-related barriers include concerns about foetal safety, misinformation, and inconsistent recommendations from providers. Complacency arises from low perceived risk of infection among pregnant women, while convenience barriers reflect structural and logistical challenges such as missed opportunities during antenatal visits, limited access, and associated costs. Underlying these factors is the significant role of trust, particularly in healthcare professionals, whose clear recommendations strongly influence vaccine acceptance. Social and cultural influences, including family and community attitudes, further shape decision-making about vaccines. Facilitators of uptake include trusted provider endorsement, clear communication emphasizing dual protection for the mother and her infant, and integration of vaccination into routine antenatal care. Evidence from systematic reviews and meta-analyses strongly supports that multicomponent interventions are the most effective approach, combining patient education, provider engagement, and system-level support. Improving maternal vaccine uptake therefore requires coordinated, trust-based strategies embedded within routine maternity services. Aligning patient education, clinician confidence, and health system support can help overcome persistent barriers, enhance vaccine acceptance, and protect maternal and infant health. Continued surveillance and tailored interventions will be critical to sustain progress and address emerging concerns as new vaccines are introduced.

Keywords: maternal immunization; vaccine hesitancy; pregnancy; antenatal care; COVID-19; Tdap; RSV.

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INTRODUCTION

Maternal immunization is a cornerstone of preventive antenatal care, uniquely protecting both pregnant women and their infants during periods of heightened vulnerability to infectious diseases. Physiological and immunological changes in pregnancy increase maternal susceptibility to illnesses such as influenza and COVID-19, while placental transfer of maternal antibodies provides newborns with critical early-life protection (Male & Jones, 2025). In recognition of these benefits, the World Health Organization (WHO) and the American College of Obstetricians and Gynecologists recommend routine use of several non-live vaccines during pregnancy, including

seasonal influenza, Tdap (tetanus–diphtheria–acellular pertussis booster), updated COVID-19 vaccines, and, most recently, the respiratory syncytial virus (RSV) vaccine for eligible women in late pregnancy (American College of Obstetricians and Gynecologists (ACOG), 2026; Santilli *et al.*, 2025). These recommendations are supported by strong evidence demonstrating safety and effectiveness (Santilli *et al.*, 2025). Longstanding data confirm that maternal influenza and Tdap vaccines reduce severe disease both in mothers and infants, while maternal COVID-19 vaccination lowers maternal morbidity and confers neonatal protection, particularly when boosters are administered in the third trimester (Jacobson *et al.*, 2026). The recent introduction of the

RSV vaccine further expands prevention, with early data showing a 68% reduction in RSV-related hospitalizations among infants under three months (Rick *et al.*, 2026). Thus, maternal immunization represents a unique opportunity to offer dual protection, safeguarding two lives through a single intervention.

Despite robust evidence and clear recommendations, uptake remains suboptimal worldwide (Razai *et al.*, 2024; Regan *et al.*, 2025). In the United States, coverage during the 2022–2023 season was only 47.2% for influenza, 55.4% for Tdap, and 27.3% for updated COVID-19 boosters (Razzaghi *et al.*, 2023; Centers for Disease Control and Prevention, 2024). RSV vaccine uptake is growing, with early data from the United States showing approximately 30% coverage, disproportionately lower among socioeconomically disadvantaged groups (Trusinska *et al.*, 2025). Alarming, surveys indicate rising hesitancy as the proportion of pregnant women describing themselves as “very hesitant” toward influenza or Tdap vaccination increased between 2019–2020 and 2022–2023 (Razzaghi *et al.*, 2023; Harris, 2023). COVID-19 booster uptake has also been particularly low, with only 16% of pregnant women vaccinated by mid-2023 with marked disparities among Black and Latina women (Williams *et al.*, 2024).

This persistent hesitancy—defined by WHO as “delay in acceptance or refusal of vaccines despite availability,” represents a critical barrier to translating evidence-based recommendations into practice. Research in this area remains constrained by the historical exclusion of pregnant women from early clinical trials, reliance on observational and surveillance data, inconsistent definitions of hesitancy, and underrepresentation of underserved populations. These limitations highlight the urgent need for inclusive research, ongoing surveillance, and tailored interventions to strengthen confidence and ensure generalizability of findings. This review integrates recent evidence on maternal vaccines and synthesizes behavioural, structural, and trust-related determinants of vaccine hesitancy to guide practical clinical strategies.

Barriers to Maternal Vaccine Acceptance

Maternal vaccine decision-making can be understood through the WHO “3Cs” framework—confidence, complacency, and convenience (WHO, 2015). Confidence reflects trust in vaccine safety and effectiveness, and in the providers and systems delivering them. Complacency arises when the perception of disease risk is low. Convenience covers structural and practical factors that determine how easily vaccination can be accessed.

Confidence-related barriers remain the most prominent. Across diverse settings, pregnant women frequently express concerns about vaccine safety and potential harm to the foetus as a primary reason for

refusal (Geoghegan *et al.*, 2022; Mitchell *et al.*, 2023). These fears persist even for long-established vaccines, reflecting the widespread belief that pregnancy is a time to avoid any medical interventions unless essential (Mitchell *et al.*, 2023). Concerns are amplified when vaccines are new or when safety data in pregnant populations are limited (Santilli *et al.*, 2025). During the COVID-19 pandemic, exclusion of pregnant women from early trials and rapidly evolving health messages created confusion and uncertainty, illustrating that information alone is insufficient without trust and reassurance (Razai *et al.*, 2024).

Knowledge gaps and misinformation further undermine confidence. Some pregnant women remain unsure about which vaccines are recommended, when or why repeated doses are necessary, for example, the need for a Tdap booster in each pregnancy to ensure infant protection (Qiu *et al.*, 2021; Razai *et al.*, 2024). Others underestimate their risk of illness, particularly if they perceive themselves as healthy or live in communities with low disease prevalence (Razai *et al.*, 2024). Inconsistent guidance from providers about vaccines allows for misinformation from peers or social media, including unfounded claims linking vaccination to infertility, miscarriage, or foetal complications (Razai *et al.*, 2024). Such misinformation exaggerates perceived risks and promotes further hesitancy. A systematic review confirmed that social media is a major source of misinformation about pregnancy and COVID-19 vaccines, reducing trust in vaccination (Malik *et al.*, 2024). The pandemic highlighted how quickly confidence can be destabilized by uncertainty and mixed messages, stressing the need for clear, consistent, and tailored communication from professional bodies.

Complacency also contributes to hesitancy. Women who have not experienced vaccine-preventable illnesses first hand may perceive infections such as influenza, pertussis, or COVID-19 as mild or unlikely to affect them (Razai *et al.*, 2024). Pregnancy is often viewed as a period of wellness, with a preference to minimize any medical interventions if possible (Mitchell *et al.*, 2023). This perception can underestimate the serious risks of infection during pregnancy and early infancy, for example, influenza-related complications in pregnancy or life-threatening pertussis in newborns (Hansen *et al.*, 2024).

Convenience barriers reflect structural and logistical challenges. Missed opportunities occur when vaccines are not offered during routine antenatal visits due to supply, storage, or referral issues (Khan *et al.*, 2024; Regan *et al.*, 2025). In low-resource settings, limited antenatal care, long travel distances, and costs further reduce uptake (Khan *et al.*, 2024). The COVID-19 pandemic exacerbated these barriers, as disruptions to routine services and reliance on remote consultations made maternal immunizations less accessible.

The central role of trust and communication cuts across all dimensions. Strong recommendations from trusted healthcare professionals are among the most powerful drivers of vaccine uptake (Razzaghi *et al.*, 2023; Mitchell *et al.*, 2023). Women who recall an enthusiastic endorsement from clinicians are significantly more likely to be vaccinated than those who do not (Razzaghi *et al.*, 2023; Regan *et al.*, 2025). Conversely, mixed messages or avoidance of the topic in clinics can be interpreted by pregnant women as provider uncertainty leading to more hesitancy (Mitchell *et al.*, 2023; Razai *et al.*, 2024). Clinicians themselves may feel unprepared to counsel patients due to uncertainty about details, evolving guidelines, time constraints, or fear of vaccine refusal, leading to inconsistent recommendations (Geoghegan *et al.*, 2022; Santilli *et al.*, 2025). Strengthening provider knowledge about vaccines in pregnancy and their confidence in addressing any patient's concerns is therefore essential to promote better uptake.

Family and community influences also shape maternal vaccination decisions. Partners, relatives, and peers can either reinforce or undermine medical advice, with male partner approval serving as a critical determinant in some contexts (Mitchell *et al.*, 2023; Razai *et al.*, 2024; Adeyanju *et al.*, 2022). Trust is multifactorial and varies across diverse groups: for example, Black pregnant women in the U.S. report greater trust in public health agencies but lower trust in individual providers, while White and Latina women show the opposite pattern (Williams *et al.*, 2024). These differences highlight the need for tailored communication strategies that address cultural and personal beliefs alongside scientific evidence.

Strategies to Improve Maternal Vaccine Uptake

Addressing maternal vaccine hesitancy requires comprehensive, multifaceted approaches that go beyond education alone. While early and accurate counselling remains essential, evidence consistently shows that information provision must be embedded within coordinated strategies that also strengthen trust, provider engagement, and system-level support (Ayouni *et al.*, 2023; Razai *et al.*, 2024). Pregnant women should receive timely guidance on recommended vaccines and their dual benefits, protection for both mother and infant, since many may be more motivated by the reassurance that immunization also safeguards their newborn during the most vulnerable early months of life (Geoghegan *et al.*, 2022).

Provider-focused interventions are equally critical. Antenatal care providers must be trained and confident to deliver clear recommendations, treating vaccination as a routine component of antenatal care rather than an optional aspect (American College of Obstetricians and Gynecologists, 2026). Regular updates on evolving evidence and schedules can enhance clinician confidence when counselling patients

(Geoghegan *et al.*, 2022; Santilli *et al.*, 2025). Practical tools such as reminder systems and standing orders can help in increasing uptake, particularly when vaccines are recommended and offered during the same clinic visit (Razzaghi *et al.*, 2023). Integrating vaccination into antenatal clinics reduces logistical barriers and ensures timely access (Khan *et al.*, 2024; Regan *et al.*, 2025). These principles apply globally, with tailored approaches in low-resource settings to facilitate access to vaccinations by minimizing costs, reducing travel burdens, and providing culturally relevant information to improve vaccination coverage (Khan *et al.*, 2024).

Community and public health strategies complement clinical interventions. Public health campaigns should deliver clear, consistent messages about maternal vaccines, while culturally sensitive initiatives such as engaging community health workers, trusted leaders, or peer support groups can counter misinformation and reinforce confidence (Khan *et al.*, 2024; Razai *et al.*, 2024). At a community level, involving respected elder women or local mother networks in antenatal classes to share positive vaccination experiences can offer a more relatable counter-narrative to social media myths. Integrating maternal immunization into broader maternal-child health programs in the community can further normalize vaccination as part of holistic care.

Evidence strongly supports multi-component interventions as the most effective. A 2025 meta-analysis found that strategies combining patient education, provider training, and system-level changes significantly outperformed isolated interventions (Regan *et al.*, 2025). This aligns with the WHO guidance that tackling vaccine hesitancy requires coordinated action at individual, community, and health system levels (WHO, 2015). Importantly, even highly effective new vaccines such as maternal RSV face similar uptake challenges, with early U.S. data showing modest coverage despite strong efficacy (Trusinska *et al.*, 2025).

CONCLUSION

Maternal vaccine decision-making is complex and shaped by scientific evidence, social context, and healthcare delivery. Persistent barriers include safety concerns, misinformation, inconsistent provider recommendations, and access difficulties (Geoghegan *et al.*, 2022; Razai *et al.*, 2024). Key facilitators are strong provider endorsement, clear communication emphasizing dual maternal-infant protection, and integration of vaccination into routine antenatal care (Razai *et al.*, 2024; Regan *et al.*, 2025). Improving uptake requires strategies that are both evidence-based and compassionate, strengthening trust in vaccines, providers, and health systems. By aligning patient education, clinician engagement, and system support, maternal immunization programs can better protect mothers and infants from preventable diseases. Future

more inclusive and robust research studies are needed to guide equitable and effective implementation strategies to close the maternal immunisation gap across diverse populations.

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